

DESIGN RESEARCH ON THE REGENERATION OF THE URBAN INDUSTRIAL
WATERFRONT TO A LIVABLE ONE

A D.ARCH. PROJECT SUBMITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAI'I AT MĀNOA IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF ARCHITECTURE

MAY 2018

By

Yating Fan

DArch Committee:

Clark Llewellyn
Priyam Das
Yiru Huang
William Chapman

Key Words: Yangpu Riverside, Industrial Space, Regeneration Design,
Design Core, Design Concept, Design Strategy

ABSTRACT

With the developing economy and the expansion of the city in the past half century, the industrial space in Shanghai's central area has been largely relocated and abandoned, resulting in many urban problems. At the same time in the context of the urban regeneration of Shanghai, the land structure and industrial structure are being adjusted, putting forward a reasonable transformation requirement on the riverside industrial space. Therefore, the design research on riverside industrial space regenerating from the "production waterfront" to "livable waterfront" is urgently needed and it is an important task of the urban transformation in current China.

This paper takes the south part of Yangpu Industrial Riverside as a research object, which has witnessed the hundred-year history of Shanghai's industrial development. Based on the research of the comprehensive study of the social, economic, cultural and environmental disciplines of urban riverside industrial space, the study focuses further on urban space in the architectural significance. This regeneration design of the Yangpu industrial riverside space is divided into three elements: 1. Design core, fully cherishes the connotation value of Yangpu industrial heritage of the material space and spiritual culture, and takes industrial heritage as the most core design principles; 2. Design concept, based on the present situation of Yangpu industrial riverside space, puts forward the life, ecology, intelligence as the vision to guide the design; 3. Design strategy, to implement the core and the concept in action, is a system approach with rich content including the integration of traffic, open sharing of public space, site excavation of post-industrial landscape and various complex functional matches. Then on the basis of this, this part takes limited intervention as the main action demand, so as to strengthen the characteristics of charm for the regeneration of Yangpu industrial riverside space.

Based on the combing of regeneration project of Yangpu industrial riverside space, this paper draws a preliminary conclusion, hoping to make suggestions for the renewal of other industrial spaces on the Huangpu riverside, and under introspection to see the future.

Key Words: Yangpu riverside, industrial space, regeneration design, design core, design concept, design strategy

Acknowledgments

I would like to express the deepest appreciation to my committee for their continued support and encouragement. Many thanks to my committee chair, Clark Llewellyn, who read my numerous revisions and helped make sense of the confusion. Thanks to my committee members, Yiru Huang, William Chapman and Priyam Das, who gave me many inspiring comments.

I offer my sincere appreciation for the learning opportunity provided by University of Hawai'i School of Architecture and Tongji University College of Architecture and Urban Planning to join the Global Track dual degree program. Thanks to Clark Llewellyn, Yiru Huang, Bin Hu, Hongtao Zhou and Christian Bergum. My completion of this program could not have been accomplished without their guidance.

Finally, thanks to my parents, and numerous friends who always offer support and love during this long process.

CONTENTS

CHAPTER 1. Introduction	1
1.1 Research Background and Meaning	1
1.1.1 Research Background.....	1
1.1.2 Research Meaning.....	4
1.2 Research Scope and Objective.....	4
1.2.1 Research Questions Raised	4
1.2.2 Research Contents and Scope.....	5
1.2.3 The Expected Research Goal.....	8
1.3 Research Framework and Methodology.....	8
1.3.1 Research Framework	8
1.3.2 Research Methodology	10
CHAPTER 2. The Theories of Urban Industrial Waterfront	11
2.1 Literature Review.....	11
2.1.1 Within China.....	11
2.1.2 Out of China	13
2.2 Distinction of Concept and Relative Theory	14
2.2.1 Urban Waterfront Space.....	14
2.2.2 Industrial Heritage Space	16
2.1.3 Urban Regeneration.....	17
2.3 The Development History of Urban Industrial Waterfront.....	20
2.3.1 The Rise of Industrial Waterfront Space before the Industrial Revolution	20
2.3.1 The Prosperity of Industrial Waterfront Space after the Industrial Revolution	20
2.3.3 The Decline of Industrial Waterfront Space in the Post Industrialization era	20
2.3.4 The Revival of Industrial Waterfront Space	20
2.4 The Feature and Value of the Urban Industrial Waterfront	22
2.4.1 The Feature and Value of the Urban Waterfront Space.....	22
2.4.2 The Feature and Value of the Urban Industrial Heritage.....	23
2.5 Chapter Summary	24
CHAPTER 3. The Regeneration Design Research on Yangpu Industrial Riverside	26

3.1 The Regeneration Design Core	26
3.1.1 The Development Evolution of Shanghai and Yangpu Industrial Riverside Space	26
3.1.2 The Status Quo of Yangpu Industrial Riverside.....	34
3.1.3 Protection and Regeneration of Industrial Remains.....	43
3.1.4 The Exploration of Historical Industrial Context of Yangpu Riverside	44
3.1.5 Summary: Taking Industrial Inheritance as the Regeneration Design Core	46
3.2 The Regeneration Design Concept.....	47
3.2.1 Analysis on the Existing Problems of Production Shoreline	47
3.2.2 The Regeneration Design Concepts of Yangpu Industrial Riverside	51
3.2.3 Summary	56
3.3 The Regeneration Design Strategy.....	57
3.3.1 The Main Design Strategy: Limited intervene.....	57
3.3.2 Texture Continuing and Accessibility Reconstructing.....	60
3.3.3 Public Space Reprocessing	70
3.3.4 Post Industrial landscape Remodeling	77
3.3.5 Summary	93
3.4 Chapter Summary	94
CHAPTER 4. The Regeneration Design Research on the Urban Industrial Waterfront in US	96
4.1 Case 1: Chicago Industrial Waterfront.....	99
4.1.1 Overview	99
4.1.2 Millennium Park.....	102
4.1.3 Navy Pier	104
4.2 Case 2: Portland Industrial Waterfront.....	108
4.2.1 Overview	108
4.2.2 South Waterfront.....	109
4.2.3 Zidell Yards	112
4.3 Case 4: Milwaukee Industrial Waterfront.....	115
4.3.1 Overview	115
4.3.2 The Menomonee Valley Community Park	115
4.3.3 The Inner Harbor.....	118
4.4 Case Conclusion: Supplementary and Reference Compared with Yangpu Riverside.....	120

4.4.1 The Regeneration Design Core	121
4.4.2 The Regeneration Design Concept.....	124
4.4.3 The Regeneration Design Strategy.....	125
CHAPTER 5. The Regeneration Design Project on Yangshupu Port Area.....	127
5.1 Introduction and Programming of the Design Project.....	127
5.2 The Regeneration Design Core	129
5.3 The Regeneration Design Concept.....	137
5.4 The Regeneration Design Strategy.....	138
BIBLIOGRAPHY.....	152
Appendix I	157
Appendix II	162

CHAPTER 1. Introduction

1.1 Research Background and Meaning

1.1.1 Research Background

1.1.1.1 The Transformation of Urban Industrial Waterfront

As an internationally important industrial and commercial city, the industrial land area in Shanghai occupied 18.51% of the total construction area, up to 361.63km², which is nearly four times the world's metropolitan New York and London. Moreover, the structure of land used in Shanghai is irrational¹. While the proportion of industrial land is too large, the proportion of urban green space and public facilities is too low, further affecting the urban space quality. At the same time, with the development of economy and the adjustment of industrial structure, the relocation of industrial land and industrial buildings in Shanghai from the central urban area has left the idle and abandoned buildings, warehouses and other buildings, forming a rich industrial cultural heritage.

Table1.1 Comparison of industrial land area among Shanghai central city and some international metropolises²

Region	Scope Area (km ²)	Industrial land area (km ²)	Percentage of industrial land area(%)
Shanghai's central city	630	122	18.51
New York City	625	22.63	2.8
Tokyo 23 wards	621	68.31	11
Hong Kong	1108	10	3.86
Singapore	716	35	6.8

Indeed, from a worldwide perspective, the spread and expansion of cities in the past half century has made the industrial land from the urban independent fringe slowly

¹ Zhang Li. "Industrial estate transformation research in downtown of Shanghai based on the view of urban regeneration". *2015 China Urban Planning Symposium (09 overall urban planning)* 2015:10

² sorted by author,data source:Zhang Li(2015)

enwrapping into the urban central area, but eventually faced with the abandonment due to the post-industrial era. These gradually declining industrial plants are in urgent need to be transformed whether for the growth of urban construction land to meet the development needs, or for the urban public services, the ecological environment and other aspects. However the strategic judgment on how to transform, the mode of land conversion, the policy of community integration in industrial plants, and the concrete design practice are in urgent need of research and investigation due to the different conditions in each.

As an old industrial park in Shanghai developed in the 19th century, and as a key urban regeneration development area in Shanghai, Yangpu industrial riverside district is a topic worthy of study. Within Yangpu industrial riverside district, there is a practical case of an open Yangpu Riverside demonstration section and an expert seminar discussion in full swing on Yangpu Power Plant as an example of the "city factory" update mode.

1.1.1.2 Urban Regeneration in Shanghai

With the urban development, urban regeneration is a dynamic changing process. Urban regeneration at different stages will show different characteristics. From the small fishing village at the end of the Yangtze River one thousand years ago to the southern town hundreds of years ago, from the port opened in 1843 to the development of Pudong new area in the 1990s, Shanghai's urban development is in different process of urban regeneration.

Nowadays, Shanghai is at the end of the rapid expansion of urban space. The land for urban construction has peaked. By the end of 2014, the built-up area had exceeded 45% of the urban land area. "Toward a Great Global City" is a vision put forward by Shanghai Urban Master Plan (《上海市城市总体规划》2016-2040), which was revised in 2015. At the same time, it focuses on the 3 dimensions - urban competitiveness, sustainable development, and urban attractiveness, to create a more open and innovative city, a greener eco-city, a happier city of humanities³. Faced with the rigid constraint of "zero increase" in the total amount of construction land proposed in the new round of urban planning of Shanghai in 2040, and according to the demand of "negative growth in land use ,planning and construction in Shanghai should be achieved" and "Urban development and transformation deduced by the way of land using" in Sixth Planning Land

³ "Shanghai Urban Master Plan"(the draft of public)

<http://www.supdri.com/2040/public/ebook01/>

Conference in Shanghai⁴, Shanghai's urban construction began to focus on stock-based development. Rather than incremental development, Shanghai has entered a new stage of connotation growth and innovation emphasizing. Thus under this circumstance of resource intensiveness, it is urban regeneration that could act as the main way to achieve sustainable development of Shanghai's urbanization.

1.1.1.3 The Public Space Planning of Both Sides of Huangpu River

As the mother river of Shanghai, Huangpu River is located in the core of the city and plays an important role in the construction of the city's economy, society, culture, history and space environment⁵. However, after nearly a century of industrial development after the opening of ports, the two sides of the Huangpu River were separated from the city life by closed factories, warehouses and wharves. And waterfront public spaces were almost completely occupied. According to the goal of "building a remarkable global city and highlighting the core global functions of the central activity zone" proposed in the new round of urban master plan, the closed coastline of production-type shoreline on both banks of the Huangpu River will be further transformed into an open-based shared shoreline. The 45km long waterfront on both banks of the Huangpu River contains Xuhui Riverside, Huangpu Riverside, Hongkou Riverside, Pudong Riverside and Yangpu Riverside as the "East Gateway" of the Huangpu River, will become important areas bearing the core global functions of the city. Furthermore, it will have a significant impact on the urban space pattern.

⁴ Zhuang Shaoqing. "Toward a Great Global City - An Innovative Probe into the New Urban Overall Planning of Shanghai." *Shanghai Urban Planning*,2016,(04):1-8.

⁵ Zou Junwen."Studies on the Penetrating Strategy of Riverside Public Space in Huangpu River - A Case Study of Huangpu District." *Urban Building* 2015,(11)

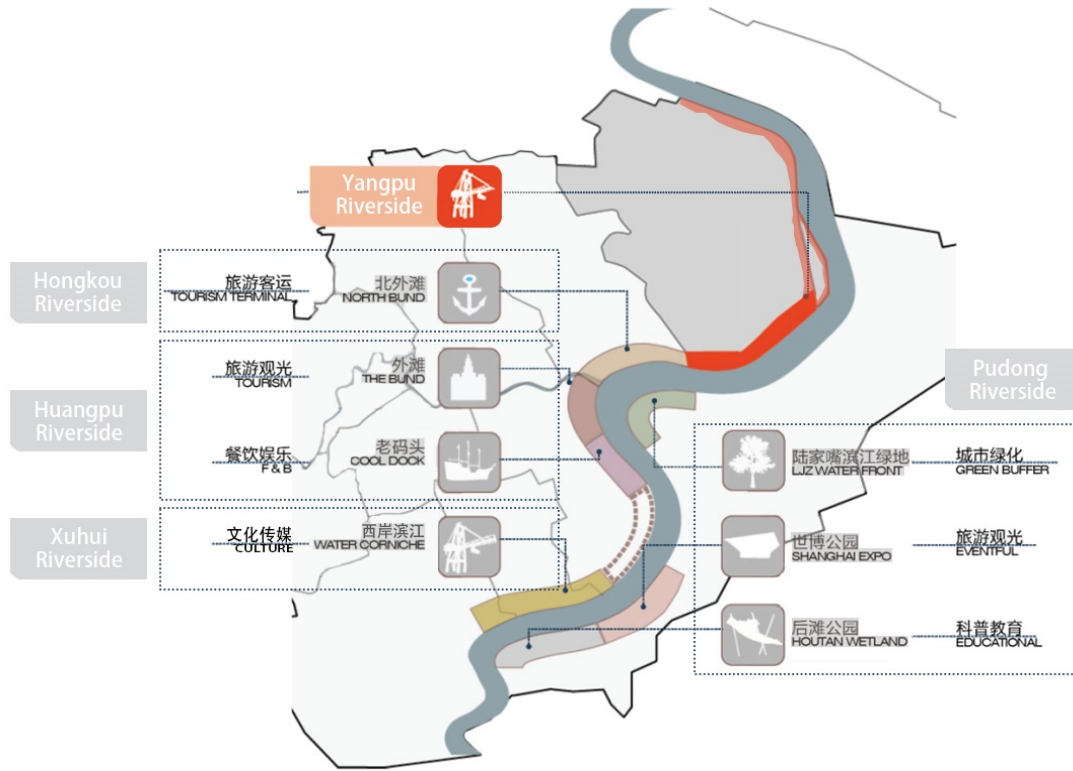


Fig1.1 The Public Space Planning of Both Sides of Huangpu River⁶

1.1.2 Research Meaning

The demand of urban regeneration puts forward higher requirements for the transformation of urban industrial waterfront land, which is not only an opportunity but a challenge for the update of industrial riverside space. Based on this background of time being, the typical case study of Yangpu industrial riverside space and cases learning from three US cities are of great significance to the study of its renewal mode, which goes beyond the category of architecture and also contains many comprehensive and interdisciplinary fields such as social culture, ecological environment and urban planning .

1.2 Research Scope and Objective

1.2.1 Research Questions Raised

Based on the above background questions are raised. For the typical industrial waterfront

⁶ drawn by author

space in the regeneration process, first of all, how to deal with the current venues affected or even contaminated by long-term industrial production activities and abandoned industrial legacy? And secondly, how to set a target according to local conditions and what kind of vision to expect about the life-oriented transformation of the future riverside space? The last is what kind of specific strategies can both cherish and extend the historical memory of a century industry, also make a reasonable contribution to ecological restoration and urban safety management in the process of re-development, moreover, in the urban design and architectural design realistically guide the waterfront industry's rejuvenation.

1.2.2 Research Contents and Scope

The research content of this paper is the urban industrial waterfront heritage space update.

The research object is the regeneration of the ongoing industrial riverside district in Shanghai, including the southern section of Yangpu industrial riverside heritage space, and at the same time, the six classic renewal cases of industrial waterfront in the three US major industrial cities, Chicago, Portland and Milwaukee.

Research perspective is its regeneration design, including the design core, design concepts and design strategies.

It should be specifically pointed out that, on one hand, in the third chapter of Yangpu industrial riverside space research, Yangpu riverside district refers to the area confined within Qinhuangdao Road - Dalian Road - Pingliang Road - Military Road - Yangpu District - Huangpu River. While the total length of the shoreline is 15.5 km long, the scope of this study mainly focuses on the southern section of Yangpu riverside, that is, the industrial riverside space south of Dinghai Bridge with 5.5 km long shoreline. When studying the specific problems in the design strategy, the 550-meter long demonstration section of Yangpu riverside, which has been built and open to public, is the key research object. And the demonstration section exactly refers to the public space demonstration area within Huaide Road to Dandong Road in the south section of Yangpu riverside. In the detailed regulatory planning the southern section of Yangpu riverside is divided by Yang Shu Pu port into the southern W7 unit and the northern W5 unit. At the same time, when studying the functional integration and linkage between the south section of Yangpu riverside and the community, the research object will be expanded to Pingliang community and Dinghai community.

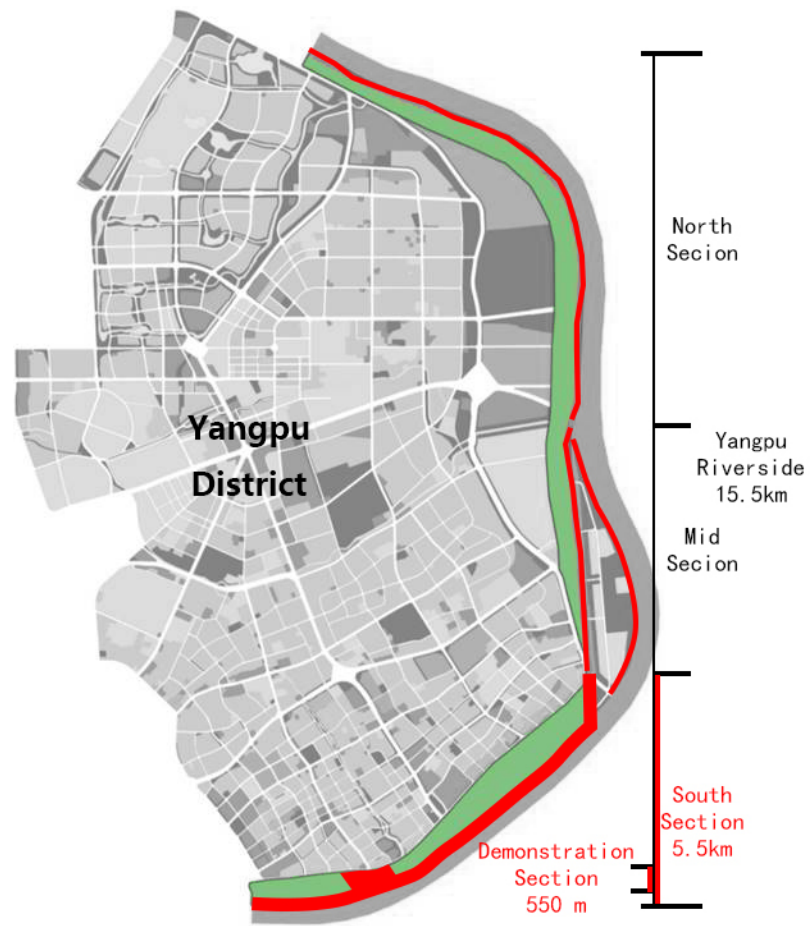


Fig1.2 The location and scope of Yangpu riverside⁷

⁷ drawn by author

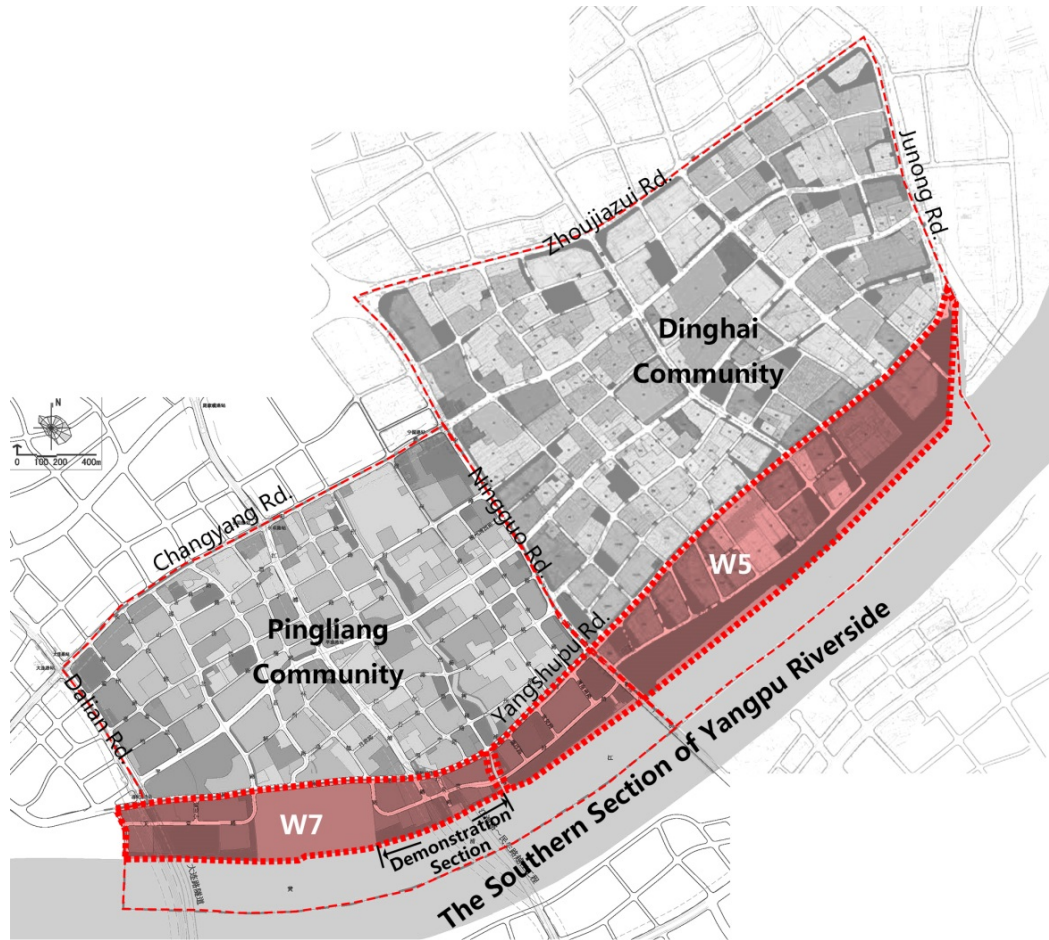


Fig1.3 Research content and scope⁸

On the other hand, the research content is expanded to the regeneration of the industrial waterfront space in the United States. Three typical examples of industrial cities in the United States and six industrial waterfront areas are selected. They are Millennium Park and Navy Pier in Chicago, South Waterfront and Zidell Yards in the Portland, Menomonee Valley and Inner Harbor in Milwaukee. I hope to study the successful cases of the United States and learn some experience from them. Also then it supposes to check leakage and fill a vacancy of the shortage of the regeneration project of Shanghai industrial riverside, and finally, relatively comprehensive and completely achieve the expected goal of the research study.

⁸ drawn by author, photo reference: the detailed regulatory plan(2013)

1.2.3 The Expected Research Goal

1. By studying the historical context of the industrial riverside heritage area and the current status of existing industrial buildings, this paper supposes to sort out a complete and contributing historical context of development. At the same time, through a large number of domestic and foreign cases studies in different regions at different periods, a systematic typological design strategies is hoped to put forward to define the connotation and value of industrial heritage in the post-industrial society. For further decision-making, I hope to establish a reference database.

2. Through the research and analysis of the regeneration design of urban industrial waterfront space from three aspects of history, society and space, this article systematically arranges the regeneration project of Yangpu industrial riverside space, summarizes its updated design core, concept and strategy, and correspondingly introspects on its shortcomings. Then, through the systematic analysis on several cases in the United States, we can make a full investigation of the insufficiency of industrial waterfront in Yangpu riverside public space project and further draw on the successful experience. On this basis, give top-down pondering the actual case of Yangpu riverside, and make recommendations on the regeneration of Shanghai's industrial riverside space. Therefore, it is hoped that a set of guidance system will be formed with a universal evaluation system of industrial waterfront regeneration strategy, which can provide reference and help for the regeneration practice of post-industrial space.

1.3 Research Framework and Methodology

1.3.1 Research Framework

1. Introduction

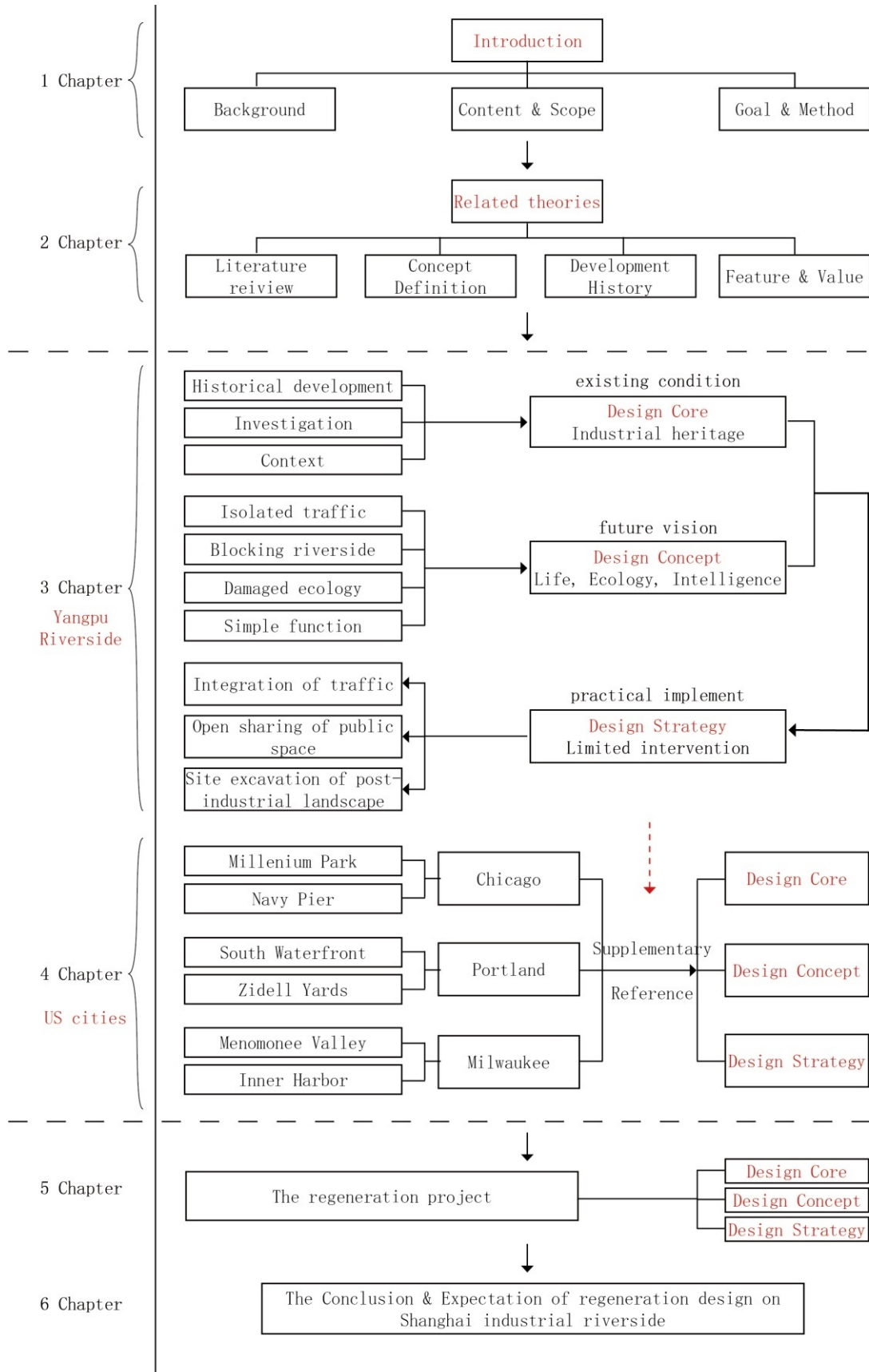


Fig1.4Research framework⁹

1.3.2 Research Methodology

The main research methods of this paper are literature research methods including library books and essays, archives historical data and network data, on-the-spot investigation method for Yangpu riverside project, case study for original design studios and Yangpu Riverside Company, also and comparative study for several regeneration cases in US, as well as the lessons learned from the generalization of the conclusions drawn by stage induction and logical deduction.

⁹ drawn by author

CHAPTER 2. The Theories of Urban Industrial Waterfront

2.1 Literature Review

2.1.1 Within China

In terms of domestic research trends within China, I have searched for excellent papers with the keyword "Riverside Industrial Renewal Mode" in the search network, and found that compared with "industrial building update", "industrial building renovation" and "waterfront public space" and other keywords, the number of these papers, as well as relevance, is relatively limited.

First of all, the initial intention of the international study on "industrial heritage", which originated from "industrial archeology" in the British around 20th century 50's, is to preserve the machinery and monuments in the period of the industrial revolution, and later gradually extended to the protection of "Industrial Heritage Site". The first international industrial heritage conservation organization, The International Conference on the Conservation of the Industrial Heritage (TICCIH), was founded in Sweden in 1978. After entering the 1990s, industrial heritage, as an important inheritance type, has become an important part of the protection and research of the world heritage protection field. Japan, Germany, the United States and other countries have done a large number of industrial heritage protections and researches and practices on re-use, such as the protection of Japan's Furano silk factory, the transformation of the German Ruhr, New York, the United States and other high-speed park re-use.

As for the research on the urban regeneration, it has been discussed on the renewal of the historical environment, like the transformation of the old city, at the beginning of the last century. With China's outbreak of urbanization process after reform and opening up, from Professor Ruan Yisan's(阮仪三) "City Protection Documentary"(护城纪实), Professor Chen Zhanxiang's(陈占祥) "Metabolism"(新陈代谢) to Professor Wu Liangyong's(吴良镛) "Protection and Development"(保护与发展), the academic community was slowly developed to focus on the renewal of the inner city. Until 2015, the West Bund in Shanghai officially held A Biennale of Architecture and Contemporary Art with the theme of "Urban Regeneration", and the research team led by the Tongji University discussed the urban regeneration of Shanghai extensively and intensely. Academician Zheng Shiling(郑时龄) gave a comprehensive summary of the urban regeneration of Shanghai from a macro point of view referred to the urgent need to update: 1. Central city industrial,

industrial area and industrial land; 2. Urban waterfront; 3. Historic district; 4. Public open space. His paper also took Yangpu Riverside as an example to talk about the inevitable transformation trend of waterfront space from production shoreline to life shoreline.

In view of the industrial heritage buildings, many scholars have analyzed the protection and reuse of industrial heritage buildings from different angles. Lu Shaoming (陆邵明,1999) summed up the reuse of industrial buildings was the valuable and meaningful design of "regeneration", and summed up the common methods and the designer's views of the reuse of industrial buildings¹⁰. Wang Jianguo and Rong Junqiang (王建国,戎俊强,2001) and Zhuangzi Di (庄简狄,2004), the former took the world's urban industrial history of the building as the object¹¹, the latter from the old industrial building recycling point of view¹². They both sorted out and explained the concept, history, classification, and re-use implementation strategy of the industrial heritage¹³. Zhang Ming and Zhang Zi (章明,张姿)design team through the transformation of the Shanghai South Power Plant (divided into two transformation stages: the first stage was transformed into the Shanghai World Expo future museum, the second stage was eventually transformed into Shanghai Museum of Contemporary Art), put forward the "Limited Intervention", "Routine Intervention", "Diffuse Exploration" design strategies, expressed a concept derived from the philosophy ideal of how to evolve into a realistic picture of reality¹⁴.

Fourthly, to search with the key words "industrial building update" "industrial building update", I found that many topics closely correlate the regeneration mode of these kinds of buildings with entrepreneurial industry intervention and entrepreneurial industrial park together. For example, Luliang (吕梁,2006) studied the influx and prosperity of the creative industries due to the rapid development of cities such as Beijing and Shanghai, which, as a result of various factors, complemented each other with the revival of historical industrial areas in the background of the times¹⁵. In fact, almost all of these projects belong to the secondary development and utilization of the original allocated

¹⁰ Lu Shaoming. "Research on a Regeneration Development and Design Method - Rebuilding and Utilization of Industrial Buildings." *New Building* 1999,(01):25-27.

¹¹ Wang Jianguo, Rong Junqiang. "On the Industrial History of Buildings and the Protection of the Re-use." *Time Architecture* 2001,(04):10-13.

¹² Zhuang Jiandi. "Research on Some Problems of Reuse of Old Industrial Buildings." *Tsinghua University* 2004.

¹³ Chen Xu, Li Huimin, Yan Ruiqi. "Development and Consideration of Recycling Old Industrial Buildings in China." *Construction Technology Development* 2009,(04):45-47.

¹⁴ Zhang Ming, Zhang Zi. "Power Station of Art." *Urban Environment Design* 2013,(Z2):44-59.

¹⁵ Lv Liang. "Creative Industries Involved in the History of Industrial Areas Updated." *Tongji University*,2006.

industrial land in an informal way, and there is no written policy, no relevant plan to control the nature of the transformation of land either. That belongs to the policy of gray area, and slowly emerges a lot of urban management issues that is not a sustainable "sub-health" update mode¹⁶.

At last, as for dissertation on architecture the research on "mode" and "strategy" of regeneration of industrial area is almost blank. The study of the mode is to explore the sociological problems of the city from a more comprehensive level, which has a certain degree of difficulty architecture students are usually not good at. Zhou Taohong (周陶洪,2005) master's degree thesis is a more comprehensive and multi-level discussion of the old industrial area update the strategic issues¹⁷. In terms of the update mechanism and the transition mode of this issue, compared to the field of architecture, the current urban and rural planning have more right to speak and more in-depth discussion. It is because not only more to explore the way to realize this program design instead of just to provide the design of space program, but also the nature of the land renewal mode instead of architecture construction, both of them are in a relatively fundamental position in the transition of the agenda. There are two papers that are closely related to this study. One is written by Feng Li and Tang Zilai (冯立,唐子来,2009), discussing the transformation of industrial land and the change of property rights from the perspective of neoclassical economics and the interests of all parties in order to realize the renewal of industrial renewal¹⁸; Another one is from Zhang Song, Li Yuxin (张松,李宇欣,2012) on account of Yangshupu District, a typical urban waterfront industrial heritage area, providing a comprehensive value assessment, and also exploring the revival strategy from the planning, ecological, community perspective¹⁹.

2.1.2 Out of China

From the perspective of foreign research out of China, there was a urban renewal movement which received a wide range of social influence, combined with material reform and policy system as a whole within the western academia. That began in 1949, as

¹⁶ Feng Li, Tang Zilai. "Transfer of Industrial Land from the Perspective of Property Rights System: A Case Study of Hongkou District, Shanghai." *Urban Planning Forum* 2013(5).

¹⁷ Zhou Taohong. "Study on Urban Renewal Strategy in Old Industrial Area." *Tsinghua University* 2005.

¹⁸ Feng Li, Tang Zilai. "Transfer of Industrial Land from the Perspective of Property Rights System: A Case Study of Hongkou District, Shanghai." *Urban Planning Forum* 2013(5).

¹⁹ Zhang Song, Li Yuxin. "Discussion on Planning Strategy of Overall Protection of Industrial Heritage Area - A Case Study of Yangshupu Area in Shanghai." *Conservation of Industrial Building Heritage* 2012,01:18-23

the United States "The Housing Act" issued. Compared with domestic, , the theoretical research on urban renewal of western academic circles is richer and more influential. Zhang Han (张汉,2008) concluded that the main research directions in urban renewal can be divided into four: urban renewal concepts and specific operation methods, the summary of the development of urban renewal, the mode of urban renewal and operation, the discussion of "urban gentrification"²⁰.

In general, this research topic can be split into five groups keywords: "urban renewal", "waterfront revival", "industrial land conversion", "renewal mode", "Yangpu Riverside". And these keywords in the architecture, urban planning, sociology and other disciplines are recently hot words. It has displayed that the literature and the number of citations are increasing in general from environmental science, urban research, geography, civil engineering and public management, these five major research directions in the web of science and other literature search website. The timeliness of the research topic can be further explained

2.2 Distinction of Concept and Relative Theory

2.2.1 Urban Waterfront Space

There are great many of scholars in western countries having defined the concept of urban waterfront in the past 20 years, but it is difficult to make a clear definition. In the doctoral dissertation, Gao Jing(高静) summarized the definitions of urban waterfront in foreign countries, such as Vayona (2011), Huang (2011), Shamsuddin (2013), Lagarens and Walansendow (2014)²¹.

Table2.1 A representative view on the definition of waterfront area abroad²²

source	the connotation of waterfront
Vayona (2011)	The densely populated areas that are or have been used are mainly for residential, leisure, commercial, fishing or industrial

²⁰ Zhang Han, Song Linfei. "A Summary of Domestic Researches on British and American Urban Renewal." *Urban Issues* 2008,(2)

²¹ Gao Jing. "Study on Recreational Regeneration of Waterfront in Metropolis." *East China Normal University* 2015.

²² table source:Gao Jing(2015)

Huang,etc. (2011)	American Heritage Dictionary(2000): The part of a town or city that abuts water, especially a district of wharves where ships dock
	Dictionary by Merriam-Webste(2006):land, land with buildings, or a section of a town fronting or abutting on a body of water
	WordNet2.0(2003):the area of a city (such as a harbor or dockyard) alongside a body of water
	Wikipedia(2006):the dockland district of a town
	The Free Dictionary(2006):Land abutting a body of water.
Shamsuddin, Latip, Ujang (2013)	Breen, Rigby(1994):defined based on the visual or other associations of water bodies
	Cau(1999):believed that the definition of Breen and Rigby (1884) is too broad and not suitable for those cities that rise above the waterfront
	Malaysian Department of Irrigation and Drainage(2003):city waterfront corridors defined as 50 meters on both sides of the river bank space
Lagareuse, Walansendow (2014)	McGovern(2008)points out Philadelphia's waterfront is the center of commerce, tourism and leisure on the edge of a central city, adjacent to the refurbished historic district
	Moretti(2010):waterfront is the urban area directly connected with the water body area
	Timur(2013):define the waterfront as an area of urban development and water interaction
	Hou(2009):describe the waterfront as a place where water and land meet

The definition of waterfront by the Chinese research scholars is similar to that of some foreign countries. Jin Guangjun (金广君,1994) has concluded that urban waterfront is a certain area of the transition between urban waters and land areas, and the dominant factor is the environmental relationship between water and land²³. Xu Hui (徐慧,2007) defined the concept of waterfront rather rationally, proposing that waters and adjacent land areas, ranges from 200 to 300 meters, and furthermore for human activities, due to taking into account the appropriate time to walk 15-30 minutes, the temptation of the

²³ Jin Guangjun. "Planning and Design of Japanese Urban Waterfront Area." *Urban Planing* 1994(4):45-49.

distance will be extended to 1000 to 2000 meters²⁴.

From many definitions of urban waterfront it can be summed up in the following three common features: First, the water body varies, and the so-called "water" refers to the rivers, lakes, oceans, canals and so on; Second, waterfront land area often has a close contact and contact with the city activities; Finally, the water and land, and their relationship are the basic compositions of waterfront space object.

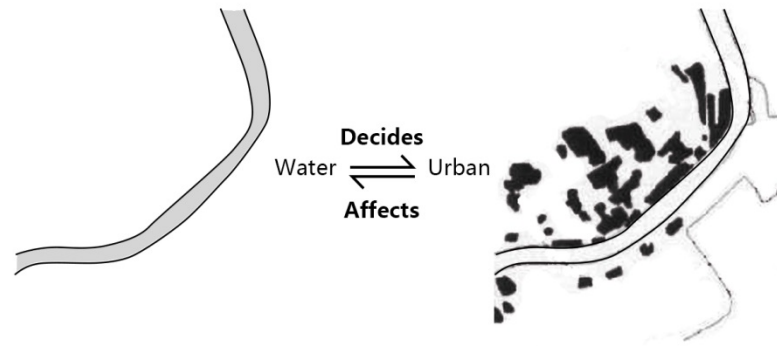


Fig2.1 The relationship between rivers and cities²⁵

2.2.2 Industrial Heritage Space

In July 2003, UNESCO confirmed that the Nizhny Tagil Charter, which was drafted by the International Association for the Protection of Industrial Heritage²⁶, stipulates that "*Industrial heritage consists of the remains of industrial culture which are of historical, technological, social, architectural or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted and used, transport and all its infrastructure, as well as places used for social activities related to industry such as housing, religious worship or education.*"²⁷.

However, the academic circles in China and abroad usually take the narrow sense of the industrial heritage as the main object of study on the industrial heritage, and that is,

²⁴ Xu Hui. "Research on Urban Landscape Water System Planning Modes: A Case Study of Taicang City, Jiangsu Province." *Water Resources Protection* 2007,23(5)

²⁵ drawn by author

²⁶ THE NIZHNY TAGIL CHARTER FOR THE INDUSTRIAL HERITAGE

<http://www.icomos.org/18thapril/2006/nizhny-tagil-charter-e.pdf>

²⁷ Yu Kongjian, Fang Wanli. "Preliminary Study on Chinese Industrial Heritage." *Architecture Journal* 2006,(08):12-15.

industrial relics left after the industrial revolution, exclusive of the ruins or ancient mining And smelting sites left from stone tools processing production process during the general history of the prehistoric.

The main study of industrial heritage space in this paper, the time span is defined in the period from the birth of modern industrial era in the late 19th century to the arrival of post-industrial age at the end of the last century. Moreover, the geographical scope refers to the Huangpu River production and processing zones, warehouses and wharf areas, as well as fisheries, steel, water, electricity, textile, shipbuilding and other industrial-related industrial value of the buildings, structures, facilities and equipment since the founding of Shanghai port.

2.1.3 Urban Regeneration

"Urban Regeneration" is not a new concept, with the urban development, the city has been in the process of metabolism. Only because in recent China, after the rapid development at the end of the century and beginning of this century, it ushered in a re-use stable development period, several words like transformation, renewal, revival and other terms have gradually become hot in the academic community. While, the generalized international concept of urban regeneration is relatively clear and complete. According to the time range of propulsion, urban regeneration has five stages: Urban Reconstruction in the 1940s and 1950s, Urban Revitalization in the 1960s, Urban Renewal in the 1970s, Urban Redevelopment in the 1980s and Urban Regeneration in the 1990s. In these five stages, due to the specific economic and social conditions, the definition of different nouns is different, corresponding to show the main characteristics of each period, expressing in different strategies orientation, special behavior, material updated object and the environment means²⁸.

Table2.2 Several stages of urban renewal in Western Europe²⁹

policy types	1950s after the war Urban Reconstruction	1960s Urban Revitalization	1970s Urban Renewal	1980s Urban Redevelopment	1990s Urban Regeneration
--------------	--	----------------------------	---------------------	---------------------------	--------------------------

²⁸ Kui Hui. "Urban Renewal in Western Europe and Its Enlightenment." *Southeast University* 2007.

²⁹ table source:Kui Hui(2007)

2. The Theories of Urban Industrial Waterfront

main strategic tendencies	To rebuild and expansion the old urban areas; suburban growth	Continuation of the theme of the 1950s; Suburban and peripheral areas of the growth; Some early attempts at urban restoration.	Focus on in-place updates and neighborhood plans; Peripheral areas continue to develop.	Many major projects for development and redevelopment ; Flagship project. Outside the city project.	To a more comprehensive form of the combination of policy and practice; More emphasis on the comprehensive solution to the problem.
main promotion agencies	National and local governments; Private sector developers and contractors.	Seek greater balance between government and private sector.	The role of private sector growth and the decentralization of the role of local government.	Emphasize the private sector and special representatives ; "Partner" model of development.	The "partner" model dominates.
behavioral space level	Emphasize local and place level.	Regional level of behavior.	Early emphasis on regional and local level, the latter pay more attention to the local level.	In the early 1980s, the emphasis was placed on the level of the place and later on the local level.	Re-introduce strategic development point of view; Increasing regional activities.
economic focus	Government-based investment, supplemented by private sector investment.	The impact of investment, such as death, has been increasing since the 1950s.	Resource Constraints and Further Development of Private Investment.	Private sector-based, selective public funds supplemented.	All-round balance among government, private investment and social industrial funds.

2. The Theories of Urban Industrial Waterfront

social category	Improvement of living and living quality.	Improvement of social environment and welfare.	Community-based activities and permissions	Community self-help with selective national support.	Community-based.
material update focus	The replacement of the inner city and the development of the periphery.	Continue similar repairs to stored areas since the 1950s.	A more extensive update to the Old Town.	Replacement and New Development of Major Projects	More moderate than in the 1980s; Tradition and cultural preservation.
environmental means	Landscaping and some greening.	Selectively improved.	Combine some innovations to improve the environment.	Growing concern for a wide range of environmental measures.	Wider intervention in the concept of environmental sustainability.

The concept of "urban regeneration" developed to today's Shanghai, as defined in the 2015 Urban Space Art Season with the theme of "Urban Regeneration": firstly, the city is not just a variety of morphological structures at the spatial level, but it is more and more complex and flexible also in terms of the city's political economy, social and cultural connotation in the process of globalization; secondly, the main object of urban regeneration is the urban lots whom vitality has decayed or lost, and the adjustment and reactivation of that can therefore solve the urban problems, at the same time enhance the sustainable development of regional economy and quality of life and upgrade the cultural environment³⁰. As the land shortage crisis of the city center intensified in today's Shanghai, how to treat the rich material and cultural heritage left from the early last century, which is the form of space and daily life represented by Lane(里弄), and the urban development typical form of the last middle century, which is workers' village, as well as the industrial land with a large proportion of urban centers, this issue has made Shanghai's urban regeneration a special and significant difference. Also, such urban regeneration boom is the background of this paper.

³⁰ Li Xiangning. "Urban Renewal - an Introverted Front." *Time Architecture* 2015,(06):60-65.

2.3 The Development History of Urban Industrial Waterfront

2.3.1 The Rise of Industrial Waterfront Space before the Industrial Revolution

Most of the early cities around the world originated from the intersection of the rivers, the mouth of the river, the gulf and the port, where are close to the source of water, with obvious advantages like living convenience and water transport. Then the canals, docks, the markets gradually formed, and the waterfront area became the population gathering place and commercial center of the early city, laying the foundation for the formation of waterfront industrial space.

2.3.1 The Prosperity of Industrial Waterfront Space after the Industrial Revolution

After the industrial revolution, the surging intensity and density of industrial activities, the unprecedented need for water resources and water transportation, and the rigid demand of industrial production and material distribution make the industry activities rapidly control of the waterfront areas. There have been more than 100 years of prosperity.

2.3.3 The Decline of Industrial Waterfront Space in the Post Industrialization era

On the one hand the comprehensive development of transport led to the rapid decline in water transport status. The obvious advantages of railways on the inland water transport has caused a huge impact, which made terminals, ports and gulfs no longer have location advantages, near the water. On the other hand, the developed countries took the lead to the bitterness of the industrial revolution, and then began the transformation of the national industrial structure. Therefore the traditional industries gathering in the coastal Riverside area of started to decline.

2.3.4 The Revival of Industrial Waterfront Space

Urban renewal and development will not be shelved because of the declining of industrial areas. It is due to the waterfront location and landscape features and values of the waterfront that industrial waterfront space caters to the requirements of a dynamic public space in urban construction of the new era. The industrial waterfront space ushers the

revival of functional transformation to re-participation in the rich city life³¹.



Fig2.2 Development course of urban industrial waterfront space³²

³¹ Wang Min, "Study on the Industrial Landscape Design of Urban Waterfront Area." *Beijing Forestry University* 2015

2.4 The Feature and Value of the Urban Industrial Waterfront

2.4.1 The Feature and Value of the Urban Waterfront Space

Charles Moore indicated that waterfront is a city's precious resource and an opportunity of challenge to the city's development. It is a chance for people living in urban life not only to escape crowded, pressure-cooker city life, but also to breathe fresh air beyond city boundaries³³. The revival of waterfront district has the following four necessary and sufficient features and values.

2.4.1.1 Innate Location Aspect

Due to the navigable advantages of rivers and oceans, the cities tend to be born in accordance with the water, and diverge along the terminals. Therefore, the waterfront is often the center of the city throughout the history, and the second is deputy center, has the congenital advantage richly endowed by nature to attract people and gather energy.

2.4.1.2 Open Landscape Aspect

As the most intense natural element occupying a large area in the city, the landscape features of the river shoreline are usually irreplaceable resources to the charm of the city. Commercial, residential and public spaces at various elevations and depths along the coast all compete to snatch the so-called "first-line river view ". In turn, these buildings also become a city-level landscape shoreline skyline. Thus the waterfront space has formed a landscape interactive value of seeing and being seen.

2.4.1.3 Public Space Aspect

Rivers, lakes, seas and other waters, generally have open space and vision, which is of great value for the design and construction of a rich and vibrant public space. Such as waterfront parks, green spaces along the river, waterside platform, waterfront revetment, creek and so on, these water interventions can greatly enhance the space environment of interest and richness in scale, form, layer and theme. At the same time, the structure of people's consumption has undergone tremendous changes in recent decades, where they are placing higher demands on the quality of public spaces, pursuing more and more

³² photo source:Wang Min(2015)

³³ Zhang Tingwei. "Urban Waterfront Design and Development." *Shanghai, Tongji University Press* 2002: 1-5

spiritual life, and keen on shopping, traveling, fitness and socialization and other outdoor activities. Water, as an element of public space, can help create a high-quality leisure and recreation space and meet people's growing demand for living consumption³⁴.

2.4.1.4 Cultural and Emotional Appeals Aspect

A river bred a city. People living near the water can tell endless stories about the river, which carries people indistinct memories. Citizens often have a high degree of community identity and sense of belonging to the city's waters, while the river has also become a symbol of the city's endorsement, entrusted with the cultural and emotional appeals, such as Thames River in London, Seine River in Paris, Singapore River in Singapore, Huangpu River in Shanghai.

2.4.2 The Feature and Value of the Urban Industrial Heritage

Industrial heritage not only honestly and scientifically recorded the process of industrial production, witnessed the history of the development of human industrial civilization, but in its own formation, completely fit the three principles of architectural design, "Durability, Utility, Beauty". Therefore, as an industrial heritage building itself also reflects the mechanical aesthetics of modern life. There are three aspects of the values and characteristics summarizing as follow.

2.4.2.1 History and Culture Aspect

Mr. Wu Liangyong(吴良镛) said: "Culture is the precipitation of history, remaining in the building, integrating in life"³⁵. Since the 19th century the industrial revolution has completely promoted the transformation of the entire social production mode. While industrial civilization has epoch-making significance in the history of mankind, industrial buildings, as the carrier of industrial civilization and the main participant in industrial production activities, their spatial scale, architectural style, construction technology and other aspects have profoundly recorded the development trace of industrial society and told the history of that era for future generations³⁶. Meanwhile, after the profound industrial revolution, there remains a cultural appeal for industrial buildings left over that can not be given up by people. And the industrial heritage that places people's desire for

³⁴ Liu Binyi. "Urban Waterfront Landscape Planning and Design." *Nanjing, Southeast University Press* 2006

³⁵ Wu Liangyong. "Meditation at the Turn of the World: The Future of Architecture." *Tsinghua University Press* 1999.

³⁶ Liu Weihui. "Research on the Reuse of Old Industrial Buildings in Shanghai." *Shanghai Jiao Tong University* 2007.

the inheritance of industrial spirits, is also the unique and attractive culture resources of the city.

2.4.2.2 Functional Usage Aspect

Due to their specific technical requirements, most industrial buildings are designed and constructed their structures as steel, reinforced concrete and brick-concrete structures, and most of them are in the form of bent frame and portal frame with firmness and durability. Thus the bearing capacity of industrial buildings is averagely ten times higher than that of civil buildings. Furthermore, industrial buildings are generally equipped with integrated plumbing and electrical equipment, together with structural load capacity, which has been extremely put on hold though after the needs for industrial production. Overall it can be fully upgraded to other functions for reuse as a civil building.

2.4.2.3 Landscape Aesthetics Aspect

Nowadays, as we can see in daily life like terrace workshop, towering cranes and chimneys, pipes and tanks, these industrial structures are almost entirely remnants of the modern industrial era. Industrial heritage in the flourishing life of the modern city has a very unique aesthetic. Because of the requirements of the industrial production, the industrial buildings usually have regular and generous plans, large spaces with a storey high space, facades with simple and smooth lines of modernism, rough structures and the original places of industrial civilization, which all constitute a special post-industrial landscape in stark contrast to the secular landscape in the city center. Instead, it is a new phenomenon of landscape aesthetics.

2.5 Chapter Summary

This chapter firstly carries on the literature review from china and outside of the chain to confirm the topic of this paper has originality and timeliness. Secondly, I refine some the key words to the regeneration of urban industrial riverside space to obtain “the urban riverside space” and “the industrial heritage space” and “the city regeneration”, and one by one to discern its concept and the definite; Thirdly, it is elaborated the riverside industrial space development history. And then based on that, I have made the analysis on the characteristics and values of the riverside shoreline and industrial heritage, also drew lessons from several typical cases of foreign waterfront industrial transformation.

Before specific analysis on the regeneration of the Yangpu industrial riverside space, this chapter hopes to carry out a comprehensive and macroscopic study on the regeneration of

the urban industrial riverside space by means of documentary theoretical research and case studies. It is hoped that this will not only provide the corresponding theoretical support and reference for the subsequent research of specific practical projects, but to establish the vision and theoretical background of thinking from the macro-perspective.

Starting from the third chapter, we will focus on the regeneration of the industrial space in the southern section of Yangpu riverside in Shanghai and the renovation of the coastline of several typical industrial cities in the United States. From the perspective of designing core, design strategy and design concept, I would conduct in-depth more specific design research.

CHAPTER 3. The Regeneration Design Research on Yangpu Industrial Riverside

3.1 The Regeneration Design Core

3.1.1 The Development Evolution of Shanghai and Yangpu Industrial Riverside Space

3.1.1.1 The Formation of Industrial Space in 1843 -1949

Opened in 1843 in Shanghai, the foreigner fortune group headed by the British flocked to the estuary of the Suzhou River to Huangpu River as a foreign ship anchorage, transporting large junk, trading tea and others. It is also in that confluence that a modern Shanghai originally began and gradually expanded. Here is the earliest Shanghai foreign terminal, meanwhile Shanghai's early industries are also developed along with the river, from the Huangpu River, Suzhou River space gradually expanding stand up.

In the course of nearly one hundred years, the riverside industry on both banks of the Huangpu River had developed from points into blocks. The "Shanghai Regional Development Plan" promulgated in 1926 can basically see the prototype of Shanghai's modern industrial space structure, which clearly defines the three important industrial bases in Shanghai's west, east and south. Afterwards, industry riverside on both banks of the Huangpu River gradually became a continuous line, forming a linear industrial belt. The spatial structure of industrial riverside basically took shape and laid the foundation for the widespread industrial production space into the hinterland after New China³⁷.

³⁷ Li Zengjun. "Symbiotic Strategy of Huangpu River Riverside Industrial Heritage Protection." *Shanghai Jiao Tong University* 2010.



Fig3.1 Industrial distribution of Shanghai in 1930³⁸

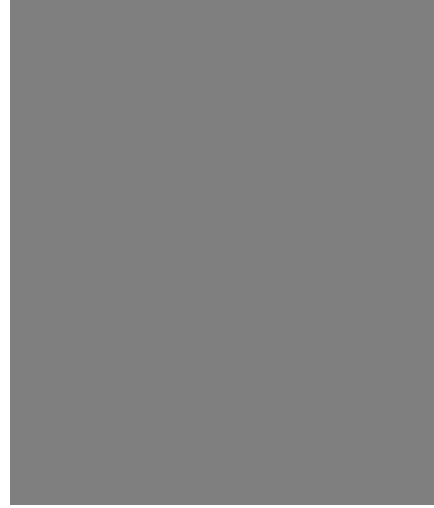


Fig3.2 Shanghai's major industrial areas
before New China³⁹

Among them, Shanghai's east industrial zone based on the textile, printing and dyeing and machinery industry, that is Yangpu industry riverside, started the budding period of newborn. In 1869, Shanghai Concession Project Bureau(上海工程局) constructed a riverside road, Yangshupu Road, not only to connect the Bund and Yangshupu Port, but also to closely link the harbor navigation resources of Yangshupu Port and the concession city center by land transportation. And it is that Yangshupu Road that greatly promoted the industrialization of Yangpu riverside in the next century and even the process of urbanization, also formed later urban fabric of Yangpu Riverside Industrial Zone marked by an important symbol of Yangshupu Road.

³⁸ photo source:Wang Meifei(2011)

³⁹ photo source:Wang Meifei(2011)

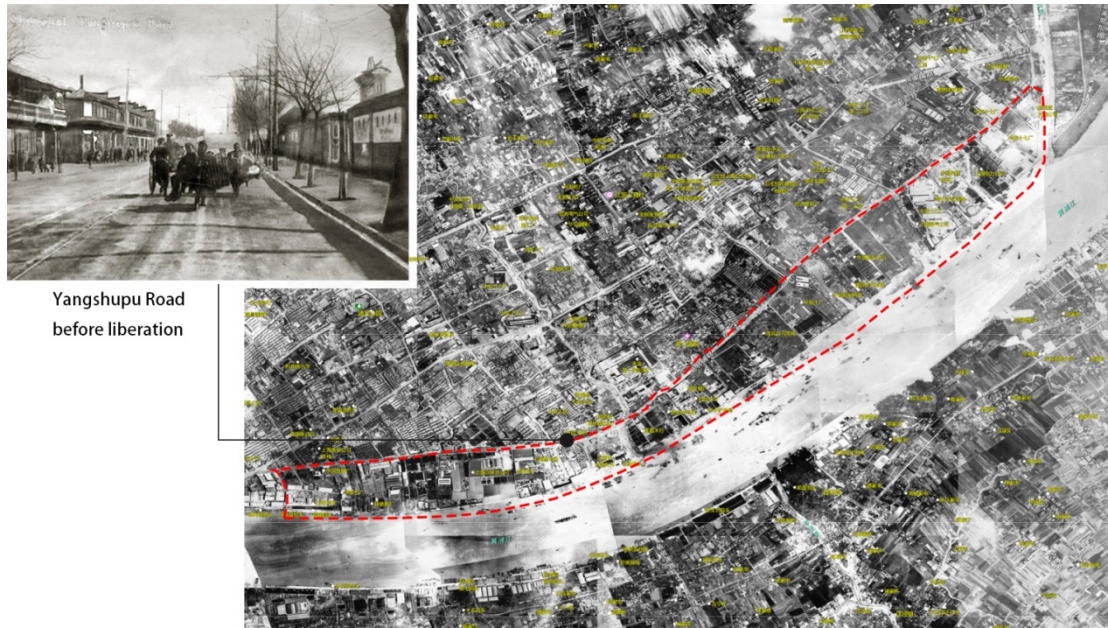


Fig3.3 Yangpu industrial riverside satellite and Yangshupu Road in 1949⁴⁰

3.1.1.2 The Expansion of Industrial Space in 1949 -1985

After the founding of New China, the restoration of the national economy and the expansion of the secondary industry were the top priorities in Shanghai. As the time was ripe, the industrial space rapidly spread from the banks along the Yangtze River to the suburbs. There emerged a series of suburban industrial areas outside the inner Shanghai, and gradually became a China's largest industrial base. Until the 1980s, the industrial zone in Shanghai's urban area developed into a ring structure, "Inner Ring Zone - Central Ring Zone - Outer Ring Zone"⁴¹, and formed eight industrial zones on the periphery of the central city in seven suburban satellite cities, then came into three large-scale economic and technological development zones⁴². In the era, the industrial structure of Shanghai was still an industrial-led at that time. The industrial zone was equipped with characteristic workers' village of Shanghai and a single, relatively effective industrial community was formed around it. As a result, the spatial layout of Shanghai's industrial space expanding from the riverside districts to the suburbs has basically taken shape.

⁴⁰ drawn by author, photo reference:Tian Di Map

⁴¹ Wang Meifei. "Study on the Evolution and Transformation of Old Industrial Areas in Shanghai Central City." *East China Normal University* 2010.

⁴² Fang Lan. "Research on the Planning Adaptability of Shanghai Industrial Park in the New Situation." *Urban Planning Forum* 2008, z1.



Fig3.4 Suburban industrial area in old Shanghai⁴³



Fig3.5 Three rings layout of Shanghai urban area of central city in 80s⁴⁴

The total output value of Yangpu industrial riverside rose, accounting for 26% of the city. At the same time, industrial development led to a surge in population. Industrial workers reached 600 thousand, and workers quarters and other residential areas soon developed surrounding the factory. In that production mode benignly stimulated by production factors and labor resources, Yangpu industrial riverside ushered in the most brilliant stage of development.

⁴³ photo source:Wang Meifei(2010)

⁴⁴ photo source:Wang Meifei(2010)



Fig3.6 Yangpu industrial riverside satellite map of in 1979⁴⁵

3.1.1.3 The Decline and Revival of Downtown Industrial Space from 1985 to the Present

At this stage, the industrial riverside of city center in Shanghai has entered a new stage of development, from prosperity to exit and from exit to revival, which thanks to the industrial layout and industrial structure adjustment of Shanghai. Central city began to focus on the development of finance, commerce, office, leisure and tourism and other tertiary industries. On the one hand, industrial riverside either failed or went bankrupt, or transferred to the suburbs, so that suburban industries ushered in a concentrated and rapid development. On the other hand, some of industrial riverside spaces began to transform into other functional spaces. Especially in response to the requirements of industrial upgrading and urban living, the creative industry have been thriving over the past ten years in the history of industrial riverside area, such as the M50 on the banks of the Suzhou River.

However, with the adjustment of industrial structure, more and more industries in riverside district in the central city have been declining. Most of the idle and abandoned industrial buildings were quickly demolished and rebuilt under the tide of urban construction. Industrial riverside space texture was disrupted and scattered, in the danger of being further cut off and fragmented.

⁴⁵ drawn by author, photo reference:Tian Di Map

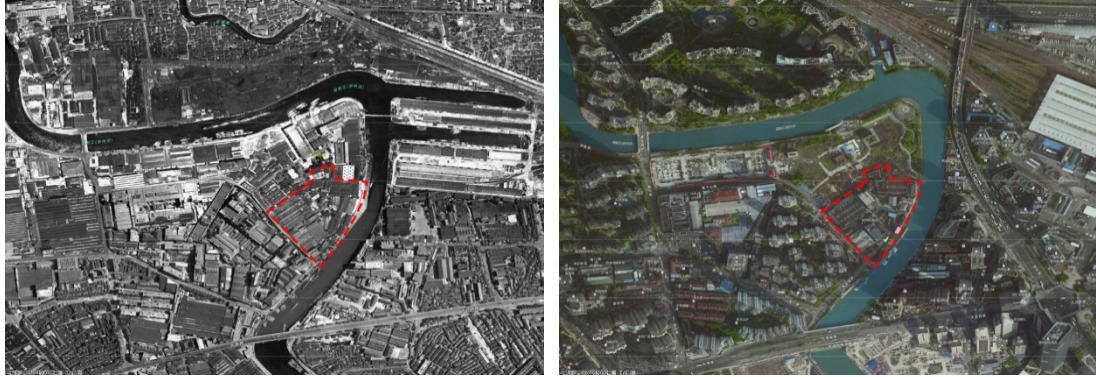


Fig3.7 From 1979 to 2016, the texture fracture along the Suzhou river near M50⁴⁶

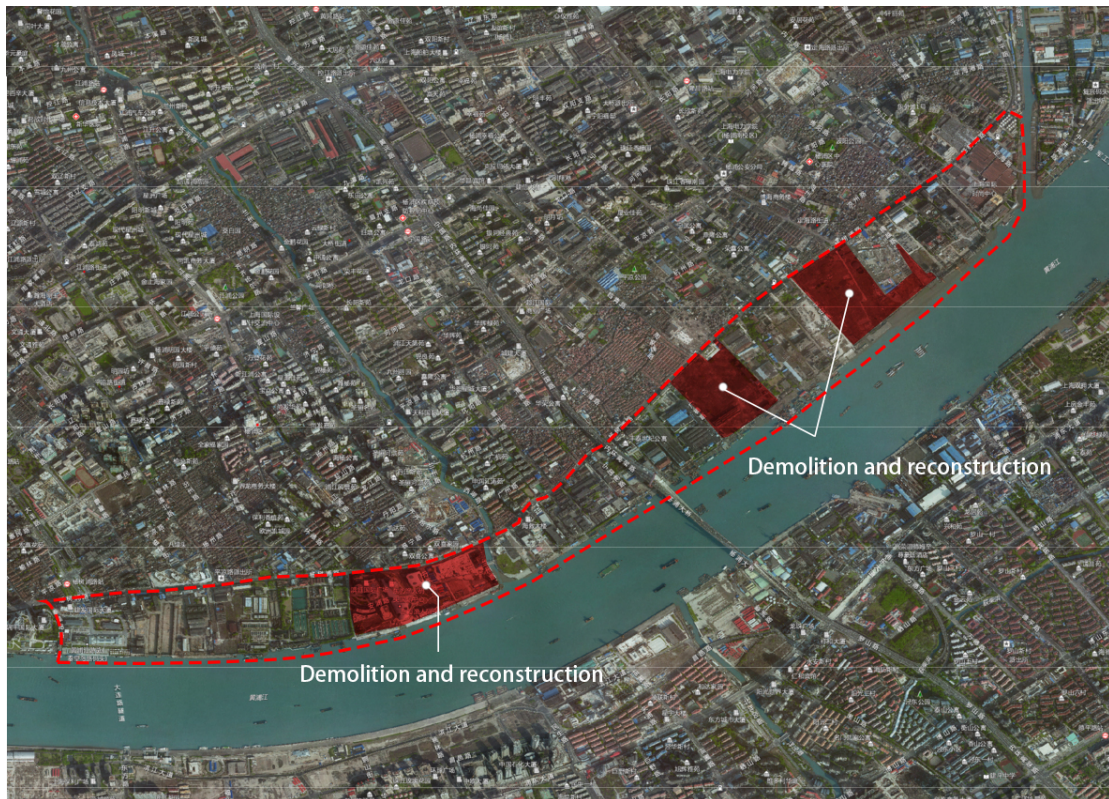


Fig3.8 Yangpu industrial riverside satellite map of in 2016⁴⁷

In recent years, with the sound of scholars, social forces and the worldwide successful practice of industrial heritage protection and regeneration, the characteristics and values of the industrial heritage space itself have drawn more and more attention. Coupled with the latest overall planning of the Huangpu Riverside, the value of industrial heritage and

⁴⁶ drawn by author, photo reference: Tian Di Map

⁴⁷ drawn by author, photo reference: Tian Di Map

the potential of the urban riverside will be raised together with this land in the Yangpu Riverside, making it the focus of urban renewal in Shanghai and deserving in-depth discussion and study by urban planners.

3. The Regeneration Design Research on Yangpu Industrial Riverside



Fig3.9 Analysis of typical spatial evolution in Yangpu industrial riverside⁴⁸

3.1.2 The Status Quo of Yangpu Industrial Riverside

As one of Shanghai's most important and earliest industrial bases, Yangpu riverside has witnessed the development of Shanghai's industrialization and urbanization and has an irreplaceable position in the history of modern Chinese industry. In 1869, on the basis of the embankment of the Huangpu River, the public concession authorities started the construction of Yangshupu Road, which started the prelude to the centennial industry of Yangshupu district. From Li Hongzhang(李鸿章) prepared to establish Shanghai Mechanical Textile Bureau(上海机器织布局) in 1878, to factories like silk, shipbuilding, paper and others have been set up in 1913, the industrial zone formed a beginning of the scale of the industrial zone. By 1937, there were 57 foreign factories and 301 national industries in Yangshupu area. It has accumulated many types of foreign affairs, aliens, municipalities and ethnic industries since the founding of new China, with nearly 100,000 employees and a total industrial output value of 720 million yuan, accounting for 5% of the country's total and about 20% of the city. It also formed a large number of "the most" of China modern industry.

Table3.1 "The most" of China modern industrial in Yangshupu District⁴⁹

1	China's earliest larger terminal	Gonghexiang Wharf	in 861 年
2	China's earliest mechanical paper mill	Shanghai Machine Paper Bureau	in 1882 built
3	China's earliest water plant	Yangshupu Water Plant	in 1883 completed and external water supply
4	China's earliest machine cotton spinning mill	Shanghai Machine Weaving Bureau	in 1890 opened
5	China's earliest foreign mill	The British Yihe Mill	in 1897 officially put into operation
6	China's earliest reinforced concrete structure plant	Yihe Mill waste spinning workshop	in 1911 built

⁴⁸ drawn by author⁴⁹ arranged by author, data reference: One Hundred Years of Industry as Yangpu

3. The Regeneration Design Research on Yangpu Industrial Riverside

7	China's earliest modern multi-storey steel structure	Yangshupu Power Plant No. 1 boiler room	in 1913
8	East Asian largest power plant	Yangshupu Power Plant	in 1913 put into operation in 1923 expansion into the largest power plant
9	East Asian largest soap factory	British Business China Soap Co., Ltd. Shanghai Branch	in 1923 created
10	East Asian largest gas plant	Yangshupu Gas Plant	in 1933 completed and put into production
11	East Asian largest manufacturing plant	The British New Yihe Mill	in 1915 opened in 1966 renamed the state-owned Shanghai first top length
12	China's largest power plant auxiliary design and manufacturing company	Shen Chang Yangshupu Plant	in 1921 founded in 1980 changed its name to Shanghai Power Station Auxiliary Plant
13	China's longest modern steel shipbuilding workshop	Shen Chang Yangshupu Plant	in 1921
14	China's first comprehensive plastics processing enterprises	Shanghai Chemical Factory	in 1924 opened in the business Ming Wah sugar factory in 1950 renamed
15	China's highest modern steel frame structure plant	Yangshupu Power Plant No. 5 boiler room	in 1938

Today, there are a large number of industrial heritage sites of various historical periods distributed in Yangpu Industrial Park. Some of them have been registered at levels of cultural relic protection units, including 13 excellent historic buildings of Shanghai and 4 immovable cultural relics of Yangpu district level, as well as 10 industrial heritage sites newly discovered at the 3rd Cultural Relics Survey and 7 preserved historical buildings. Meanwhile, the "Detailed Controlled Planning of the Huangpu Riverside"(《黄浦江沿岸控制性详细规划修编》), the 2013 edition, also provide statistics and rules for protection

of namely W5 and W7 units^{50, 51} (see regions from Figure 1.3 for details). There are 5 protected buildings, 5 preserved historic buildings and 14 suggesting preserved historic buildings (see the lists of Protected Buildings, Controlled Historic Buildings, Newly Discovered Inventories List at the 3rd Cultural Relics Survey, Protected and Preserved Historic Buildings in Yangpu riverside district from Appendix I). In addition, there are some buildings that have not yet the protection of identity but higher value. Except buildings, there are still plenty of facilities and equipment, barges and other structures with historical value, as well as industrial technology during particular period, which are worth cherishing.

In this part I have carried out the investigation of southern section of Yangpu riverside, while the respondents are existing industrial buildings, industrial facilities and equipment, docks, industrial processes only in addition to an appendix I that have the identity of the historic value(See detailed table of them from Appendix II). The research was conducted on the status quo remains, hoping the follow-up protection and utilization of the decision to do some reference for the preparation.

⁵⁰ Zhang Song, Li Yuxin. "Discussion on Planning Strategy of Overall Protection of Industrial Heritage Area - A Case Study of Yangshupu Area in Shanghai." *Conservation of Industrial Building Heritage* 2012,01:18-23

⁵¹ Zhang Qiang. "Research on Yangpu Riverside Industrial Heritage Protection and Public Space Renovation." *Tsinghua University* 2013.

3.1.2.1 Industrial Buildings

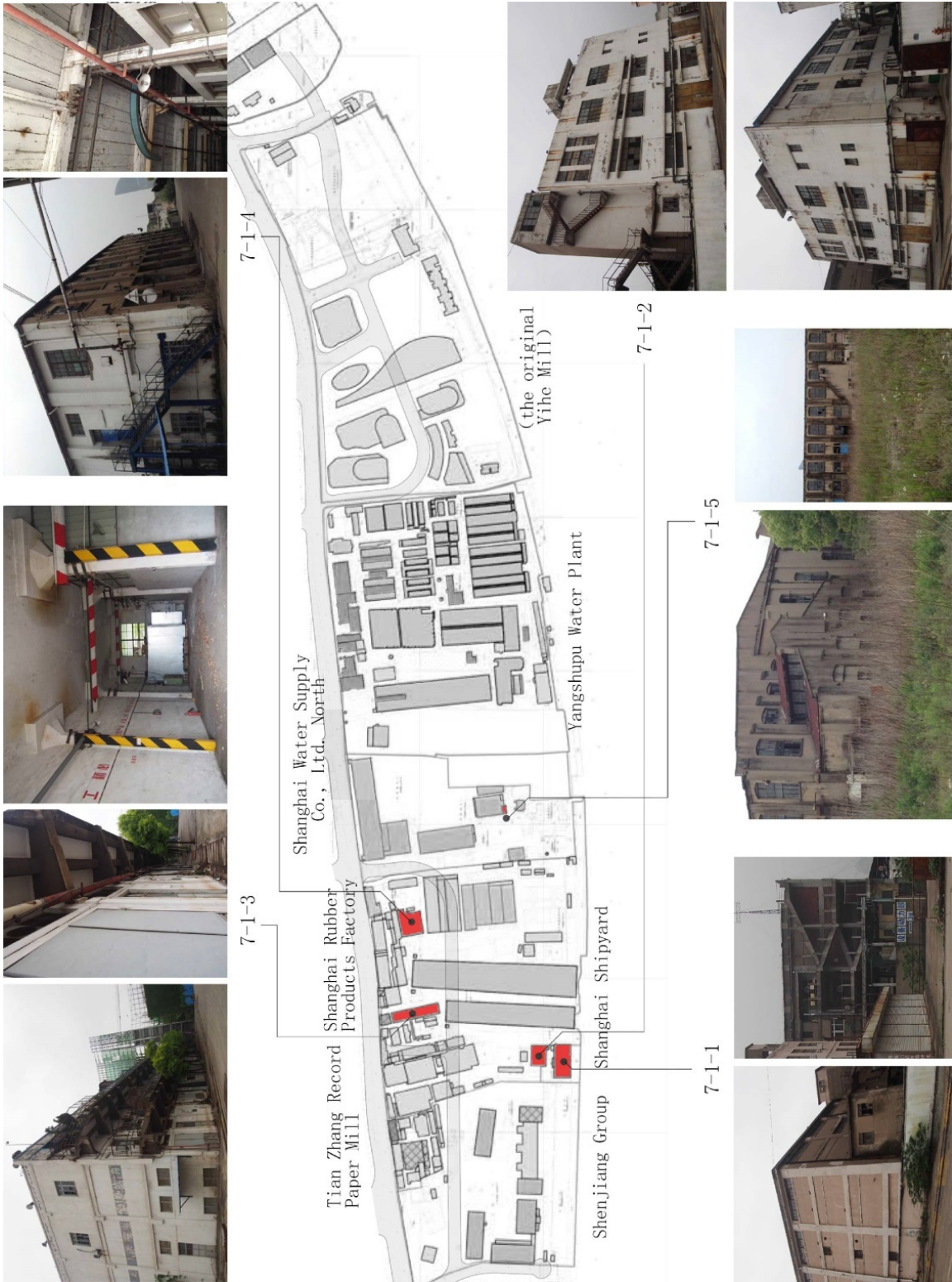


Fig3.10 The status quo of W7 unit industrial buildings⁵²

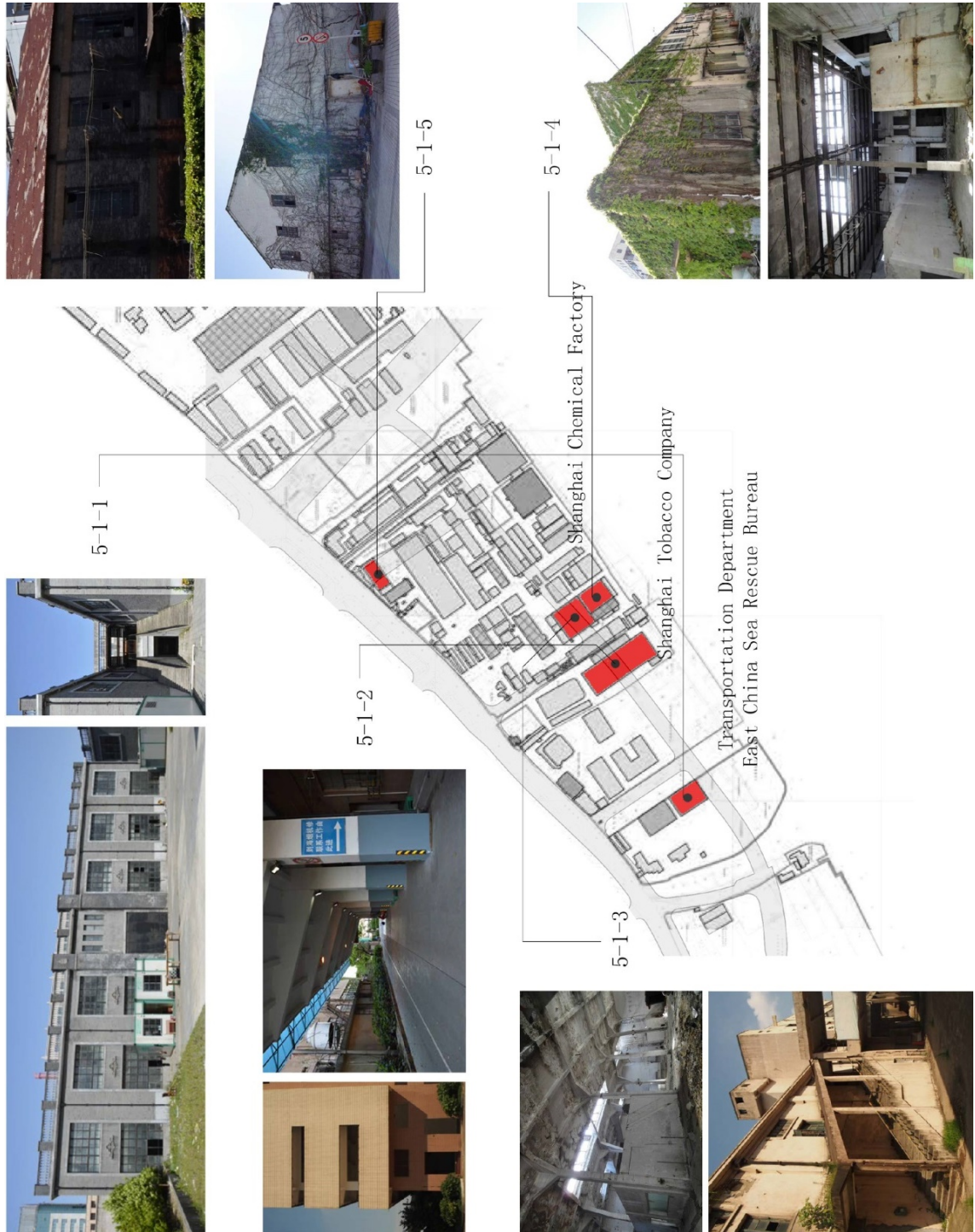
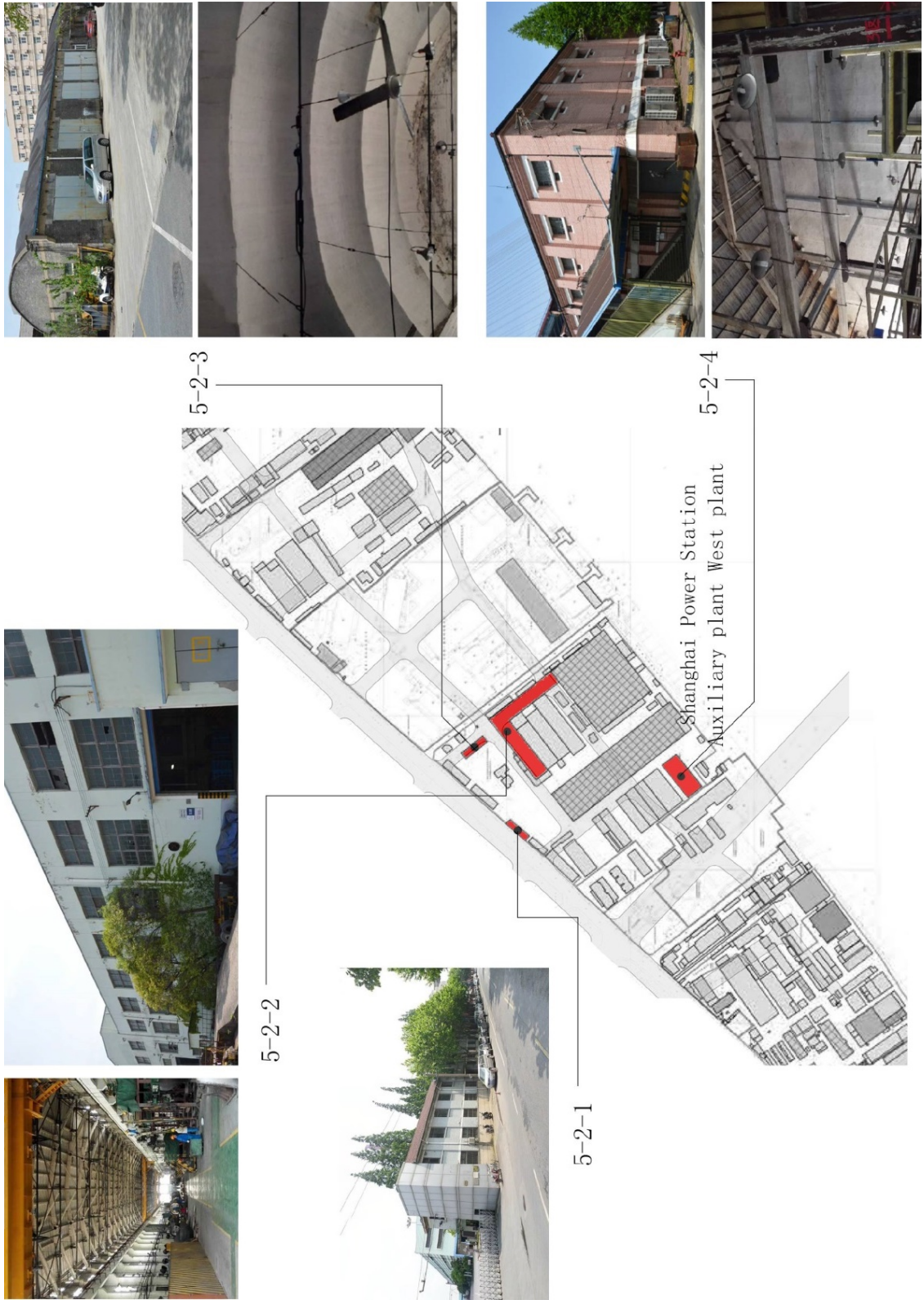


Fig3.11 The Status Quo of Weinan Road south of W5 unit industrial buildings⁵³

⁵² drawn by author

3. The Regeneration Design Research on Yangpu Industrial Riverside



⁵³ drawn by author

Fig3.12 The status quo of Weinan - Linqing South Road of W5 unit industrial buildings⁵⁴



Fig3.13 The Status Quo of Linqing South Road north of W5 unit industrial buildings⁵⁵

⁵⁴ drawn by author

⁵⁵ drawn by author

3.1.2.2 Industrial Wharf

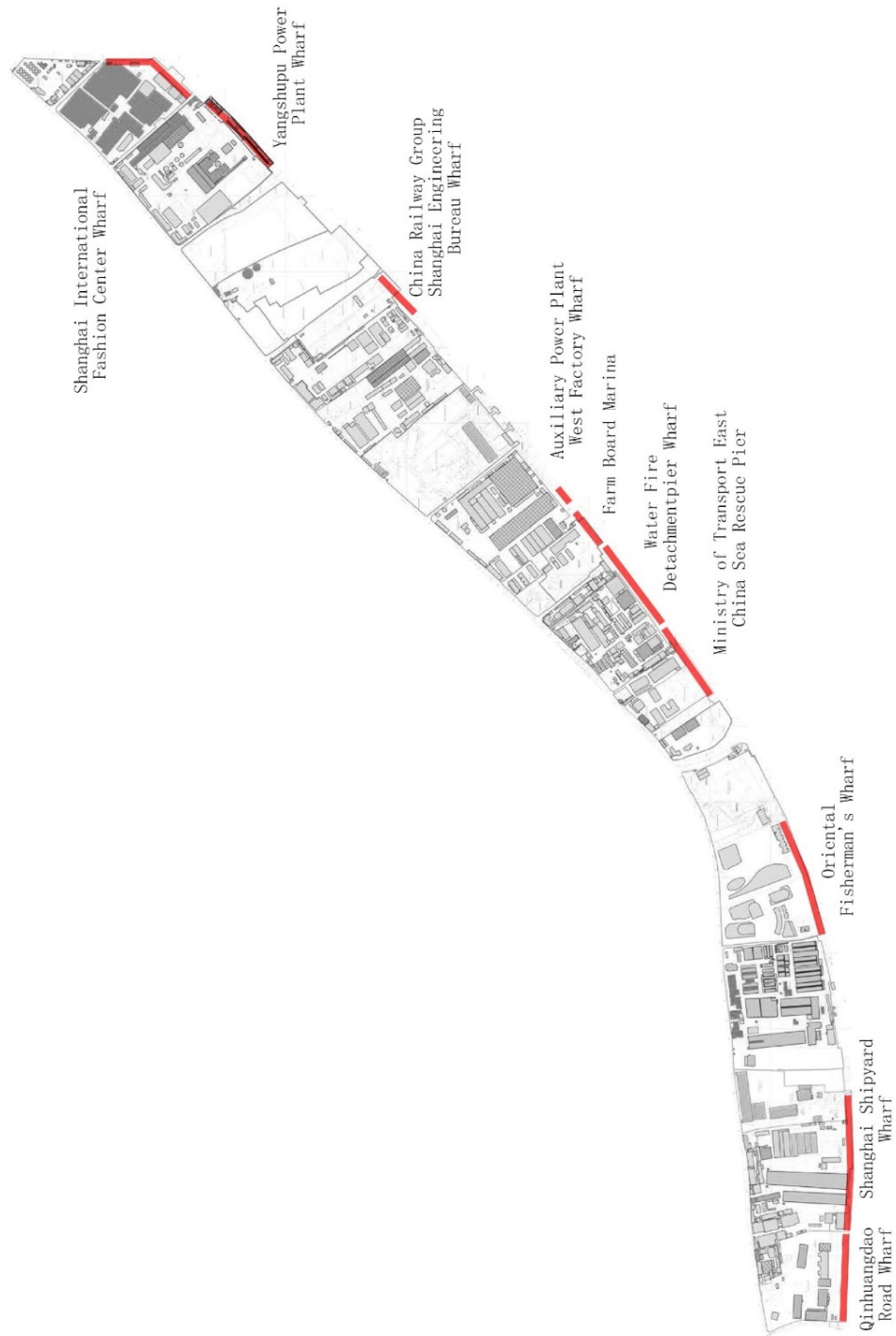


Fig3.14 The status quo of industrial wharf⁵⁶

⁵⁶ drawn by author

3.1.2.3 Industrial Facilities and Equipment



Fig3.15 Chimney, cisterns in Yangshupu Water Plant, and wharf crane in rescue pier⁵⁷



Fig3.16 Chimney 1 and 2 in Shanghai Chemical Factory⁵⁸



Fig3.17 Chimney 1-1,1-2,1-3 and 2 in Power Plant⁵⁹



Fig3.18 Pump room underground space in Power Plant⁶⁰

⁵⁷ taken by author

⁵⁸ taken by author

⁵⁹ taken by author

⁶⁰ taken by author



Fig3.19 Coal trestle, terminal crane, conveyor belt, clean water tank, wet ash storage tank, ash storage tank in Power Plant⁶¹

3.1.3 Protection and Regeneration of Industrial Remains

The century industrial development of Yangpu riverside intensively brings together industrial buildings, there is no lack of the earliest ancestors of many domestic industries such as power, textile, paper, sugar and gas lights, for example Yangshupu Power Plant(杨树浦电厂), Shanghai Machinery and Paper Bureau(上海机器造纸局). As the survey found above, there are 22 industrial buildings, 14 industrial facilities and equipment and 4 are key protected wharfs of total 10 ones in addition to the existing industrial buildings in Appendix I that have identity protection. They all have high industrial characteristic, history value, artistic aesthetic value and scientific value (see Appendix II for details).

To be specific, the types of these industrial buildings are mostly factory buildings and warehouses; the building has an average of two floors; the types of roofs are usually flat roof and double-slope roof, also rare modern Xieshan(歇山) roof and wavy hyperboloid roof of the former Soviet; the spaces usually have large story height, large span, simple and generous plan and facade, space capacity variability; the structural forms have the most common reinforced concrete structure, and some steel, brick, brick-concrete structure, and several often uncommon structural shapes such as non-beam floor, the bottom cantilever and hyperbolic arch brick; their façades usually have strong industrial characteristics, as large windows or horizontal long window is the most common, as well

⁶¹ taken by author

as red brick, green brick masonry walls; although, the quality of the building preservation varies. Facilities and equipment are often distinguished by their large size and apparent location, with not only their own aesthetic scientific value also more meaningful due to particular processes recorded by them. The terminal is a characteristic area of industrial riverside, retaining more industrial sites with outstanding industrial value, such as docks, orbits, terminal cranes, anchor piles, etc.

Therefore, I propose the following suggestions for protection and regeneration of the surveyed buildings.

1. The buildings been updated to commercial, such as Shanghai International Fashion Center (formerly Cotton Plant 17)(上海国际时尚中心,原上棉十七厂), in the course of the use and subsequent regeneration, should be respected especially the building elements such as the original facade texture, rather than blindly build and refurbish.

2. The buildings located in public space in the planning of the building, such as No.5-1-3, No.5-1-5 of Shanghai Chemical Co., Ltd., No.5-3-1, No.5-2-3 of Shanghai Power Station Auxiliary Plant, No.7-1-1, No.7-1-2 of Shanghai Shipyard Shipping Co., Ltd, are suggested to integrate the preserved façade, structure into public space with the consideration of public space such as green space.

3. The buildings that conflict with the planned roads, such as No.5-1-2, No.5-1-3 within Shanghai Tobacco Company, No.5-1-5 of Shanghai Chemical Co., Ltd., No.5-2-3 of Shanghai Auxiliary Machine Factory, No.5-3-2, No.5-3-3 of Yangshupu Power Plant, are advisable to retain the façade or retain the structure depending to the situation. The planned road can pass through under the middle of the building. Also when encountering extremely valuable ones, I would suggest to remain and protect them as a whole, and hope can adjust the planning of new roads, bypassing the building.

3.1.4 The Exploration of Historical Industrial Context of Yangpu Riverside

In addition to the above visible material heritage of industrial buildings, Yangpu riverside also contains profound invisible industrial connotations that can be tapped. These historical stories have highly characteristic of the times and industrial spirits. Even though the carriers of some stories, the industrial heritage, have been demolished and no longer in existence, they are still enough to become an important object of continuation of Yangpu riverside's context. This section takes the first phase of the public space in Yangpu riverside (south section) as an example to excavate three pieces of cherish historical context of the ancient industrial heritage which has been unfortunately

sacrificed due to the development of the first, second and third phases of the Fisherman Wharf(see details from Figure 3.21).



Fig3.20 Satellite map of changes of the Fisherman Wharf⁶²

⁶² photo source: The Original Design Studio

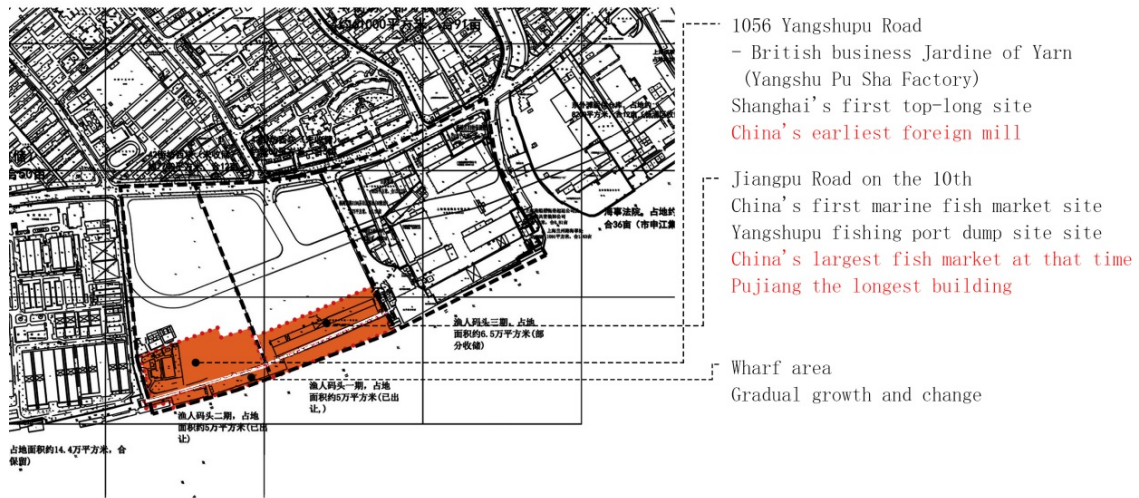


Fig3.21 Industrial context mining in demonstration section⁶³

3.1.5 Summary: Taking Industrial Inheritance as the Regeneration Design Core

According to the spirit of the Central City Work Conference, "to retain the city's unique urban environment, cultural features, architectural style and other genes, to extend the historical context of the city and to protect the cultural heritage left by its predecessors", in material wealth, the treatment to architectural heritage is more and more changed from "demolishing and transforming and retaining" to "retaining and transforming and demolishing". And even more in spiritual wealth, they are more tending to absorb the essence of the cultural connotation left by the predecessors in the historical context, then to preserve it and inherit it. Accumulating material and spiritual wealth of the time little by little has a crucial role in shaping the city's personality and charm, as well as the development of the collective national identity. Therefore, different from those along Huangpu riverside, such as Hongkou riverside as the international shipping center, Huangpu riverside as the tourism and leisure center, Xuhui riverside as the cultural and media center and Pudong riverside as the financial and commercial center, Yangpu riverside needs to take advantage of the backwardness to accurately identify their own position and the core and highlight the characteristics and charm of Yangpu riverside, which is the major issue of the renewal project, but also the key.

Yangpu riverside was once the birthplace of Chinese modern industry and witnessed the

⁶³ drawn by author, photo reference: The Original Design Studio

industrialization of Shanghai for centuries. There is not only a rich industrial heritage but also an industrial spirit to be excavated. The wealth of the industrial context has remarkable features and status in Shanghai and even the whole country. Therefore, in order to cherish and preserve industrial remains with historical and cultural values, record and inherit the industrial spirit with scientific and humane values, Yangpu riverside takes the inheritance of a hundred years of industrial context as the design core of life-oriented regeneration. And then to put that first, Yangpu industrial riverside could have the aesthetic value of art and the value of public life in new era.

The clear definition of the design core means that, firstly to put industrial inheritance as the theme of the regeneration of Yangpu industrial riverside space. Secondly, the material and spiritual context of the industry is highlighted as the driving force behind the development of Yangpu riverside. So that, on the one hand, it faces the history to set up an attitude of preservation and inheritance, and on the other hand, it faces the future to establish an approach that the development should relies on industrial remains. Make history new and make new history.

3.2 The Regeneration Design Concept

3.2.1 Analysis on the Existing Problems of Production Shoreline

3.2.1.1 Traffic Service is Blocked

The large areas of water body for the city like rivers, there is a certain degree of particularity. While they are precious natural resources, it's easy to form breakpoints and islands. At all three levels of accessibility, between the two sides of the river, between riverside and central city and the internal of riverside district, is lacking in effective and close ties and isolated from each other.

1. Between the two sides of the river. Between Yangpu riverside south section and the other side, Pudong district, there are a bridge over the river (Yangpu Bridge), a tunnel (Dalian Road Tunnel), 3 ferry lines (Qi Qin line, Min Dan line and Xie Ning line) and a subway line (Line 4) to solve the basic traffic demand, but the road network density is still very low. The interval of cross-river vehicle roads between Dalian Road Tunnel and Yangpu Bridge is 3 kilometers long. Due to the span of the Huangpu River and the navigational altitude requirement, the pedestrian system is difficult to establish.

2. Between riverside and central city. The urban roads leading to riverside area are often dead end, moreover, the urban waterfront areas tend to build a waterfront expressway,

sometimes can have a great impact on the riverside landscape. For example, the ramp of Yan'an Elevated Road on the Bund, known as the "first bend in Asia", has caused devastating blows to the Bund, an international riverside historical landscape. Also, Yangshupu Road, an important "hero" of Yangpu industrial, is almost the dead ending of all the north-south roads of Yangpu District, but relatively too narrow to carry the current and future traffic capacity. At the same time, between Yangshupu Road and riverside it formed a vast industrial hinterland, and the entire 5.5 km of hinterland only has Anpu Road, Dandong Road, Ningguo South Road, Guangde Road and Dinghai Road, these five urban-level roads extending into industrial hinterland, which means it's averagely a road per less than 1 km. To sum up, the road network density is very low, riverside hinterland accessibility is poor.

3. In the hinterland of riverside, due to the large and closed factory block and the flood control wall blocking the land and water area, there is no penetrating mode of transportation in the depth and the extension of the whole section, and the reachability of vehicles and pedestrians is even worse. Taking the section of Yangshupu Power Plant and Dandong Road - Weinan Road as an example, the internal roads left in the factory are usually not open to the public, and the quality and environment of the roads are poor. There are even fewer planks across the flood wall.

Therefore, the status quo of the traffic system in the whole section of riverside shows that although in terms of urban location the south section of Yangpu riverside is located in the central area of the city, as for urban structure, the south section of Yangpu riverside is actually at the edge of the urban structure and the road system. The status quo shows that the low density of connections across the Huangpu river and the poor communication with the city have resulted in the formation of isolated islands between the two sides of the Huangpu river, and on the other hand as the end of urban hinterland , Yangpu District lacks of the urban transport services.

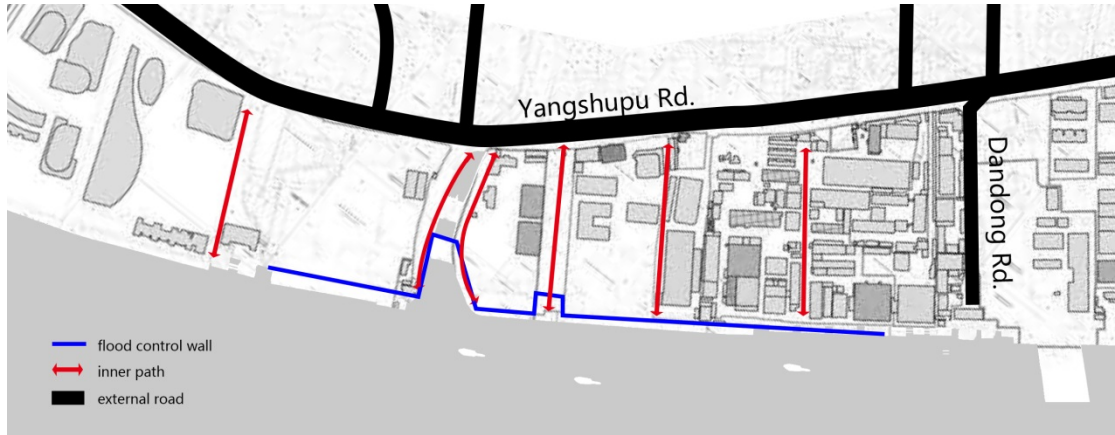


Fig3.22 The status quo of roads and paths near the Yangshupu Port⁶⁴



Fig3.23 The path through power plan



Fig3.24 Flood control wall



Fig3.25 Passage of wall⁶⁵



Fig3.26 Cluttered and crowded on Floating Wharf⁶⁶

⁶⁴ drawn by author

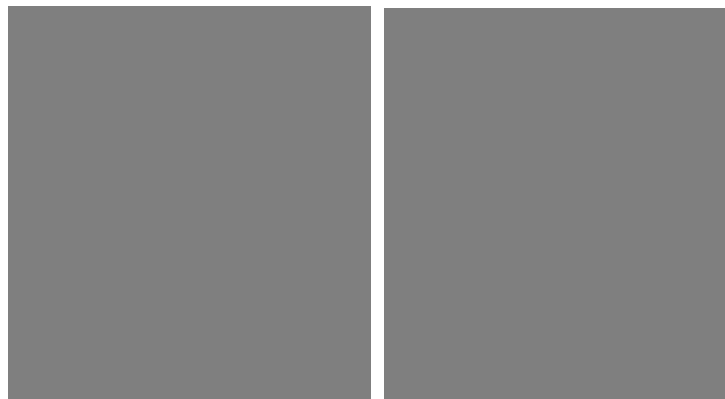
⁶⁵ photo source: The Original Design Studio

3.2.1.2 The coastline is closed and messy

Overall, the open space and green space in riverside area are seriously underdeveloped. For reasons of safety, ownership and efficiency, the original plant partitioned the south section of Yangshupu riverside, which severely discouraged citizens from sharing sight and living channels with riverside. It also became the isolated island of urban life. The main part of Yangpu riverside is in shady situation⁶⁷, but also has many historical and aesthetic value of an important industrial heritage. However most of the abandoned industry is filling along the pier with stinky old dirty facilities and equipment. There is clutter crowded, no landscape, no rules.

3.2.1.3 The ecological environment is destroyed and monotonous

The Environmental Protection Agency (EPA) in United States proposed the concept of "Brownfields" in the 1980s as a remediation plan for the re-use of contaminated land. The main target of the Brownfield Program was industrial leftovers. Yangpu riverside has many factories like textile, chemical, electric power, machinery manufacturing and other large factories, which caused a lot of industrial plants in a hundred years of industrial wastewater, industrial waste gas and waste, etc.. Huangpu River and the riverside land are perennial carrying and digesting with these pollutants completely separated from the ecological environment, which seriously undermining the ecological balance of aquatic plants and soil along the river. In addition, some areas of the southern riverside section were left unattended for perennials. There were no ecological plants in the wharf. The ecological landscape was observed monotonous.



⁶⁶ photo source: The Original Design Studio

⁶⁷ Chang Qing, Wei Shu, Shen Li, Dong Yiping. ""The East Bund Experiment" - Research on the Protection and Renewal of Riverside Area in Yangpu District, Shanghai." *Urban Planning* 2004,(04):88-93.

Fig3.27 It is overgrown with weeds in Yangpu riverside⁶⁸

3.2.1.4 Functional industries are single and inefficient

Within the south section of Yangpu riverside, with a total land area of 177.7 hectares, the discontinued industrial land, storage space, including municipal public utilities land and to be demolished and under construction are 150.16 hectares in total, accounting for 85.8% of the total area. Almost all of them are industrial-type sites except for a handful of residential and road sites, most of which have been discontinued with a production value of zero. Moreover the production activities of a few factories are also far worse than before, with lower output value. The data from Zhang Li (2015) shows that the industrial output value of Shanghai's downtown area was 5.36 billion yuan per square kilometer in 2010, only half of Singapore, one-third of Hong Kong and one-quarter of Tokyo's 23 districts.

3.2.2 The Regeneration Design Concepts of Yangpu Industrial Riverside

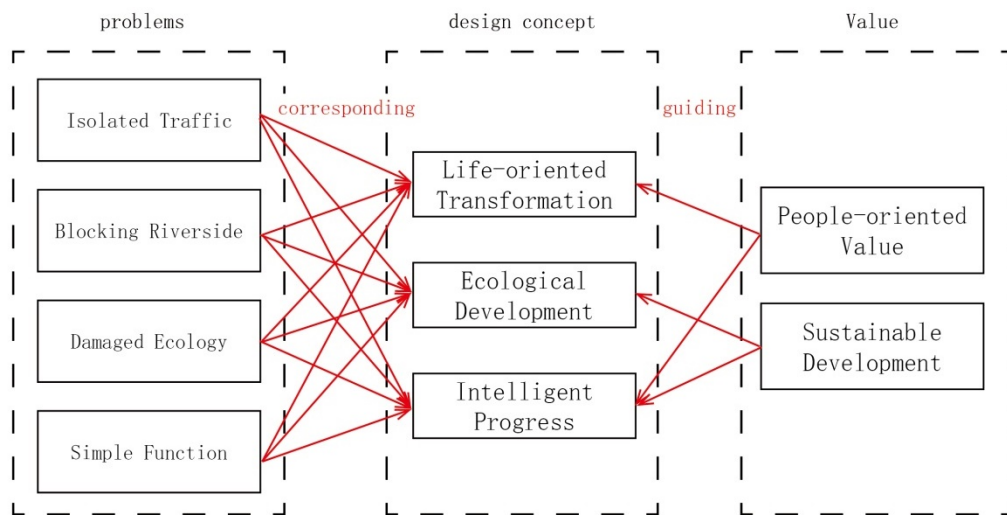


Fig3.28 Logic analysis of frame of design concept⁶⁹

With the transformation of economy and policy, the paradigm of urban culture also changes. The transformation of waterfront corridors from the production shoreline to the living shoreline reflects the new tendency of urban culture and social needs. The regeneration of the Yangpu industrial riverside space should address the need for a more open and inclusive social environment and thus contribute to the socialization of life,

⁶⁸ photo source: The Original Design Studio

⁶⁹ drawn by author

ecology and intelligence.

The design concept of the regeneration of Yangpu industrial riverside space is based on the premise of design values, upholds the people-oriented values and sustainable development values. People-oriented claims social equality, spatial justice, behavior freedom, and the put the appealing of all categories of people in urban environments as the basic starting point to ultimately build up a structure of harmonious social life space⁷⁰. Sustainable development, which requires to not only meet the needs of the present generation without compromising the ability to meet the needs of future generations, is based on the origin of ecology and has now evolved into environmental sociology and social ecology so that economic, social and environmental resources coordinated

Yangpu riverside project regenerated from the "production" shoreline to the "living" shoreline, in terms of the design concept, must make contribution maximize to the economic, social, urban and environmental, which requires adhering to the concept of three aspects: life-oriented transformation, ecological development and intelligent progress.

3.2.2.1 Life-oriented Transformation

From the view of people-centered values, the regeneration of Yangpu industrial riverside space the audience positions residents of the surrounding communities, tourists from peripheral urban areas and foreigners and workers in Yangpu riverside district as main audiences, provides a multi-dimensional functions, spaces and environments for their living, leisure and work, and other different needs. By taking the public's habits and future aspirations into consideration, it also provides an open space system for diversified public activities and creates a comfortable and lively living environment. Therefore, the life-oriented transformation is the driving force for development and operation, but also the goal.

a. Citizens and activities are the protagonists

What's more important of the regeneration of Yangpu industrial riverside space from productive to livable shoreline, compared to breaking the barrier of physical space between plant and plant, plant and city, is to involve residents, tourists, workers into the

⁷⁰ Yang Weili, Wang Xingzhong, Zhang Dujuan. "Evaluation and Prospect of Research on the Quality of Urban Life and Living Space." *Human Geography* 2010(03):22-23.

activation industrial riverside park, so that space can change from the past isolation and seclusion to daily quality and publicness. Then, the citizens and the activities of citizens have become the protagonists of the industrial riverside space at this time. However, due to different historical contexts and development status in waterfront areas, the characteristics and needs of public activities vary greatly, such as the Yangpu riverside and Xuhui riverside in Shanghai.

Therefore, the first level of the regeneration design concept is based on the values of people-oriented, focusing on the habits and needs of citizens' daily activities and public activities. On the one hand, mobilize public participation. The citizens can participate in discussions with designers, policy makers, construction parties and operators together from the design proposal to the coordinated construction, abandoning the completely top-down promotion and update. On the other hand, further understand the citizen's activity characteristics, activities requirements and the flow of people, ascertain the scale and density of various public activities, and form the special contents of daily activities planning, festival activities planning and tourism activities planning. Furthermore, according to the different orientation industries and mixture degree, association degree, matching degree between the leading industries and other industries, form public activities guiding principles with different emphases.

b. Open, shared, inclusive attitude

What would be totally different from the isolation of the factory area due to the requirements of safety and confidentiality is that the life-oriented transformation of Yangpu riverside would lead to be a complete set of continuous open space, achieving the integration of landscape, traffic, information and other social resources, inheriting and tolerating the historical remains and cultural heritages. With an attitude of openness, sharing and inclusiveness, Yangpu riverside hopes to create a rich, continuous, diverse and humane outdoor environment and ensure that almost all public spaces and green spaces are completely open and accessible to return the Huangpu River back to citizens.

c. Not only multivariate, but also more complex function

The transformation of life-oriented needs a reasonable supporting function as a support, to meet various functions such as commercial office, social rest, sports and fitness, entertainment, arts and culture, sightseeing and tourism with public space system. But the just multiple juxtaposition of functions is not enough, some other kinds of composite layout of functions, such as the overlap between public space and hinterland functions,

interlocking hinterland functions, the vertical interaction of functions in the same land and so on, can make them interacted with each other, resulting in multiplier effect. Moreover, the compound development of functions can go beyond the scope of internal functions to overlap its own function system with urban functions, interlock with the community interests and the public interests and form a complex giant system of various types and levels. Thus, the new phrase of functional linkage and permanent new development forms in Yangpu riverside.

3.2.2.2 Ecological Development

The regeneration of Yangpu industrial riverside space taking the view of sustainable development as one of the values, is intended to emphasize the development of new projects to be ecologically sustainable. Adjacent to the largest natural elements in the city, the industrial riverside has completed the most violent human production activity lasting for a hundred years. Therefore, when redeveloping it, we should have awe-inspiring attitude towards the nature and uphold the belief of respecting the original natural and social environment. At the same time, we should leave room for the follow-up development of the natural and social environment not only by building a green and low-carbon slogan and a slogan of environmental protection but also by focusing on the design of the urban environment, functional layout and structure, as well as pursuing harmonious and ecological development of urban and natural with the laws of nature.

a. Ecological restoration is a prerequisite

The ecological development of Yangpu industrial riverside is based on the ecological restoration of environment as a prerequisite to ensure that while the follow-up of life functional activities stationed in industrial riverside zone, the destroyed urban waterfront environment by the original production, storage and transportation and other industrial activities has been completely governed. That requires to repair the soil, air, water quality and waste after industrialization to meet the needs of comfort and security of human settlements. What's more, the riverside areas that serve as transitional areas between waters and terrestrial ecosystems need to form a balanced ecological environment achieving water and land The exchange of ecological, physical and informational energy in the terrestrial ecosystems⁷¹.

⁷¹ Huang Yaozhi. "Urban Detailed Planning and Design." *Beijing, Chemical Industry Press* 2012: 125-126.

b. Development requires low impact ideas

The narrow definition of "Low Impact Development" (LID) coming from the treatment of the soil and water environment through water seepage is a rainstorm management technology in the United States in the 1990s to solve the problem of rainwater⁷². Furthermore, the generalized concept of "low impact development" adopted in the regeneration of Yangpu industrial riverside is not a rough development of removing and reconstruction. Ecological development advocates to first repair then exploit, first protect then reuse, and to tease rather than erase, get ecologically involved into the current conditions rather than brutally. The objects of the regeneration are the soil, water and other ecological environment, even more are the city's layout and texture, function and efficiency of a comprehensive development.

3.2.2.3 Intelligent Progress

Yangpu District has taken an important responsibility for Shanghai Smart City (including smart communities, smart grids, etc.) and the development of the knowledge industry environment. This requires that the industrial riverside area, as the main part of strategic transformation of Yangpu District, should be developed intelligently. Proceeding from the people-oriented and sustainable development values, the progress of intelligence establishes the concepts of intelligence, innovation and knowledge. It is not only focused on the advanced interacting and sharing of information network and construction of high-tech equipment and facilities in smart cities, but also faced with the needs of the society, industry and environment to achieve intelligently optimize resource allocation and utilizing efficiency, build knowledge-based innovation and technology industry in Yangpu, guide and cultivate an efficient and low-carbon lifestyle, and provide and equip intelligent space and infrastructure with informatization. It makes Yangpu riverside intelligently progress facing to future.

a. Intelligent City is the version 2.0 of Smart City

While the version 1.0 of the Smart City is through the information technology means to achieve multi-layer sharing of city information, thereby enhancing the efficiency of government, business efficiency, Intelligent City as a version 2.0, is based on this

⁷² Wang Duodong. "Application of "Low Impact Development" Mode in Compiling Soil and Water Conservation Plans." *China Society of Soil and Water Conservation, Soil and Water Conservation Society of China Soil and Water Conservation Ecological Construction Committee* 2013:5.

supporting the intelligent public facilities, more open and safer digital information facilities, government management and resident supervision in a convenient way, and better public services for residents. In the planning and process of design and construction management, it's used intelligent means to promote the intelligent transformation of existing infrastructure to further enhance the level of human services along the coast. The Yangpu riverside project should not only focus on some hard targets, but based on people-oriented to build a sustainable high-level integrated service system.

b. Knowledge-based industries oriented

Yangpu industrial riverside space should take full advantage of the new functional innovation and entrepreneurship resources and policy advantages, make full use of riverside and industrial hinterland location and spatial characteristics to attract innovative entrepreneurship and industry presence. After the knowledge-based industries oriented, riverside could be transformed from the industrial base into an innovation service and knowledge economy center, and a knowledge-intensive industrial structure with high knowledge, high technology, high interaction, high added value as well as high innovation has been constructed⁷³.

3.2.3 Summary

This section starts from the discovery of the current situation of Yangpu industrial riverside space and prepares for the corresponding design concept. The status quo is divided into four main areas: barrier of transportation services, closure of coastline, destruction of ecological environment and singleness of functional industries. The legacy of these productive industrial coastlines urgently needs to be solved by providing living shoreline regeneration in the right medicine, at the same time it comprehensively enhance the quality of urban life. In this regard, Yangpu industrial riverside space adhering to the people-oriented and sustainable development values, establish life-oriented transformation, ecological development and intelligent progress as the design concepts, coupled with industrial heritage as design core, to comb the design principles for the next section, a corresponding design strategy to solve the status quo specifically.

⁷³ Wang Tieshan. "Research on Interaction and Development of Knowledge - Intensive Services and Smart Cities." *Journal of Xi'an University of Posts and Telecommunications* 2015,(04):92-96+101.

3.3 The Regeneration Design Strategy

3.3.1 The Main Design Strategy: Limited intervene

3.3.1.1 Framework of Design Strategy

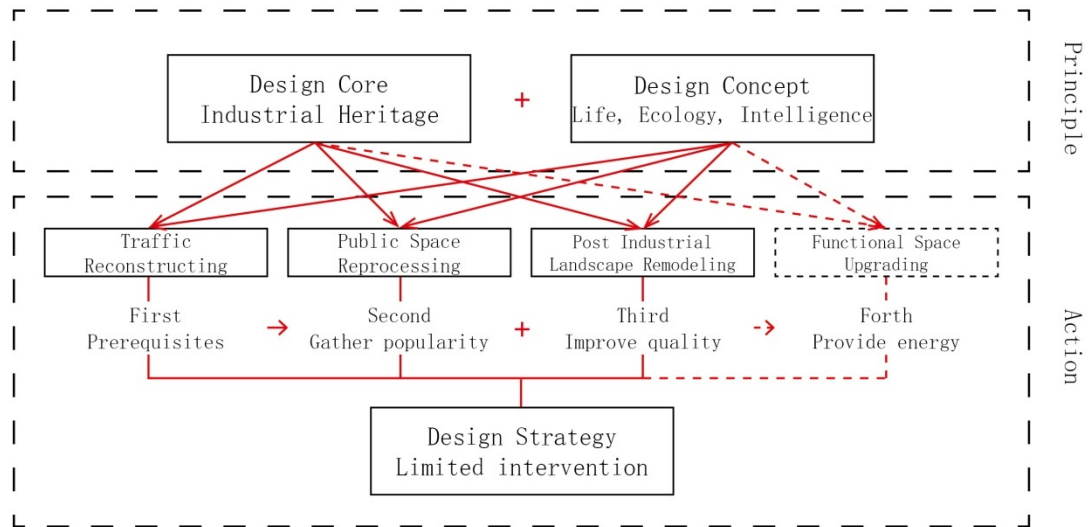


Fig.3.29 Logic analysis of design strategy framework⁷⁴

Based on the industrial inheritance as the design core and the living, to implement the strategy of action of the regeneration of Yangpu industrial riverside space, ecological and intelligent design concept, is mainly from four important aspects: first to refactor traffic system is a prerequisite for the development of the region; second, to revival of public space; third, to reshape the post-industrial landscape, strengthening the connotation of riverside industrial remains, gathering charm and popularity and improving the quality of space; finally to upgrade functional space, providing lasting vitality for the follow-up development by the integration of knowledge-intensive composite industries in the region.

The implement of design core and design concept to the strategies of action is a rich and integrated system processes, such as the accessibility of traffic routes, land and water under the three-dimensional design, green travel, etc., public space and post-industrial landscape penetration, multi-activity theme, relics of industrial remains, etc., intelligent matching of functions and functions, diverse compounding and community integration, etc.. On the basis of corresponding action methods of public transport, public space,

⁷⁴ drawn by author

post-industrial landscape and functions, “Limited Intervention” in this paper, is the main but not only design strategy, the key but not comprehensive design strategy.

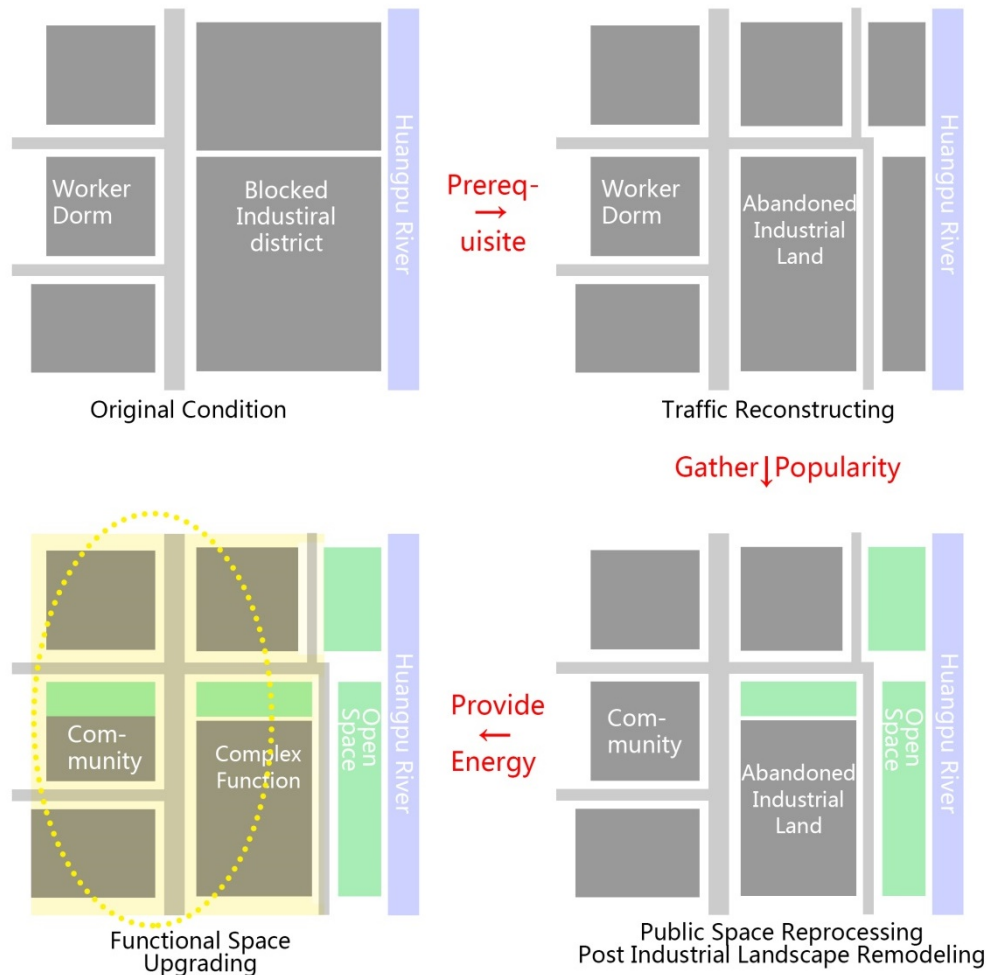


Fig3.30 Diagram on design strategy⁷⁵

3.3.1.2 Argumentation of “Limited Intervention” Strategy

What is "Limited Intervention"? Between Intervention and inserting is often used as a medical term to refer to the insertion of a particular device into a blood vessel or organ, to diagnosis or treatment of a disease. Also it is used in political affairs and the judiciary, where it is the right to interfere with the incident⁷⁶. In this paper, "intervention" in the category of urban design refers to the change of the original space and the infiltration of

⁷⁵ drawn by author

⁷⁶ Wang Jingbin. “On the Limited Involvement of Administrative Power in Private Fields.” *Jinlin University* 2008.

new elements when the existing urban space is to be renewed. However, the "limited" intervention in this article is a relative concept. In the strategy of urban regeneration, it is neither a brutalization method, "large demolition and construction" in urban construction radicalism nor a pedantic practice of keeping all conservatism, but falls in between. The "limited" intervention pursues a kind of "limit" that can not only cherish and inherit the urban context, but also meet the development needs of modern urban life and also make room for sustainable development for the future. Furthermore, the limited intervention is not a "one-size-fits-all" and "one-smooth" design method of utilitarianism. On the contrary, it is based on local conditions and aims at the differences in site characteristics and the existing status quo.

On one hand, Yangpu riverside is a modern industrial base with a history of one hundred years. The collective memory carried by industrial sites is a very rich and precious material and spiritual wealth. In the regeneration of the new era, Yangpu riverside is targeted at the industrial heritage exhibition as the theme. On the other hand, starting from the values of people-oriented and sustainable development, we put the idea into the transformation of life, the development of ecology and the progress of intelligence. Therefore, the two affect each other at the same time and jointly request that the regeneration of Yangpu riverside be limited in the mode of intervention as the main action demand, namely, design strategy.

3.3.1.3 The Method of Limited Intervention Strategy

There is a great quantity of industrial remains of different latitudes in Yangpu industrial riverside space, the place of industrial space order, industrial buildings, facilities and equipment, dock space or even the process. To regenerate them is to sort out, rather than construct. The strategy of limited intervention means that the content of the original order and the remains of industrial sites are maximally embodied, as the premise and the key, then the updated content also intervenes in a limited way with the help of auxiliary methods to realize the rejuvenation of the original industrial spatial features. Specifically:

1. According to the urban texture, spatial structure and industrial flow order, comb traffic context and path system, and reproduce the memory with the historical context of the exhibition;
2. According to the original functional space characteristics of different factories in different locations, divide the public space into thematic planning, so that public space after the regeneration could become open and shared, glamor;

3. Re-use facilities and equipment according to the location, trend and characteristics in the site, keep the original landscape elements and native plants as far as possible, restore and regenerate the industrial landscape according to the site, and then infiltrate ecological green into the hinterland of life;

4. Based on the large number of industrial buildings and buildings left over from the concrete conditions, based on the functions, structures, facades and texture of the old buildings, the complex functions of supporting the public spaces and surrounding communities are put into effect to complete the functional upgrading of the area.⁷⁷

3.3.2 Texture Continuing and Accessibility Reconstructing

"If you want to get rich, road first", this Chinese phrase also can be applied to the regeneration of industrial riverside space. To rejuvenate industrial riverside space, excellent traffic and route system is the first and necessary step of renewal. In the former section of this paper, the analysis of traffic problems is divided into three levels: between the two sides of the Huangpu River, between the two sides of the river, between riverside and central city and the internal of riverside district. The status quo of the whole traffic flow in riverside district is analyzed. Yangpu riverside south section, in fact, is located in the urban structure of the island and the end.

Therefore, after carding traffic context of Yangpu industrial riverside space, to take continuing the texture of the city as the goal from the urban planning level, it supposes to repair the original urban network of the hinterland in accordance with the planning of "narrow street, dense road network". At the same time, the texture of the network would be extended through Yangshupu Road and then into the hinterland of riverside area. From the urban design level, with the aim of extending the historical texture, it would rely on the existing factory walk system in the hinterland of riverside to sort out the entrances and exits of the public space and the slow-moving path system. The regeneration of Yangpu industrial riverside space intends to achieve an overall upgrade of traffic context under the premise of respect the urban texture and historical texture.

3.3.2.1 Between the two sides of the Huangpu River

On the basis of the existing traffic links between the two banks of the Huangpu River,

⁷⁷ Zhang Zi, Zhang Ming. "The Cultural Expression of Power Station of Art, Shanghai." *Time Architecture* 2013,(01):120-127.

two new cross-river tunnels and a subway line are added according to the detailed regulatory plan. In this way, there will be 4 important roadways going through the 5.5 km south section of Yangpu riverside, the interval of main road network connecting with the cities will be reduced from 3 kilometers to 1 kilometers, and the two sides of the Huangpu River will be strengthened more closely, which is of far-reaching significance. The new roads and metro lines will further enclose Yangpu southern riverside from the edge of urban structure into the central area of urban structure and upgrade the industrial space of Yangpu riverside from the view of the urban structural level and provide the basic conditions for the subsequent redevelopment.

Talbe3.2 River crossing traffic planning of Yangpu riverside⁷⁸

Types	No	Name	Status
River crossing bridge	1	Yangpu Bridge	In use
Tunnel	1	Dalian Road Tunnel	In use
	2	Jiangpu Road-Minsheng Road Tunnel Project	Planning
	3	Longchang Road-Yunshan Road Tunnel Project	Planning
Ferry Line	1	Qiqin Line	In use
	2	Mindan Line	In use
	3	Xiening Line	In use
Subway Line	1	Line 4	In use
	2	Line 18	Planning

⁷⁸ Arranged by Author, data reference:the detailed regulatory plan(2013)

total of 19 roads perpendicular to Huangpu River linking between the riverside and the central city in depth. The average road density is about 250 meters, in a reasonable range of road network density.

At the same time, since these roads are mostly extensions of the existing roads in the downtown area, they effectively divide the land into industrial hinterland and repair the original large scale of industrial land, and continue the urban fabric of the central city suitable for living. From the aspect of urban fabric, the planning of the road system helped to complete the regeneration of the living space of the industrial riverside area.

Table3.3 Overview of new and extended roads⁸⁰

	No	Name	Origin-destination	Length	Width
W7 Unit	1	Huaide Road	Yangshupu Road-Anpu Road	240	20
	2	Tianzhang Road	Qinhuangdao Road-Yangshupu Road	795	20
	3	Ningyuan Road	Tianzhang Road-Yangshupu Road	128	16
W5 Unit	1	Anpu Road	Huaide Road-Guiyang South Road	1972	20
	2	Weinan South Road	Yangshupu Road-Anpu Road	206	24
	3	Guiyang South Road	Anpu Road-Yangshupu Road	316	16
	4	Longchang South Road	Anpu Road-Yangshupu Road	251	20
	5	Ningwu South Road	Anpu Road-Yangshupu Road	387	20
	6	Shuangyang South Road	Anpu Road-Yangshupu Road	340	24
	7	Linqing South Road	Anpu Road-Yangshupu Road	271	22

⁸⁰ Arranged by Author, data reference:the detailed regulatory plan(2013)

3. The Regeneration Design Research on Yangpu Industrial Riverside

8	Songpan South Road	Anpu Road-Yangshupu Road	204	24
9	Desha Road	Anpu Road-Yangshupu Road	168	16
10	Kuandian Road	Anpu Road-Yangshupu Road	305	16
11	Tonghua Road	Tengyue Road-Guiyang South Road	238	16
12	Yangpu Road	Longchang South Road-Pansong South Road	1218	20

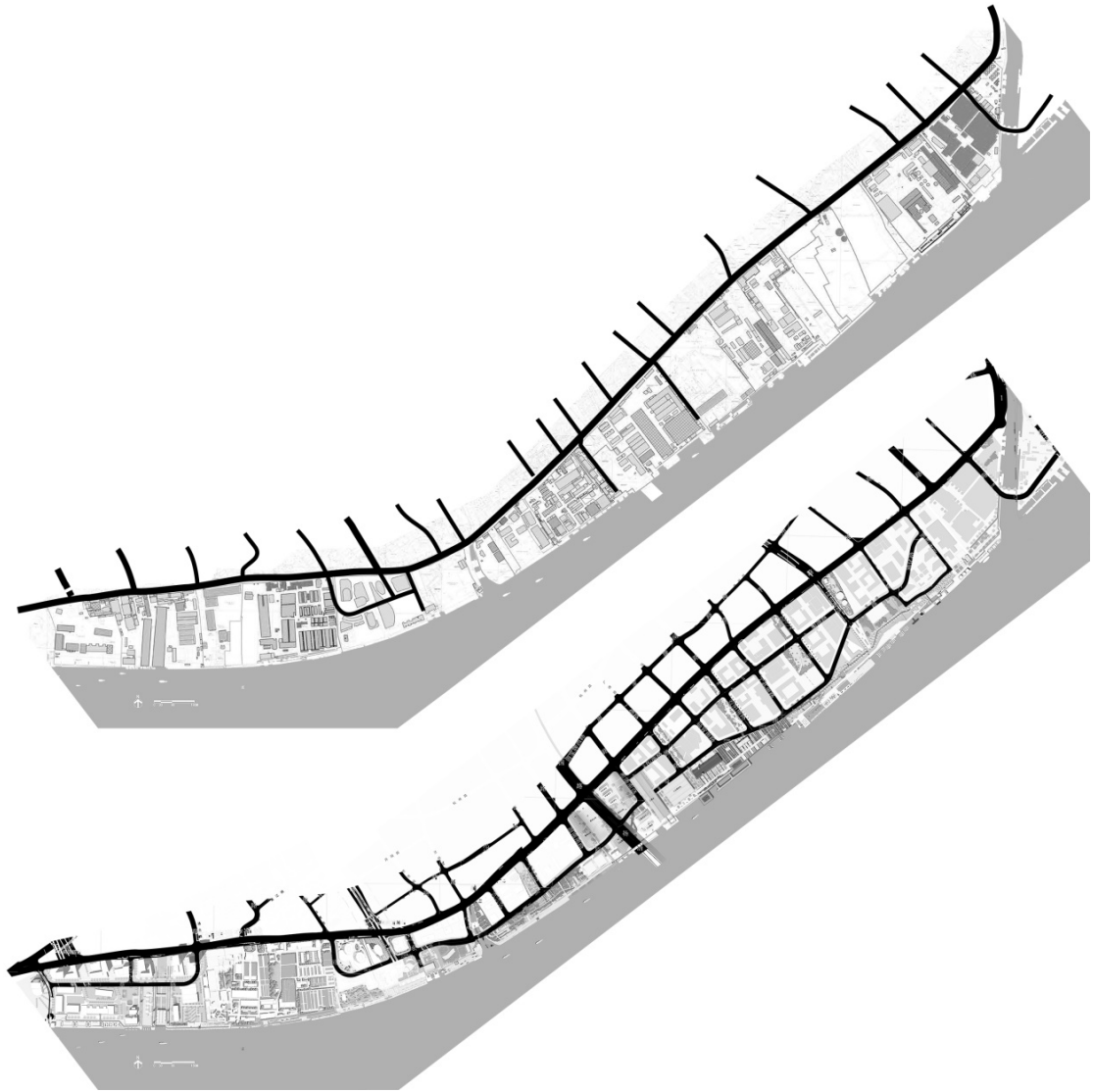


Fig3.32 Road venation contrast of situation and planning⁸¹

3.3.2.3 The Internal of Industrial Riverside District

a. Vehicle system

Due to the hinterland of Yangpu industrial riverside as the deepest depth of 500 meters, the road network is a little large, so that in the detailed regulatory planning it's supposed to extend the extension of the Anpu Road and add Tianzhang Road and Tonghua Road. And Yangpu Road would be added in the some Yangpu Bridge northern part of the hinterland increase. Thus these 4 roads are parallel with Yangshupu Road. Also, as the

⁸¹ drawn by author

main riverside roads in the hinterland, they could complete of the entire riverside all through only except for of Yangpupu Water Power Plant in the south and the Yangpu Power Station in the north end.

In addition, some new roads such as Anpu Road in regulatory planning are in conflict with other industrial buildings that have obvious historical and artistic value but do not have the status of identity protection. It is suggested that the road track should be adjusted according to circumstances, to value industrial heritage. Or it should, in addition to meet the requirements of road traffic, transform the industrial building, so that the road could cross the department from the overhead of industrial buildings, to achieve both fish and bear's paw, that is to achieve protection and reuse of industrial buildings at the same time do not affect the integrity of the planning of the road network system. For example, the planned extension of Anpu Road will pass through the middle of 5-1-2 (see in Chapter 3 Section 1) warehouse located in Shanghai Tobacco Company. That warehouse is of high value and well-preserved. The transformation plan of first-floor overhead construction not only saves Tobacco storage free from demolition, and like more unexpected design results, creates an ecological hill across over the road.





Fig3.33 The comparison with before and after of the warehouse over Anpu Road⁸²

b. Slow-moving path system

In addition to service car traffic, in the planning to achieve the entire board public space all through along the Huangpu River by Shanghai municipal government, it's also indicated to implement to the appropriate range of slow-moving path system. That is to plan to build a people-oriented continuous slow system, and give practical consideration with the walking needs of the public on the riverside public space. Moreover in the regeneration of Yangpu industrial riverside space, it also designed a variety of slow-moving systems to meet the diverse needs of citizens of leisure and create a slow life of the linear vitality zone. Specifically, it is divided into jogging tracks, cycling tracks and wandering trails. The three curving roads are paved with plastic texture, which are distinguished by different colors respectively to help the public realize the health vision of universal fitness.

⁸² photo source: The Original Design Studio

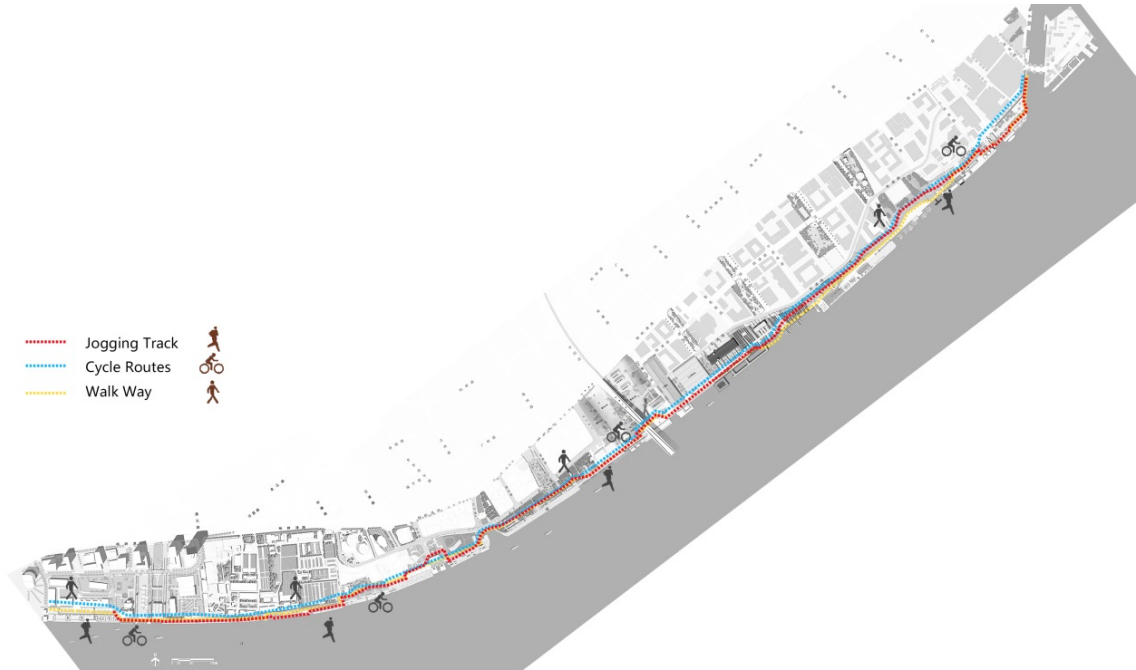


Fig3.34 The slow-moving path system in Yangpu riverside⁸³



Fig3.35 The slow-moving path system at different levels⁸⁴

Meanwhile, the design of the path of the model system, the design relies on the original history of the texture of the original Shanghai Fur Factory, Jiangpu Road fish market and loading dock, provides with rich entrance linked with surrounding functional plots to enhance accessibility. And it's designed different levels of route systems such as wharves, wetland parks and plazas.

⁸³ drawn by author, photo reference: The Original Design Studio

⁸⁴ photo source: The Original Design Studio



Fig3.36 Path analysis of demonstration section⁸⁵



Fig3.37 Section analysis of demonstration section⁸⁶

c. Repair of the breakpoints

Six breakpoints were encountered in the process of traffic system repair. They were cut off because of Yangshupu Water Plant and Yangpu Power Plant which have the needs of industrial production lines to be located along river, because of Qinhuangdao Road Water

⁸⁵ photo source: The Original Design Studio

⁸⁶ photo source: The Original Design Studio

Gate with partial harbor of the shipyard dock, because of Dandong Road Ferry Station and Ningguo Road Ferry Station due to the ferry terminal, and because of Yangshupu Port due to the entry into the harbor. Six breakpoints have four kinds of breakage modes, so that four corresponding repair plans correspondingly. They are relatively water trestle bridge, overhead corridor link, the top of wharf building crossing and landscape bridges spanning the river course.



Fig3.38 Analysis on breakpoint repair⁸⁷

3.3.3 Public Space Reprocessing

Urban design is urban public space design. Public space as the city's "living room", is not only a container of urban life, also a symbol of urban vitality. The redevelopment of Yangpu industrial riverside space, following the first step after the reconstruction of traffic context, is the development of public space design. Yangpu riverside started to attract citizens to enter through the opening up of public spaces along the riverfront and the sharing of social resources such as coastal shoreline and industrial history. Various activities took place successively and actively. From the completely isolated closed space

⁸⁷ drawn by author, photo reference: The Original Design Studio

to the present open roaming space, Yangpu riverside has gradually gather popularity, laying the foundation for the functional infiltration of the hinterland of riverside.

3.3.3.1 Penetration and Infiltration of Public Green Space

The urban public space consists of two main components: public green space and urban plaza. Yangpu riverside is occupied for a long time by such productive functions as the factory wharf. There is a serious lack of public green space .Urban eco-environment and leisure environment are in urgent need of improvement. In the renewal design, the public green space extends along the strip in the riverside area, hoping to penetrate the whole section of the riverfront belt and adjust the shape of the strip green space according to the land boundary of each factory and wharf of the riverside. At the same time, it is also planned to adjust the boundaries of green planning considering full account with the transformation and reuse of facilities and equipment, and the historical heritage with the extreme value for the environment. As a result, on the one hand parallel to the dimension of the shoreline, a narrow over-water trestle is formed as a limited green belt between the outstanding preserved buildings in the section of Yangshupu Water Plant and it's also planned to form a magnified green park in the section of Shanghai Shipyard, southern Jiangpu Road, Yangpu Bridge, Yangshupu Power Plant, Fuxing Island canal and other places. On the other hand perpendicular to the dimension of the shoreline, due to the special elements of the flood wall, public greenfield is supposed to be different elevation between inside and outside of the flood wall, the pier and the hinterland. Riverside green space is not "smooth" blindly show the same width or the same landform ribbon, rather than morphology continuous stretches and convergence. From the parallel and perpendicular to the shoreline of the two dimensions, it would show a rich multi-level waterfront green.

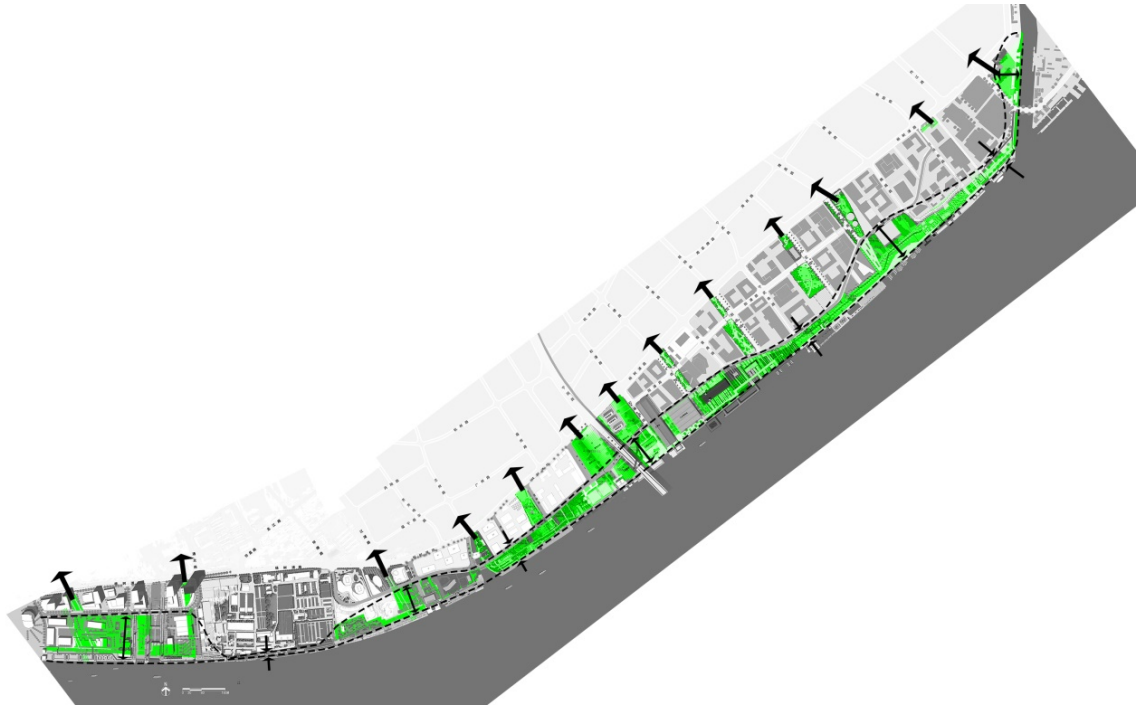


Fig3.39 Green space system in riverside area⁸⁸

⁸⁸ drawn by author



Fig3.40 Riverside green space in various levels⁸⁹

3.3.3.2 Multiple Activities in Public Space

The openness and inclusiveness of public space can best meet the public space requirements of citizens in different age groups and different time periods. Taking the demonstration section of Yangpu southern riverside as an example, after the case study and community investigation, the activities of the citizens come from The diverse needs of children, adolescents, youth, and middle-aged and elderly people, so that the design of public spaces serve these rich and varied activities.

⁸⁹ drawn by author



Fig3.41 Demand for multiple activities in different age groups⁹⁰



Fig3.42 Distribution of multiple activities in different age groups⁹¹



Fig3.43 The organization of multiple activities in public space⁹²

⁹⁰ photo source: The Original Design Studio

⁹¹ photo source: The Original Design Studio

⁹² photo source: The Original Design Studio



Fig3.44 Theme Planning of Public Space⁹³

⁹³ photo source: The Original Design Studio



Fig3.45 The plan of the south section of Yangpu riverside⁹⁴

⁹⁴ photo source: The Original Design Studio

3.3.3.3 Theme Planning of Public Space

According to different parts of the industrial heritage characteristics in the southern public space of Yangpu riverside, it is planned nine themes from Qinhuangdao Road to the northeast Dinghai Road.

3.3.4 Post Industrial landscape Remodeling

Post-Industrial Landscape means that for the decayed industrial wasteland and heritage site, it is transformed with the landscape design method to form a new landscape with multiple meanings⁹⁵, namely "landscape after industrialization." According to the definition, the post-industrial landscape has three characteristics: 1. The object of action is industrial heritage and abandoned areas. In the past 20 years of the industrial restructuring, more and more such areas are facing the protection and regeneration; 2. The kernel of landscape design is the spirit of the industrial site, that is, the original industrial elements and characteristics of the site should be preserved and reused in the industrial landscape. Instead of being demolished and reconstructed, the remodeled landscape must continue the context of the place and retain the place of memory. Post-industrial landscapes by type include urban parks with open spaces in cities such as Paris-Bercy Park in France; urban plazas such as the Urban Best Practices Square after World Expo Shanghai; and industrial communities such as the Granville Island Art Community in Canada . In accordance with the geographical location, Post-industrial landscapes contain the waterfront landscape, such as the United Kingdom Birmingham center waterfront transformation; heritage tourism landscape, such as Britain's Ironbridge Gorge; mining ecological landscape, such as Germany's Ruhr industrial zone.

The reconstruction of the post-industrial landscape has become an important part of the renewal of Yangpu industrial riverside space which is dominated by public space. The site design is aimed at the "post-industrial landscape" and intended to integrate the industrial features of this modern industrial heritage through an open form of public landscape. It's planned to use the site of industrial heritage, original plants and native plants in industrial areas, through the post-industrial landscape design methods to form a unique site landscape, while allowing its organic integration into the public space, to participate in public events.

⁹⁵ Wang Xiangrong, Ren Jingyan. "From Industrial Wasteland to Green Park Landscape Design and Industrial Wasteland Renewal." *Chinese Landscape Architecture* 2003,(3):11-18.

In the post-industrial landscape remodeling of Yangpu industrial riverside space, the focus is divided into two aspects of the post-industrial landscape design: firstly, the relics of industrial heritage, including the atmosphere reproduction within the industrial relic, interactive experience, the industrial context of exhibition design, industrial exhibition belt system design; secondly, the reconstruction of the original landscape, including greening systems, plant selection and eco-sponge city rainwater wetland design.

3.3.4.1 The Reappearance of the Atmosphere of Industrial Remains

Sometimes the retrospective of place memories is not only the protagonist or visual focus of the place, but often the details that are ubiquitous and easily overlooked, and the experience of immersing and interacting with them. Therefore, it is not necessary to hype Yangpu riverside, which is the industrial heritage theme of riverside industrial space, with the remodeled industrial buildings or entrance plates or promotional videos. Instead, the details of industrial remains may bring endless tension and infection to the renewal of industrial space. Also, a concrete and authentic dialogue experience with elements of industrial character can impress citizens.

1. Ground texture: apply concrete paper membrane technology on the surface treatment, rather than the original program design to blindly choose a new pavement, retaining the original dock floor texture, and enhance the surface texture.

2. Industrial Rail and Industrial Boat: restore the characteristic elements of the wharf orbit to embed Industrial Rail in the pavement, combining with rail to design a quay pump structure of the ecological island, which is a combination of plants, seats and illuminated industrial landscape composite landscape sketch, the Industrial Boat.

3. Plumbing Lights and Plumbing Railings: the reused plumbing, which had been found everywhere in the industrial arena but has been discarded, has become a floodlight and railings of the communal space along the riverside and has been cleverly integrated into the new life at the pier.

4. Retention of revetments: there are a large number of metal anchors and concrete pier tied by piers in the site. A single anchor bolt or bollard pile with the key points in the design is reserved and a set of anchor bolts are selected for reorganization. The anchors are placed on the slopes of the riverside facing the river, as an important composition of elements place for site remember.

5. Fishing port gate: China's first fish market left a jagged flood wall and supporting gate.

In the design this feature of elements will be retained and upgraded to reproduce part of the memory of the fishing port, and to form a form of infiltration and integration with supporting business of Fisherman's Wharf.

6. Ramp rack design: as a founder of the modern Chinese textile industry, the textile process flow in The British Jardine Mill(英商怡和纱厂) is also part of industrial historical memory. The project abstracts and replays the form and characteristics of the machines in various stages of the spinning process, ultimately forming the ramp rack that reflects the spinning scenario.

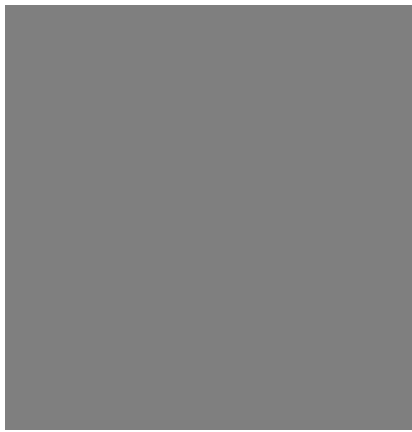


Fig3.46

Original ground texture



Fig3.47

Original track



Fig3.48

Original proposal paving⁹⁶



Fig3.49



Fig3.50

⁹⁶ photo source: The Original Design Studio

Construction of Industrial Rail



Scene of Industrial Rail⁹⁷



Fig3.51 Drawings of Industrial Boat



Fig3.52 Scene of Industrial Boat⁹⁸

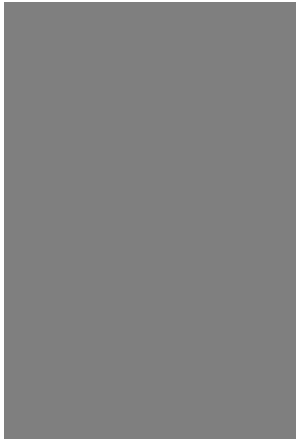


Fig3.53

Water pipe lights and railings

Fig3.54

Retention of concrete anchor boat pile

Fig3.55

Retention of anchor bolt⁹⁹

⁹⁷ photo source: The Original Design Studio

⁹⁸ photo source: The Original Design Studio

⁹⁹ photo source: The Original Design Studio



Fig3.56 The original fish market gate¹⁰⁰



Fig3.57 Design to retain gate of fishing port¹⁰¹

¹⁰⁰ photo source: The Original Design Studio

¹⁰¹ photo source: The Original Design Studio



Fig3.58 Production process of cotton textile industry in Shanghai in 30s¹⁰²

¹⁰² photo source:http://www.360doc.com/content/14/0614/10/178233_386488443.shtml



Fig3.59 Spinning machinery¹⁰³



Fig3.60 Ramp rack design

Fig3.61 Ramp rack scene¹⁰⁴

3.3.4.2 Interactive experience of industrial heritage

1. From the ash storage tank to the weightless coal bunker: in the huge ash tank of the Yangshupu Power Plant, the weightlessness environment is planned to be simulated by the pneumatic device to the weightless coal bunker, so that more general public can experience the astronaut's life in space, fun and scientific.

2. From the terminal to the tower crane: transform the significant terminal suspension at

¹⁰³ photo source:http://www.360doc.com/content/14/0614/10/178233_386488443.shtml

¹⁰⁴ photo source: The Original Design Studio

the Yangshupu Power Plant into a functional space completely suspended from the river, so you can stroll through the cafeteria for exhibitions to provide a unique experience of walking on the river.

3. From underground pumping station to deep pit climbing: use deep underground pit of Yangshupu Power Plant to build deep pitching rock climbing, combine extreme sports with industrial remains, make citizens truly interact with them.

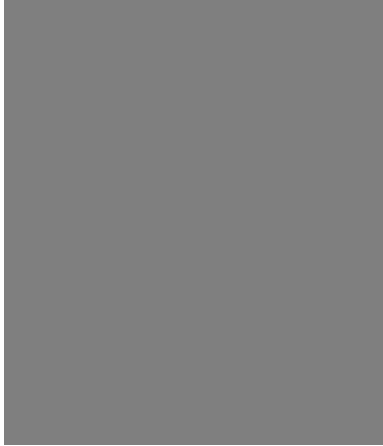


Fig3.62 The status quo of ash trunk



Fig3.63 The design of the weightless coal bunker¹⁰⁵



Fig3.64 The status quo of terminal suspension



Fig3.65 The design of tower crane¹⁰⁶

¹⁰⁵ photo source: The Original Design Studio

¹⁰⁶ photo source: The Original Design Studio

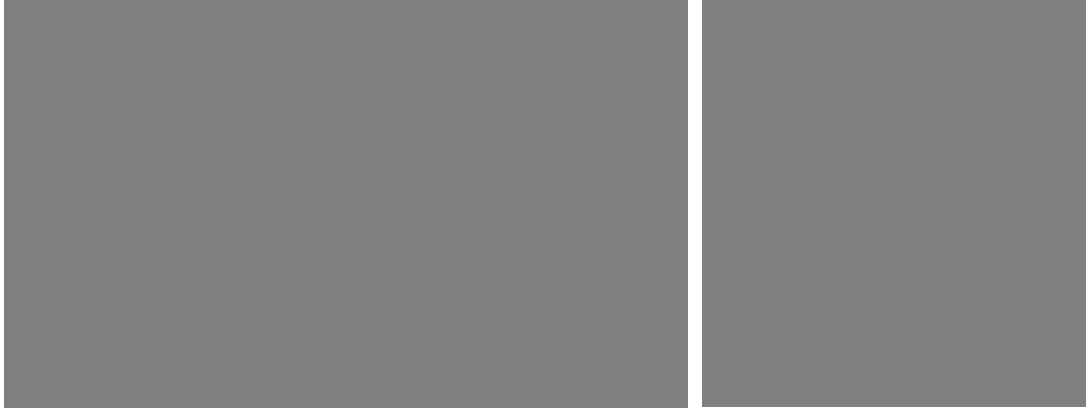


Fig3.66 The state quo of underground pumping station Fig3.67 The design of deep pit climbing¹⁰⁷

3.3.4.3 The Exhibition of Industrial Context

As mentioned above, taking the changes from 2000 to 2015 of important industrial heritage site of Huaide Road to Dandong Road as an example, although it has now been totally banned by Fisherman's Wharf, the precious historical context behind it needs to be continued. The design project of the first phase of the demonstration public space section in Yangpu Riverside (southern section), due to policy timing, was involved even after the Shanghai First Fur Factory(上海第一毛皮厂) in was almost completely dismantled. However at that time, the site survived two 1918 English country buildings, old diameter campanulas, old flood walls and old docks. In the spirit of cherishing the spirit of industry, there are many retained industrial and landscape elements fully created place of industrial sense, still hope that these already invisible industrial history and memory in the venue can be shown. The demonstration section uses the following three ways to exhibit.

a. Artistic display of ground and wall

After the abstract design of historical memory, artistic display will be done in the form of images by spraying on the flood wall and cutting the incised concrete floor.

1. Abstract design of historical images

A representative building of Shanghai First Fur Factory, because of its distinctive facade design is known as the Tiger House. The building was built in 1915 and has a reinforced concrete structure, from left to right including the clinic, the stack and the furnace. The project abstracted its facade into a pictorial design, accompanied by explanatory text, and

¹⁰⁷ photo source: The Original Design Studio

spray-painted on the flood wall.



Fig3.68 Spraying process

Fig3.69 Historical image design effect¹⁰⁸



Fig3.70 Tiger House facade

Fig3.71 The abstract design of Tiger house¹⁰⁹

2. Urban texture changes

The development of fish market in Jiangpu Road and the change of the texture of the loading and unloading terminals are also sprayed on the flood wall by the abstract illustrations after the design and analysis.

¹⁰⁸ photo source: The Original Design Studio

¹⁰⁹ photo source: The Original Design Studio



Fig3.72 Urban texture changes sprayed on flood control wall ¹¹⁰

3. Temporal and spatial changes

In the middle of the track passing through the demonstration section, the hundred year historical time axis of the Yangpu industrial area has been embedded in the concrete floor.



Fig3.73 Etching the temporal and spatial variation of concrete floor¹¹¹

b. Theme sculpture exhibition

In fish market of Jiangpu Road and the loading and unloading terminals it once occurred intensive transport, handling and sale of functional activities, unprecedented grand occasion. Project through the slices, lattice and other forms of image, recorded the textile, loading and unloading fish and other activities in the form of thematic sculpture.

¹¹⁰ photo source: The Original Design Studio

¹¹¹ photo source: The Original Design Studio



Fig3.74 Sculpture of handling of fish scene¹¹²

c. Promotion of information technology

The project is also planning to establish the industrial heritage historical information, historical images and historical information database, so as to allow the public to walk in the demonstration section of can spray on the wall surface of the two-dimensional code for reading more information.

¹¹² photo source: The Original Design Studio

3.3.4.4 Industrial Exhibition Zone

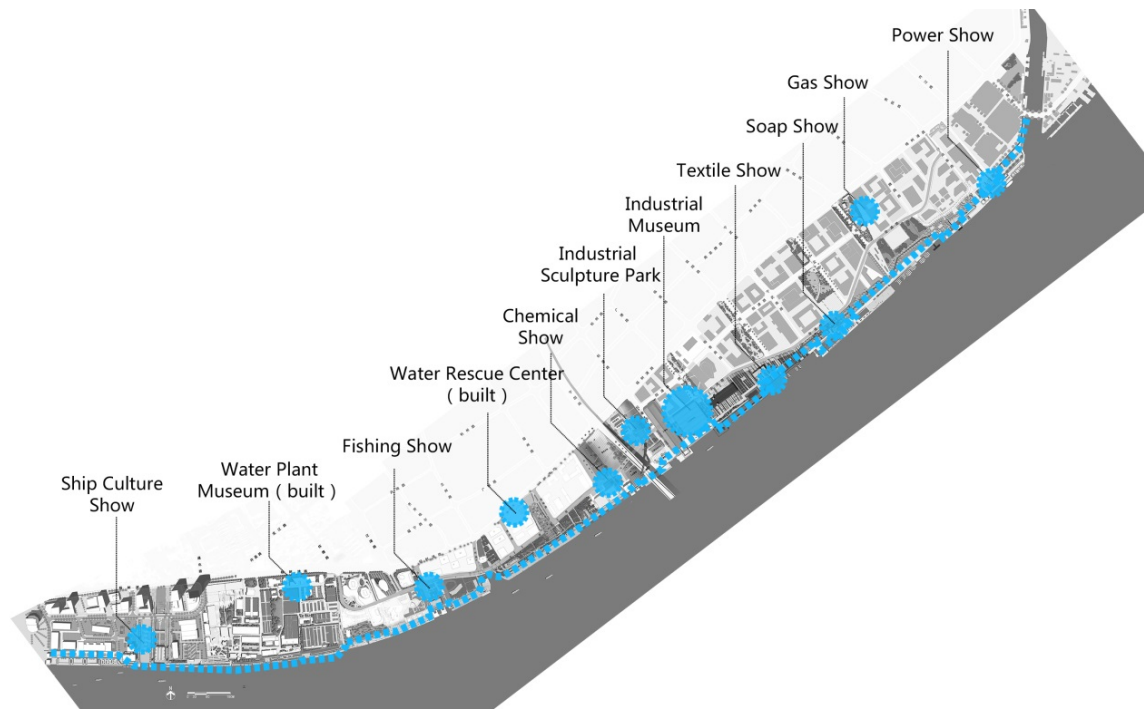


Fig3.75 Industrial exhibition zone of south section of Yangpu riverside¹¹³

Based on the protection and utilization of the above industrial buildings, the excavation of industrial historical memories and the exhibition of industrial remains, after integrating with the whole section, in the 5.5-km public space design project in Yangpu riverside (south section) it is arranged 11 historical relics of industrial heritage continue to show nodes according to the current situation and characteristics of industrial remains in different locations. Each node also has its own specific historical continuation of the industrial operation approach. For the demonstration section, it has designed three series of thematic exhibitions, named "a hundred years of industry", "Mill Chronicle", "fishing port presents."

3.3.4.5 Original Landscape

The reconstruction of the primary landscape consists of three parts. One is the greening planting methods with integration, diversification and combination of activity space. The second is the plant selection based on the remodeling of the memory of industrial sites. The third is the ecological Design rainwater wetlands.

¹¹³ drawn by author, photo reference: The Original Design Studio

a. Greening planting methods

Taking the demonstration section of Yangpu riverside as an example, this project includes a complete greening rainwater park and some greening floating ecological islands and sinking plants that hope to continue greening in the wharf area to jointly form the greening system of the demonstration section. Among them, the terminal area is located outside the flood wall, as part of the extension of the land extension, its construction requirements do not allow to cover the earth, so that it is difficult to achieve large-scale green plantation. Thus floating and sinking are two ways to solve how to extend the issue of planting green on the pier.



Fig3.76 Greening distribution plan¹¹⁴



Fig3.77 Greening floating ecological islands



Fig3.78 Sinking plants¹¹⁵

b. Plant selection

The south public section of Yangpu riverside is designed to select a large number of native plants, such as the Awn muhly grass, Pennisetum, dianthus and other wild herbs,

¹¹⁴ photo source: The Original Design Studio

¹¹⁵ photo source: The Original Design Studio

oleander and other native shrubs. They could minimally involve in the original ecology, also create a memory of industrial sites for citizens as well.



Fig3.79 Plant selection¹¹⁶

¹¹⁶ drawn by author, photo reference: The Original Design Studio

c. Rainwater wetland



Fig3.80 The plan and section of the design of rainwater wetland¹¹⁷

In some enlarged green parks and plazas in southern section of Yangpu riverside, such as the demonstration section and the power plant section, there are some rainwater plazas and rainwater wetlands designed as ecological sites based on the principle of a sponge city. Typical examples are rainwater wetlands in the demonstration section.

The core of the sponge city is that it rationally controls the runoff of rainwater landing on the underlying surface of the city so that rainwater can be absorbed and used on the spot at that time¹¹⁸. Its most direct and significant change is to soften the surface of the hardened ground used in the past. The advantages could be: 1. To greatly reduce the pressure on the urban drainage network to solve the urban waterlogging; 2. The seepage rain water can indirectly supply the groundwater, To some extent to prevent collapse; 3 multi-level use of rainwater helps to save water resources; 4 local regulation of

¹¹⁷ photo source: The Original Design Studio

¹¹⁸ Zhang Xiaoying. "Sponge city no longer 'see the sea'." *General Machinery* 2016,(06):14-16.

micro-climate can also improve, water ecology. Sponge city operation can be described as "seepage", "storage", "stagnation", "net", "use", "row".

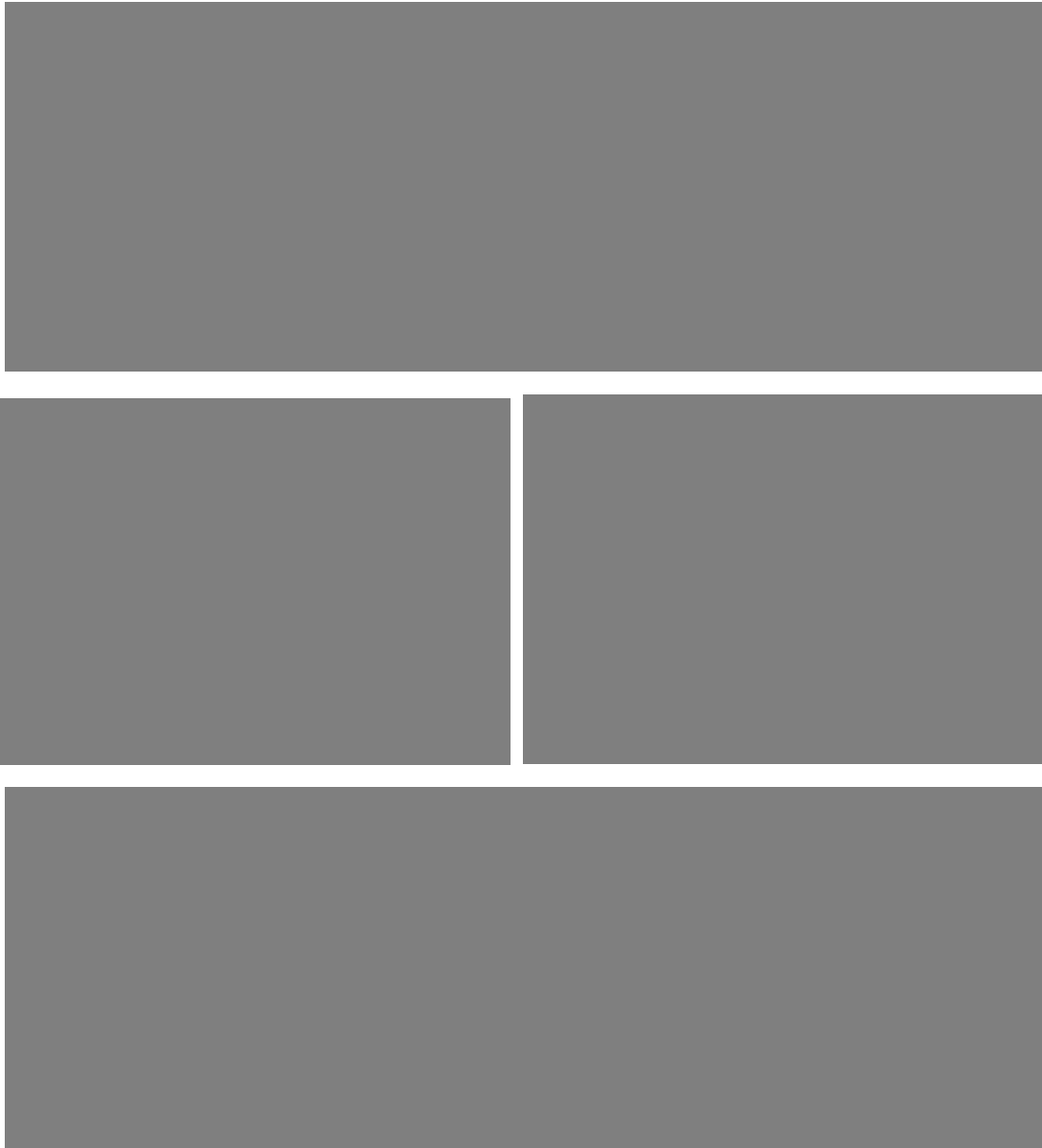


Fig3.81 The "seepage", "storage", "stagnation", "net", "use", "row"¹¹⁹

3.3.5 Summary

Based on the research and summary of the design cores and design concepts in the first two sections of Yangpu industrial riverside space in this chapter, this section deduces the

¹¹⁹ photo source: The Original Design Studio

"limited intervention" as the key design strategy, followed by the theoretical argumentation and method interpretation of limited intervention to further support the rationality of taking limited intervention as a design strategy. Subsequently, the limited intervention strategy is applied to traffic context, public space, post-industrial landscape in the regeneration of Yangpu industrial riverside space.

Last but not least, apart from being dominated by public space in the regeneration of Yangpu industrial riverside space, we should also transform the function of riverside hinterland and integrate with the functions of the surrounding communities in order to enhance the vitality of the area in an all-round way. Yangpu riverside is planned to develop into a knowledge-intensive compound shoreline with continuous motivation for innovation to achieve sustainable development. This part has been reflected in the detailed regulatory plan, while in this section, the strategy analysis on public space design of Yangpu riverside involves less. It will be focused on the design later in this paper.

3.4 Chapter Summary

This chapter, by focusing on the urban space, systematically sorts out the regeneration design of the southern section of Yangpu industrial riverside, and summarizes the corresponding industrial inheritance as the design core, with life, ecology and intelligent as the design concepts and limited intervention as the main design strategy. In the regeneration project of Yangpu riverside, the design principles starting from the design source to the specific strategic plan, even to the scene of the completed effect, are the same all through. We can get some valuable revelations:

1. Treasure the material and spiritual cultures left behind after the original industrial productive space, and regard them as the core connotation of the life-oriented regeneration of the of the industrial riverside space;
2. Take "people-oriented" and "sustainable development" as the fundamental starting points for the life-oriented regeneration, and on the basis of ensuring a healthy economic development, emphasize the needs and habits of people and the environment to establish the concept and vision for the regeneration of industrial riverside space;
3. Based on 1 and 2, "intervene" the life-oriented regeneration into the site in "limited" ways, and while excavating and keeping memories in place develop in a green and intimate manner;
4. The project also leaves some regrets. Some of the industrial characteristics are obvious

and rich in scientific and artistic values. However these industrial heritages have been dismantled without being able to be protected;

5. The project is a regeneration based on public space. What's more, due to the limitation of development mode in the policy dimension the connection and integration of functions between the project and the riverside hinterland and surrounding communities, is limited.

So far, only 550 meters of demonstration section in the 5.5 km of Yangpu industrial riverside space is in operation and the others are still under construction. However, there are still a lot of urban industrial spaces in downtown Shanghai that need to be updated urgently, and even the other first- and second-tier industrial cities in China have large-scale productive coastline is being more and more idle and gradually open the issue of regeneration. Urban regeneration of industrial space in riverside of China now still has a long way to go.



Fig3.82 Second phase of Yangpu riverside is under construction¹²⁰

¹²⁰ photo source: The Original Design Studio

CHAPTER 4. The Regeneration Design Research on the Urban Industrial Waterfront in US

The position of the US military industry and the auto industry in the history of world industrial development is self-evident. There are many industrial cities such as Chicago, Boston, Portland and Baltimore. With the advent of the post-industrial era, major industrial cities have also left a lot of waterfront industrial wasteland. The transformation practice of the waterfront industrial space began in the 1970s and created many excellent cases.

Table4.1 The list of the practice of regenerating industrial waterfront space in the United States¹²¹

Name	Location	Year	Type	Industrial Type	Conservation Mode	Regeneration Mode
1 Plan Envisages Reusing Pittsburghs Industrial	Pittsburgh	2004	Large Waterfront Industrial Area	Steel, Manufacturing	Old Melts into New	Mixed development
2 The Menomonee Valley Community Park	Milwaukee	2012	Large Waterfront Industrial Area	Railway Transport	Old and New coexist	Open Space (Park)
3 Louisville Waterfront Park	Louisville	1990	Single Waterfront Industrial Heritage Site	Railway	Old Melts into New	Open Space (Park)
4 Olypic Sculpture Park	Seattle	2001	Single Waterfront Industrial Heritag	Oil Transport	Old and New coexist	Open Space (Park)

¹²¹ sorted by author

4. The Regeneration Design Research on the Urban Industrial Waterfront in US

e Site							
5	Northside Park	Denver	2000	Single Waterfront Industrial Heritage Site	Sewage Treatment Plant	Old and New coexist	Open Space (Park)
6	Gasworks Park	Seattle	1970	Single Waterfront Industrial Heritage Site	Gas Plant	Old and New coexist	Open Space (Park)
7	Hunter's Point South Waterfront Park	New York	2013	Single Waterfront Industrial Heritage Site	Military Base	Old and New coexist	Open Space (Park)
8	The Allegheny Riverfront Park	Pittsburgh	1994	Single Waterfront Industrial Heritage Site	Expressway	Old and New coexist	Open Space (Park)
9	Reordering Old Quarry	Guilford	-	Single Waterfront Industrial Heritage Site	Quarry	Old and New coexist	Residence
10	Urban Outfitters Headquarters at the Philadelphia Navy Yard	Philadelphia	2013	Single Waterfront Industrial Heritage Site	Navy Yard	Old and New coexist	Industrial Parks

4. The Regeneration Design Research on the Urban Industrial Waterfront in US

1 1	Riverbank State Park	New York	1993	Single Waterfr ont Industr ial Heritag e Site	Sewage Treatment Plant	Old and New coexist	Mixed developm ent
1 2	Brooklyn Navy Yard	New York	1971	Single Waterfr ont Industr ial Heritag e Site	Dockyard	New Melts into Old	Industry Heritage Park
1 3	Fisherman' s Wharf	San Francisco	1978	Wharf, Port Area	Wharf	Old Melts into New	Mixed developm ent
1 4	Port of Baltimore	Baltimore	-	Wharf, Port Area	Port	Old Melts into New	Mixed developm ent
1 5	Long Dock Park	New York	2004- 14	Wharf, Port Area	Port and landfill	Old and New coexist	Open Space (Pa rk)
1 6	Riverside Park South	New York	1991	Wharf, Port Area	Port	Old and New coexist	Open Space (Pa rk)
1 7	Gantry Plaza State Park	New York	-	Wharf, Port Area	Port	Old and New coexist	Open Space (Pa rk)
1 8	The Brooklyn Bridge Park	New York	2003-	Wharf, Port Area	Wharf	Old and New coexist	Open Space (Pa rk)
1 9	The Charleston Waterfront Site	Charleston	1975- 90	Wharf, Port Area	Wharf	Old and New coexist	Open Space (Pa rk)
2 0	New York South Port	New York	1995	Wharf, Port Area	Wharf and Warehouse	Old and New coexist	Commerci al Center
2 1	Navy Pier Chicago	Chicago	1989	Wharf, Port Area	Wharf	Old and New coexist	Mixed developm ent
2	Inner	Milwaukee					

2	Harbour		
2	UrbanRiver	Massachuse	
3	Visions	tts	
2	South	Portland	Mixed
4	Waterfront		developm ent
	Goose Island		
2	Planned	Chicago	
5	Manufactur ing District		

4.1 Case 1: Chicago Industrial Waterfront

4.1.1 Overview

Each city has its own unique history. Most of the origins of coastal cities are closely related to its neighbors' rivers, lakes and oceans. The same situation is true of Chicago, which is located on the southernmost tip of Lake Michigan, both at the forefront of commercial trade in the Lake district and as easily accessible to the mainland. Furthermore, the historical development of Chicago could stand for on typical type of US cities.

The late 19th century was a time of great development for Chicago, with the rapid rise for its proximity to the Lake.

The massive fire that struck Chicago in 1871, lasting for days in a row, was one of the great catastrophes in the history for human city in the 19th century, destroying some property value of 200 million U.S. dollars in the region of 675 square kilometers. However, the unrelenting fire did not have much impact on the development of Chicago. Chicago experienced a "rejuvenation" process. Through a series of massive redevelopments, Chicago expanded rapidly at an unprecedented rate. The construction of a large number of high-rise buildings also earned Chicago the reputation of hometown of high-rise buildings. Also, water transport industry reached its heyday. Chicago became the transportation center of the entire central and western regions. Steel and the crops in the central and western regions continued to be transported to Chicago.

At the end of the nineteenth century, two elevated roads were built in the Lake Michigan

area - Rudolph and Michigan Avenue - providing great convenience to the city in connecting rail and waterways, while at the same time cutting off the city's relationship with the lake.

At the beginning of the twentieth century, with the advent of the automobile era, a large number of motorway roads and highways, including the famous Lakeshore Avenue, were built along the lake. As a result, the cities and lakeshore became increasingly separated.

In the mid-20th century, the adjustment of the industrial structure in the world caused the waterfront region to undergo a serious process of De-industrialization. The rail transport, ports and other facilities in lakeshore rapidly declined, and the water adjacent to industry suffered a certain degree of pollution. Waterfront space from the city's economic vitality reduced to an abandoned area of the city, becoming a harsh environment, a hotbed of crime.

It was not until the 1970s that people gradually realized the value of lakes and rivers to a city. To recreate the waterfront space, it is not only close to the water, close to the beauty of nature, but also should provide open, exchanges, entertainment, public view of the public space for city life.

In the following two cases, the Navy Pier rebuilt by the Chicago government in 1989 with a total investment of 1.5 billion U.S. dollars and the Millennium Park started construction in 1997 are famous cases for the renovation of port wharves and lakeside areas precisely in this context and in view of this concept.

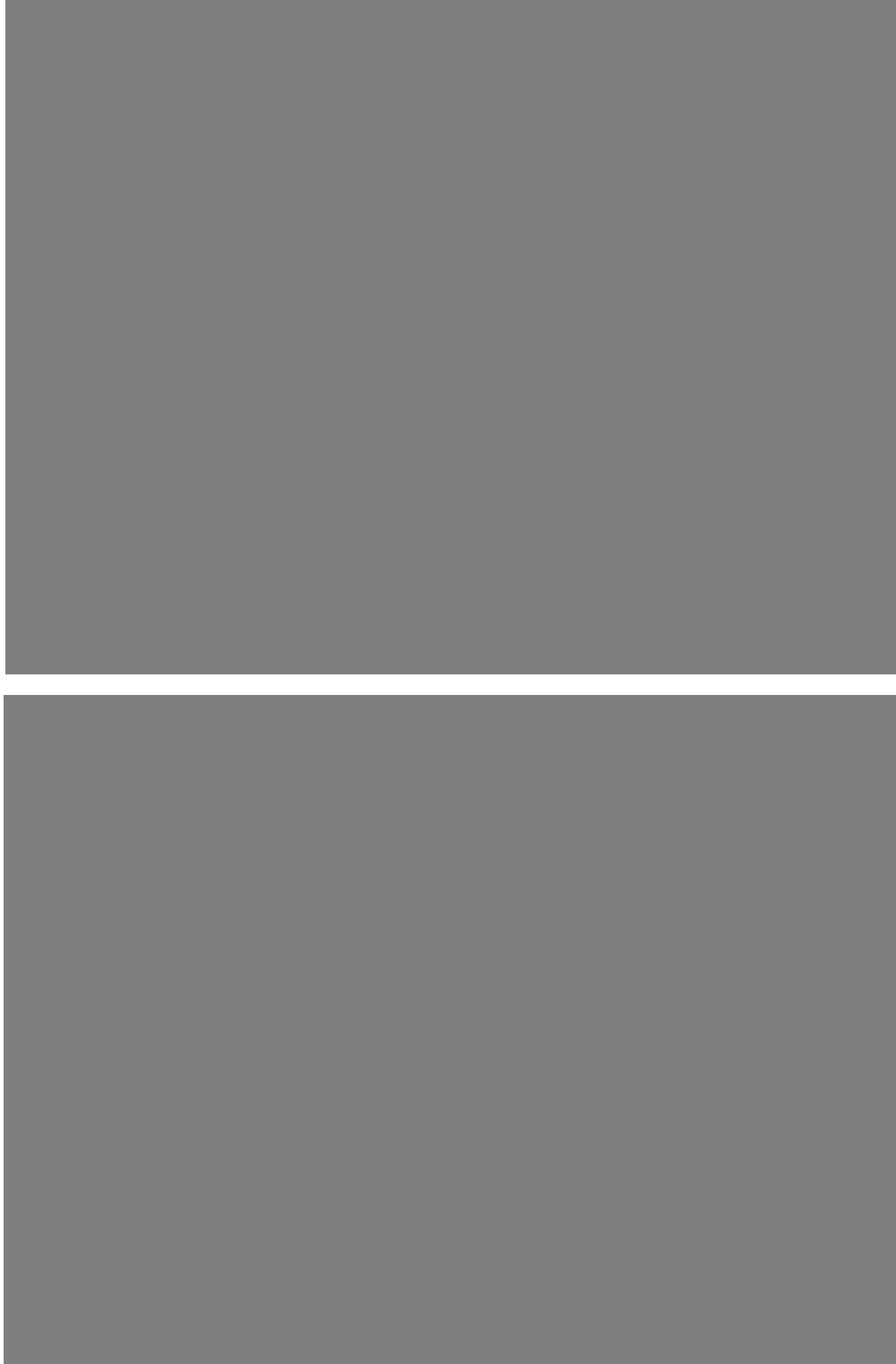


Fig4.1 The planning of waterfront area in 1990 and 2016¹²²

¹²² photo reference, Chicago Department of Planning and Development

4.1.2 Millennium Park

Millennium Park covers an area of 24 acres in the heart of Chicago's metropolitan area. Millennium Park, recipient of the 2009 Rudy Bruner Award for Urban Excellence, was once an industrial wasteland transformed into a world-class public park. In fact, from the 1850s until 1997, the land that is now occupied by Millennium Park was controlled by the Illinois Central Railroad. Thus, the area, which was covered with unsightly railroad tracks and parking lots, remained blight on Chicago's lakefront throughout the 20th century.

The Millennium Park project started at the end of 1997, when the mayor Richard M. Daley wanted to turn the area into a brand new public space for Chicago residents. The original project plan calls for a 16-acre park and outdoor music avenue in Grant Park with a traditional Beaux Arts style. Over time, with private-sector promises, the involvement of world-renowned architect Frank Gehry and the planning of the leading firm SOM, the project ambitiously involved of world-renowned artists, architects, planners, landscape architects, and designers, evolving into a splendid undertaking.

a. Traffic reorganization

The design of the first phase of the project started in 1997, including the dismantling of abandoned railway lines and the establishment of underground tunnels. The huge underground transport network includes a huge subway transfer station and underground parking. Plenty of open ground space for pedestrians is just a pedestrian paradise. A winding pedestrian bridge designed by Frank Gehry, linking Millennium Park with Grant Park in the east, delineates unparalleled urban lines. Footbridge full-length 36m, the bridge body is wrapped by stainless steel mesh plate, deck deck is a wooden deck, smooth ramp leading to the ground. The bridge serves as a pedestrian link between the city and the lakeshore park, isolating heavy traffic and noise like a natural barrier, and providing pedestrians with further safe and comfortable walking space.

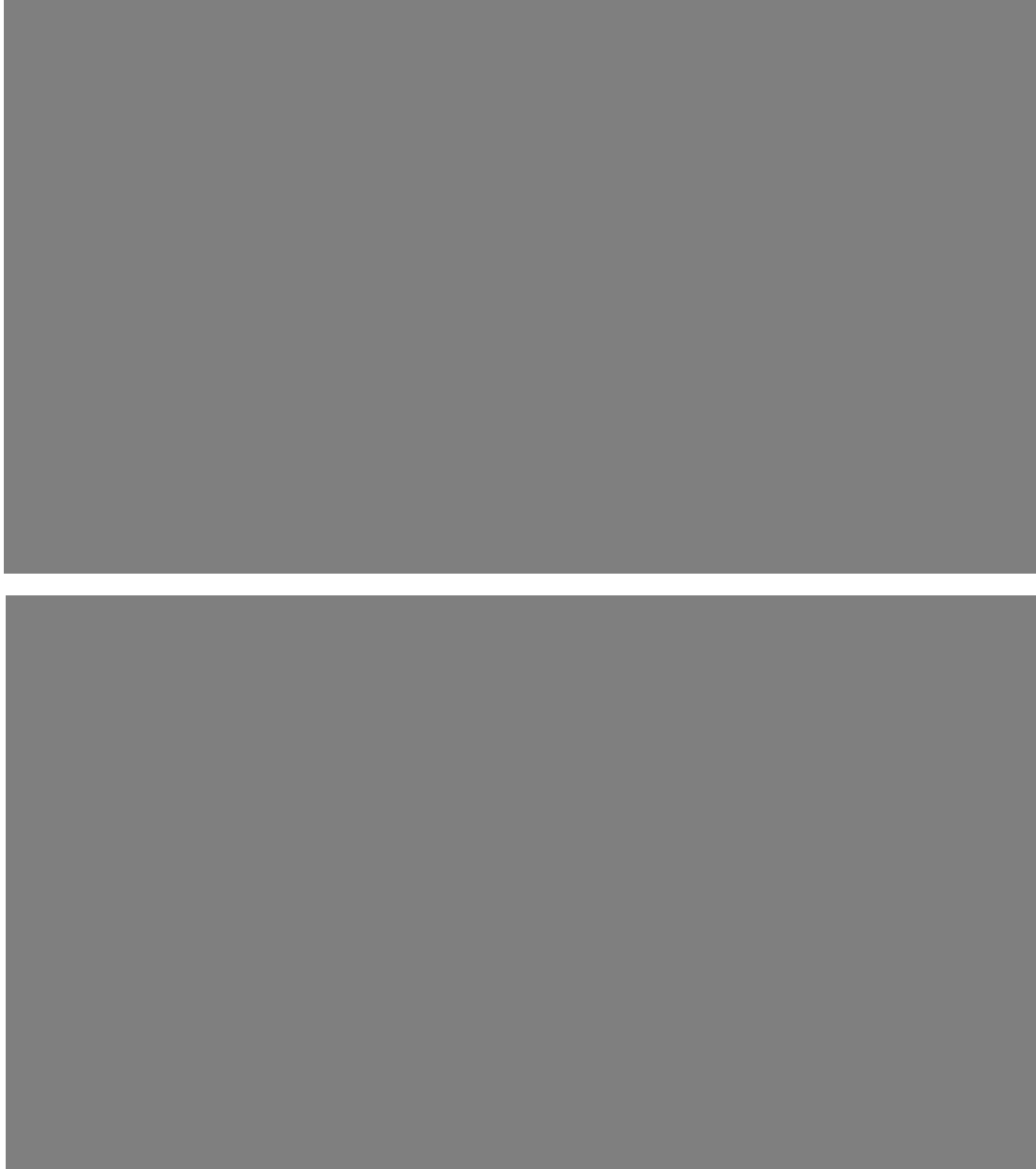


Fig4.2 The before and after comparison of Millennium Park¹²³

b. Open space and public art center

Millennium Park is also an unprecedented fusion of world-class art, music, architecture and landscape design, where people can feel the fantastic impact of interactive public art and listen to the fabulous classical music of the Grant Grand Orchestra. The star architect Frank Gehry joined it to icing on the cake. What's his most challenging and most exciting

¹²³ photo reference: http://www.som.com/china/projects/millennium_park_master_plan

concept is to create a completely open concert hall for 10,000 people. The crossing cable on the lawn erected the huge scaffolding. The dazzling appearance of the building makes it the crowning touch in park art. Its central trail, lawns and majestic limestone walkway colonnades make people think of Beaux Arts-style public spaces. At the same time, Millennium Park boasts many unique features such as Jaume Plensa's interactive video installations and fountains and Anish Kapoor's stunning Cloud Gate sculptures. People with a sense of modern art.

4.1.3 Navy Pier

Located on the shores of Lake Michigan in the North Near North Chicago, USA, the Navy Pier is a marina with 3,300-foot (1,010-meter) 24-acre area. As a historic building in Chicago, it was built in 1914 and opened to the public in 1916 for a total cost of 4.5 million U.S. dollars. It was the largest wharf in the world at that time. During the First and Second World War, it was served as a naval training base and the use of base. During the next few decades, the pier was in a quiet state. In 1989, the government of Chicago invested 1.5 billion U.S. dollars to rebuild the pier and again open to tourists in 1994.

With the passage of time, the Navy Pier is still the benchmark for windy city tourism. However, the aging facilities, backward architectural shapes and inadequate utilization of waterfront areas are making the tourist attractions of the wharf decline year by year. The Naval Terminal Design Competition of 2012 was just to solve this problem. The team led by James Corner Field Operations eventually defeated 4 other competitors, including BIG, as the winner of the international redesign competition of the Navy Pier. The concept of their victory is to seek to make the "People's Pier a truly iconic and world-class destination, truly achieve the "people-wharf-the city" between the three organic balance.



Fig4.3 The design of Navy Pier by James Corner Field Operations¹²⁴

a. Remaining problems

Navy pier was always a consumer-oriented public places, recreation and entertainment is the theme, while the consideration of people is mostly just based on consumption as a starting point. In addition to setting the Ferris wheel in the entrance as the center of the playground and configuration some recreation facilities, other venues are only monotonously set back into a word-shaped venue around the building, greatly reducing the people's active participation. Especially in recent years, with the improvement of various facilities in the surrounding areas, the Navy Pier is no longer the first choice for travel in Chicago. Visiting the Navy Pier has become no more than an attraction of its inner design and spirit.

¹²⁴ photo reference: <http://bustler.net/news/2479/james-corner-field-operations-winning-design-for-navy-pier-redesign>



Fig4.4 The former Navy Pier¹²⁵



Fig4.5 The plan of Navy Pier by James Corner Field Operations¹²⁶

¹²⁵ photo reference: <https://fall.ilexpo.com/location.aspx>

b. Traffic reorganization

First of all, internal traffic and external urban traffic should be fully integrated to make full contact with the city. Second, the riverfront walkway should be set up to strengthen the interaction between people and rivers so as to meet people's nature to be close to water. Finally, the internal “∞” shape road together with the riverfront walkway assumes the task of major traffic flow. The perfect establishment of the city, waterfront, internal wharf and pedestrian system is the foundation of the whole project.

c. Function

When former time the recreation and leisure is the main function of the Navy Pier, the playground became the most popular venues on the wharf, visitors can only follow the set road, passively involved into other places. Although Navy Pier could thrive in less developed recreation and leisure facilities of the era, leading the city tourism, nowadays Navy Pier needs to reposition itself. Therefore, since the Navy Pier is a rich historical place with many historical relics - warships, anchors and other elements representing the memory of the Navy, they should be reflected and become the cultural existence of the wharf. For example, a large iron anchor stands at the far end of the marina, commemorated by the Chicago cruiser for the Navy Pier. At the same time, 202,300 square meters of parks, gardens, shops and restaurants gather together with beautiful landscapes, are attracting foreign visitors with an annual tourist number of up to 7 million.

d. The attraction of public space

The Polk Park Fountain Square features a dramatic fountain; architectural lighting on the historic Head house façade; the new food court, community meetings and party space in South Chicago; a winding "wavy wall" that lets light and movement into the interior of the Southern Arcades while gathering to create a magnificent south staircase. A larger and better ferris wheel with collection of the latest technology has become a new landmark here. These fun-filled designs combined with public spaces make the marina a new sustainable, iconic, world-class activity and cultural center, attractive and charismatic to both citizens and tourists.

¹²⁶ photo reference: <http://bustler.net/news/2479/james-corner-field-operations-winning-design-for-navy-pier-redesign>



Fig4.6 The winding “wavy wall” in public space¹²⁷

4.2 Case 2: Portland Industrial Waterfront

4.2.1 Overview

Portland built its city in 1851, had been the largest port in the northwestern United States until the late 19th century when the railroad extended to Seattle. After World War I, the great development of the shipbuilding and timber industry in Portland also further established the status of the economic, cultural and transportation center of the city. In the 1940s, the rise of manufacturing industries such as steel made Portland an industrial city for a long time. Heavy industries such as metallurgy still occupy a pivotal position in the local economy. In the late 1970s, the economic crisis hit the heavy industry and traditional manufacturing industries in the area severely, causing the regional economy to stagnate and the urban development to decline. In the mid and late 1980s, the regional economy gradually transformed itself with the new manufacturing and service industries as the development direction.

¹²⁷ photo reference: <http://narchitects.com/work/chicago-navy-pier-9/>

Portland's south waterfront was formerly a brownfield industrial land that began restore in 2004. Now it is one of the largest urban renewal projects in the United States. Soon with the city's largest and most complex brownfield being cleared, the urban regeneration of Portland public waterfront has extended to Zidell Yards, designed by Sasaki firm, making this area a new look. With populace development and solid urban advancement, Portland has ascended in the ranks of American urban communities from a languid industrial port town to one of standout cities to live in the whole country.

4.2.2 South Waterfront

At the beginning of the 20th century, the Portland Waterfront became an industrial zone by leveraging the connection to the Willamette River. The area was involved in World War II as the important maritime industries in the United States. Since then, many naval vessels in the arena have been dismantled and salvaged, leaving a lot of metal debris and other pollutants on the river bank. The war was over, and the waterfront was still used as industrial land, restarting the industrialization of the new period, mainly for the manufacture of aluminum and agrochemicals.

As one of the only remaining undeveloped parcels in Portland, the 130 acre, North Macadam Urban Renewal Area broke ground on redevelopment in 2003. With solid public and private investors in place, the newly named South Waterfront district intends to implement its vision of a high density residential district with a rich mix of urban-scale offices, housing, hotels, parks and retail uses in the near future.¹²⁸

¹²⁸ Jeremy Davis, Mark Sauer, Devin Yoder, "Industrial Waterfront Redevelopment - Milwaukee's Inner Harbor." *University of Wisconsin – Milwaukee* 2011



Fig4.7 The range of the South Waterfront¹²⁹



Fig4.8 Evolution of the South Waterfront district¹³⁰

a. Transportation

Transportation alternatives incorporate a streetcar expansion into the area, passerby and bike associations, an elevated cable car, and river taxi's. The road grid will be separated in the north and south sections of the district to reflect the twist in the waterway. East/west roads are likewise used to visually and physically associate the advancement and the riverfront.

¹²⁹ photo reference, Jeremy Davis, Mark Sauer, Devin Yoder (2011)

¹³⁰ photo reference, <https://www.portlandoregon.gov/bps/article/501232>

b. Greenway

Greenways and parks are incorporated all through the area to inspire a various experiences for citizens and tourists.



Fig4.9 The plan of the Greenway¹³¹

c. The mixed use of land

The South waterfront area seeks to empower a rich mix of uses in the region including office, institutional, residential, neighborhood-scale retails, parks, and greenway use. A profoundly urban character is built up by requiring dynamic uses on the ground floor of buildings, constraining surface parking and prohibiting drive-through eateries, and upholding the building height limits and permitting rewards or special cases for open enhancements or eco-friendly development.

¹³¹ photo reference, <https://www.portlandoregon.gov/bps/article/181205>

4.2.3 Zidell Yards



Fig4.10 The location of Zidell Yards¹³²



Fig4.11 The former situation of Zidell Yards¹³³

¹³² photo reference, Jeremy Davis, Mark Sauer, Devin Yoder (2011)

¹³³ photo reference, <http://www.sasaki.com/project/425/zidell-yards-master-plan/>



Fig4.12 The planning of Zidell Yards by Sasaki¹³⁴

a. Transportation

Zidell Yards is remarkably situated to supplement Portland's catapulting development. In Zidell Yards, it has easy access to transit by means of Portland's notable car-free bridge, Tilikum Crossing, and furthermore by streetcar, airborne cable car, MAX train and various bikeways including the new Greenway trail along the Willamette River. Imagined as bicycle associations with encompassing ranges, Zidell Yards will be a vision of a sound, dynamic piece of Portland in the South Waterfront's development.

b. Mixed use

The Zidell Yards design sets a reasonable vision for this area that will end up being the social heart, retail center, and creative hub of the South Waterfront district. As the primary retail corridor, Bond Avenue will link through Zidell Yards to interface the Central District into the rising OHSU Schnitzer grounds. Meadow Park, with its waterfront and vertical farms, is integrated with the surrounding buildings and will be the center of the Zidell Yards. A magnificent infrastructure, Ross Island Bridge, although the base is now divided into two regions and this rare infrastructure will be linked to the base in the future, across a unique urban gallery - the gallery will be with newly built leisure parks, ecological depressions and even creative office / start-up space integration.

¹³⁴ photo reference, <http://www.sasaki.com/project/425/zidell-yards-master-plan/>



Fig4.13 Analysis on function of Zidell Yards by Sasaki¹³⁵

c. The legacy of industrial activity

The industrial history of the riverfront is a major theme of the concept of the regeneration of Zidell Yards. In keeping with the rich industrial history and culture of the former site, while giving the base a forward-looking and bold vision, the design team also sought to preserve many industrial monuments and artifacts on site. The rectangular shipbuilding area will be transformed into one of the key activity hubs; gantries and cranes will be retained in their original site as a large sculptural installation to add an industrial atmosphere to the park; the redesigned slipway will be reused into a dock landing to bring people directly to the waterfront without any distance.



¹³⁵ photo reference, <http://www.sasaki.com/project/425/zidell-yards-master-plan/>



Fig4.14 The industrial remains integrated into the site in Zidell Yards¹³⁶

4.3 Case 4: Milwaukee Industrial Waterfront

4.3.1 Overview

Milwaukee is Wisconsin's largest city, located on the west coast of Lake Michigan, about 200 kilometers south of Chicago. In 1996, the Milwaukee area (including 4 counties) had a population of 1.46 million and a total area of 3,781 square kilometers.

According to the development plan of urban centers in 2000-2020, tourism and entertainment will become the main development directions of urban centers. Therefore, the development of waterfront areas will be raised to the height of the future of urban development.

4.3.2 The Menomonee Valley Community Park

Known as the Valley, it is Menomonee River lowlands with 4 * 1.5 square miles. The Menomonee Valley cuts through Milwaukee from Miller Park on the west to downtown Lake Michigan to the east. Here in the late 19th century industry rapidly developed. It's all Milwaukee Road mechanical repair shop - 140 acres of rail yard and mechanical shed. In the 1980s, as the familiar storyline of the cities in the Midwest of the United States, the industries began to gradually move out of the cities. The valley is like a 1,200-acre scar in the city, while the contaminated valley floor was isolated from the surrounding cities. In

¹³⁶ photo reference, <http://www.sasaki.com/project/425/zidell-yards-master-plan/>

order to solve the serious urban problems and rejuvenate the Menomonee Valley, the "Renew the Valley" project was launched in 1988¹³⁷.



Fig4.15 The images of the Menomonee Valle¹³⁸

a. Restore the natural environment

The \$20 million brownfield remediation project has been named "the largest environmental governance in history" to address the environmental problems of contaminated soils and sewers for miles. Remove asbestos and cover the soil to protect and enhance the health of human environment.

In the meantime, the Valley has put forward the concept of "Stormwater Park", which could catch every drop of rain falling in a business park. Through some native planting, it also can filter and clean up all the storm runoff in the park.

Not only is humanity's environmental health considered, but the Valley is also committed to restoring natural habitats to reinvent biological diversity, especially at the edge of the wetlands and near the center of his waterway.

¹³⁷ Adam Regn Arvidson, "Most Industrial." *Landscape Architecture Magazine* 2016

¹³⁸ photo reference, Adam Regn Arvidson(2016)

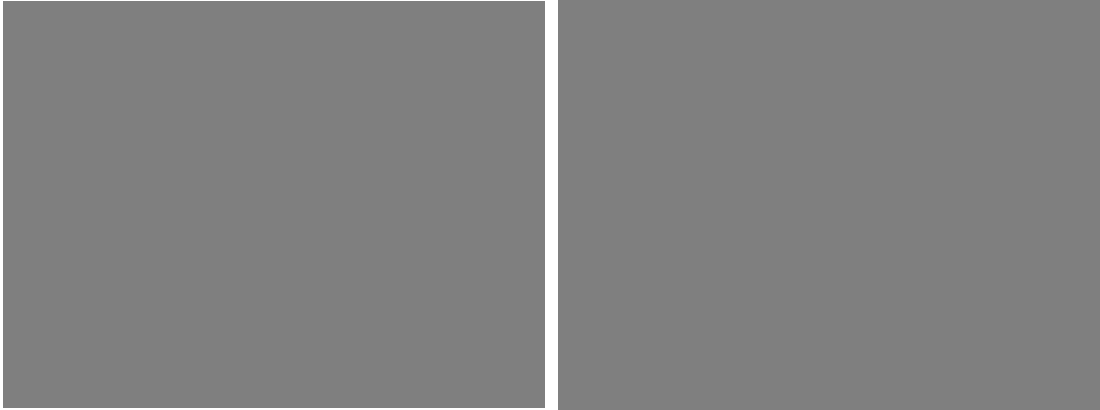


Fig4.16 The ecological environment of the Vally¹³⁹



Fig4.17 Analysis on the stormwater park¹⁴⁰

b. New economic development opportunities

While the City rehabilitated the site's ecology, the Valley's update also actively promoted economic growth and increased employment. Many Menomonee Valley multi-level institutions, public organizations, private advocates and many others have all been established over the past 17 years. The executive director of the Menomonee Valley partners said the Valley has added a total of 5,200 jobs since 1999.

The famous Harley-Davidson Museum, also in this context, was transformed from the

¹³⁹ photo reference, <http://marelandscaping.com/project/menomonee-valley-industrial-center-community-park/>

¹⁴⁰ photo reference, Adam Regn Arvidson(2016)

industrial facilities in the past, the industrial design of the orange and gray design seems to pay tribute to the valley and the city. Together with other Valley leisure facilities, it attracts 10 million tourists a year to see for themselves.

4.3.3 The Inner Harbor

The Milwaukee Inner Harbor reconstruction project is a public-private partnership that rejuvenates Milwaukee's historic urban gateway by meeting the stringent environmental goals of stimulating private investment and economic growth. The area has the potential to become a vibrant urban area with a job center and restored community buildings built along working, modern and well-established and operational waterfront.

While brownfield's remediation, land-use and building reuse are at the core of this project, the benefits of this project for the "water and mobile" part can not be ignored or understated. The Inner Harbor will connect multiple neighborhood cities and reintroduce Milwaukee to this unique working waterfront.



Fig4.18 The region of Inner Harbor¹⁴¹

¹⁴¹ photo reference, Jeremy Davis, Mark Sauer, Devin Yoder (2011)

a. Revitalize the ecology

Milwaukee Inner Harbor plans to complete 10 acres design of protected or rehabilitated shoreline habitats in the study area by 2015, with a focus on resolving legacy environmental issues for heavy industrial use.

On this basis, on the one hand, we will develop clean technologies and achieve the goal of zero net energy consumption and net zero rainwater runoff in the study area in 2023. On the other hand, the ecological process in Inner Harbor will be restarted to encourage the natural habitat of the environment

b. Revitalize economic development

The University of Wisconsin-Milwaukee University (UWM) completed the Freshwater Science Building in 2014 and by 2023 plans to achieved the goal of repairing 100 acres of Brownfields and creating a study area of 22 jobs per a cre of redevelopment in the study area

4.4 Conclusion: Supplementary and Reference Compared with Yangpu Riverside

In summary, these six well-known cases from three major U.S. cities share the following commonalities: They are committed to improving the ecological environment left by the industrial production, rejuvenating the waterfront industrial land located in the center of the city as a target and vision, achieving the renovation of waterfront industrial land through a series of measures like transportation, nodes, functions and others. That is, correspondingly, the three-aspect, design core, design concept and design strategy. With the specific analysis and summarization of these cases, and comparison of Yangpu riverside regeneration project, it is found that there are some common coincidence with Yangpu riverside, some aspects that Yangpu riverside has not been involved in to be able to be used as a supplement, some ultimate uniqueness that Yangpu riverside has shallow tasted but not done enough, yet also their own limitations and legacy problems that Yangpu Riverside and later industrial riverside space regeneration in Shanghai can be circumvented.


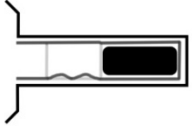






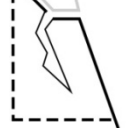
	Diagrams	Design Core	Design Concept	Design Strategy
Millennium Park			<p>RIVERSIDE SPACE</p> <p>↕</p> <p>PEOPLE</p> <p>↙ ↘</p> <p>CITY ← WATER</p>	
Navy Pier		Similar as Yangpu Riverside	<p>RIVERSIDE SPACE</p> <p>↕</p> <p>PEOPLE</p> <p>↙ ↘</p> <p>CITY ← WATER</p>	
South Waterfront		 Brownfield Remediation Complements for Yangpu Riverside		
Zidell Yards				 Loving water & Integration of community Reference for Yangpu Riverside
Menomonee Valley Park		 Brownfield Remediation Complements for Yangpu Riverside	<p>RIVERSIDE SPACE</p> <p>↕</p> <p>PEOPLE</p> <p>↙ ↘</p> <p>CITY ← WATER</p>	
Inner Harbor		Brownfield Remediation Complements for Yangpu Riverside		

Fig4.19 Comparison with Yangpu riverside as the conclusion of cases study¹⁴²

4.4.1 The Regeneration Design Core

Yangpu riverside regeneration project takes "industrial inheritance" as its design core and places emphasis on the original material and spiritual space, which helps locate its own characteristics accurately and strongly throughout the entire riverside space along the Huangpu River to fully enhance its cultural connotation. Meanwhile, throughout the transformation and renewal of a hundred years Navy Pier still shows itself as a naval base and is not lost in the tide of the times. Instead, it takes the display and inheritance of

¹⁴² drawn by author

material and culture of the post naval base as the core competitiveness of the project. With its own trait and later development, it has become a world-class waterfront industrial renewal project.

In addition, the urban renewal program of South Waterfront in Portland and two cases, The Menomonee Valley Community Park and the Inner Harbor, in Milwaukee City, all focused on environmental repair, namely “Brownfield Remediation” or “Brownfield Revitalization”. “Brownfield” first proposed in 1992 and successively two notable acts were promulgated in 1994 and 2002. Brownfield Revitalization is a nationwide environmental governance initiative in which process Portland and Milwaukee was once acting as the pioneers and backbones. What’s more Brownfield Remediation often requires the great determination of the government and the high cost of developers. In Portland, there is a \$ 400,000 grant to assess contamination on properties around the city, with a target area of East Portland and a \$ 1 million grant to provide loan fund (RLF) for cleanup on private properties¹⁴³, while in Milwaukee, the \$20 million brownfield remediation project included 23 federal and state grants to address the contaminated soil, old foundations and miles of relic brick sewers¹⁴⁴. Nevertheless, many cases and studies have shown that after expensive investments Brownfield Remediation often leads to more public interests, rejuvenating and stimulating the development of community economy in the longer term. It is also worth mentioning that Brownfield Revitalization contains not just about managing contaminated soils and bodies of water, also repairing or rebuilding contaminated buildings, and even more comprehensive actions such as recycling and improving infrastructure, supporting communities business and even history and culture, create employment and so on.

¹⁴³ Rebecca Hamilton, *You are here: A snapshot of greater Portland jobs – and a challenge*, 2017, site: <https://www.oregonmetro.gov/news/you-are-here-snapshot-greater-portland-jobs-and-challenge>

¹⁴⁴ Jeremy Davis, Mark Sauer, Devin Yoder, “Industrial Waterfront Redevelopment - Milwaukee's Inner Harbor.” *University of Wisconsin – Milwaukee* 2011



Fig4.20 The brownfield region of Portland¹⁴⁵



Fig4.21 The benefits of brownfield remediation of Portland¹⁴⁶

¹⁴⁵ photo reference, Rebecca Hamilton (2017)

The environmental pollution along the coast of Huangpu River is not serious enough to be the main problem that limits the renewal, and taking the case of the river training of Suzhou Creek completed 20 years ago as an example, the water body management is no longer the main task of the space regeneration of the industry riverside in Shanghai at this stage. However the treatment of environmental pollution after industrial production, represented by "Brownfield Remediation", as the design precondition and core of how to deal with the conditions of the site, would serve as complements for this paper's argument, the design core, based on the regeneration of Yangpu industrial riverside space.

4.4.2 The Regeneration Design Concept

The "life-oriented" transformation proposed in the Yangpu riverside regeneration project is intended to transform a closed production-type shoreline into a public-open life-style shoreline. To dig out its fundamental issue, that is, for the typical type of space such as "industrial waterfront space" to discuss the relationship between "city-people-water". Transforming the triangular relations from a closed to an open one, is an regeneration design concept shared by Yangpu riverside and these six cases in US.

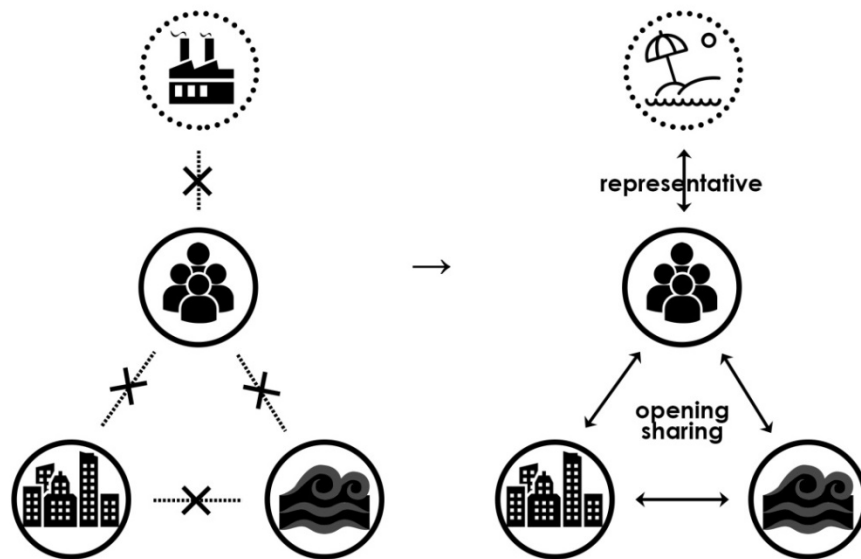


Fig4.22 The fundamental relationship of "life-oriented" transformation¹⁴⁷

It is worth mentioning that Millennium Park opened up the original large parking lot and crossed the barrier waterfront avenue in order to rejuvenate the industrial waterfront

¹⁴⁶ photo reference, Rebecca Hamilton (2017)

¹⁴⁷ drawn by author

space. Meanwhile, Millennium Park is introduced several significant art installations so that art and vitality has become relative internalizing. The park itself has become a world-class art themed public space so as to make the relationship between people and city mutually supportive, while the relationship between people and water is lack of relative and lack of feature of loving water. In other words, the public spaces such as Millennium Park do not need nor do not borrow Waterfront to endow the greater and richer value, its own art and culture has entrusted and rich and significant connotation for people and city.

Withal, Navy Pier and Menomonee Valley Community Park, the former one has become a world-class waterfront resort after a century of renewal development, while the latter has been transformed into native habitats and green lungs by thorough Brownfield Remediation. Both of them connect people and water closely in different ways, while the public space is relatively isolated from the city and even forms an isolated island.

In addition, the project of linking public space throughout the whole both sides of the Huangpu River has just started. The regeneration of Yangpu riverside is still under discussion and construction. For these industrial riverside spaces, the regeneration concept, "life-oriented" transformation, can be said to be the inevitable answer, also to achieve the openness of the relationship between city and people, people and water is also an inevitable result. At the same time, learning from the cases shows that like the mutual penetration of the city, water and waterfront public space, and the mutual interaction between the three and people, how to balance the relationship of sharing and opening of "city-people-water" is really worth considering carefully.

4.4.3 The Regeneration Design Strategy

In terms of specific operational strategies, there are many commonalities between the cases and the Yangpu riverside project. For example, sorting out and connecting the traffic circulation of the site has become the primary measure for almost all projects, and the design of the public space nodes, the repair of the ecological environment are also the necessary part of the implementation of the most project. In addition, compared with these cases in the United States, there is an excellent advantage in the regeneration of Yangpu riverside, which is, the design core of "industrial inheritance" is applied throughout from the beginning of the planning and design to the construction details at the end of the project as for the demonstration project. And when finally open to the public, it forms the atmosphere of an post-industrial in public space, unique and significant.

While, of course, there is some fly in the ointment, the project, Zidell Yards, designed by Sasaki in Portland could bring some thinking of this article. First of all, this project, as a section of the entire South Waterfront renewal project in Portland, is very comparable in scale with the demonstration section being the first to be completed of 5.5km Yangpu riverside. Secondly, Sasaki values the industrial heritage of the site to retain and renovate some industrial structures making them parts of Zidell Yards which coincides with the design core of Yangpu riverside. However, the base conditions of Zidell Yards though provide Sasaki some of the conditions and potentials that does not have in Yangpu riverside, making it worth learning from and reflecting on the following two points.

Firstly, as a waterfront public space, Zidell Yards project, its skillful design by Sasaki fully meets the loving water nature of the people through these full and interesting interaction experiences between water and people. Then, Zidell Yards is not just a remodel of public spaces but also an urban design project in neighborhoods. Therefore, the project directly involves the diverse and complex functional structures and the linkage with the surrounding communities. Overall, these two points would not be achieved and reflected sufficiently in Yangpu riverside but due for using for references.

CHAPTER 5. The Regeneration Design Project on Yangshupu Port Area

5.1 Introduction and Programming of the Design Project

The design region is selected from a part of the research region of Yangpu industrial riverside in Shanghai, and then expanded into the neighbor, considering the community as well. Thus, it is basically located along the Yangshupu creek, within Hangzhou Road, Meizhou Road, Qiqihaer Road and Huangpu River.

There are two reasons for the boundary of design project , that are:1. Yangshupu Port and the riverside of Yangshupu Creek is urgently ready to be regenerated from blocked to open to citizen's life. 2. As a supplement of my research is totally an industrial riverside, this region allows me to consider the relationship between riverside and city, between industrial heritage and community.

The specific programming is shown in the chart below.

Table5.1 The programming of the design project¹⁴⁸

LAND AREA	398350	m ²
BUILDING AREA	600485	m ²
RESIDENCIAL	63.7%	
EDUCATIONAL	0.4%	
COMMERCIAL	20.2%	
OFFICE	9.2%	
PUBLIC FACILITIES	1.3%	
INDUSTRIAL	5.1%	
BUILDIGN DENSITY	20.0%	
FAR	1.5	
GREENLAND DENSITY	13.6%	

¹⁴⁸ sorted by author



Fig5.1 The location of the design project¹⁴⁹

¹⁴⁹ drawn by author



Fig5.2 The masterplan of design project¹⁵⁰

5.2 The Regeneration Design Core

Learning from the regeneration of Yangpu industrial riverside and other cases like Navy Pier in Chicago and Zidell Yard in Portland, this project also consent to respect the

¹⁵⁰ drawn by author

industrial context and preserved industrial buildings in some way. The regeneration design core of his project is treated as the expansion of industrial inheritance of Yangpu industrial riverside with a few industrial buildings and equipment to be preserved. Nowadays, there is not much trace of industrial production left near Yangshupu Port, as the significant industrial port during the prosperous industry age though. Several valuable factories have already been demolished when I did the research. Therefore, this project design plans and constructs new functional buildings in several special way to valued these industrial context and memory.

5. The Regeneration Design Project on Yangshupu Port Area

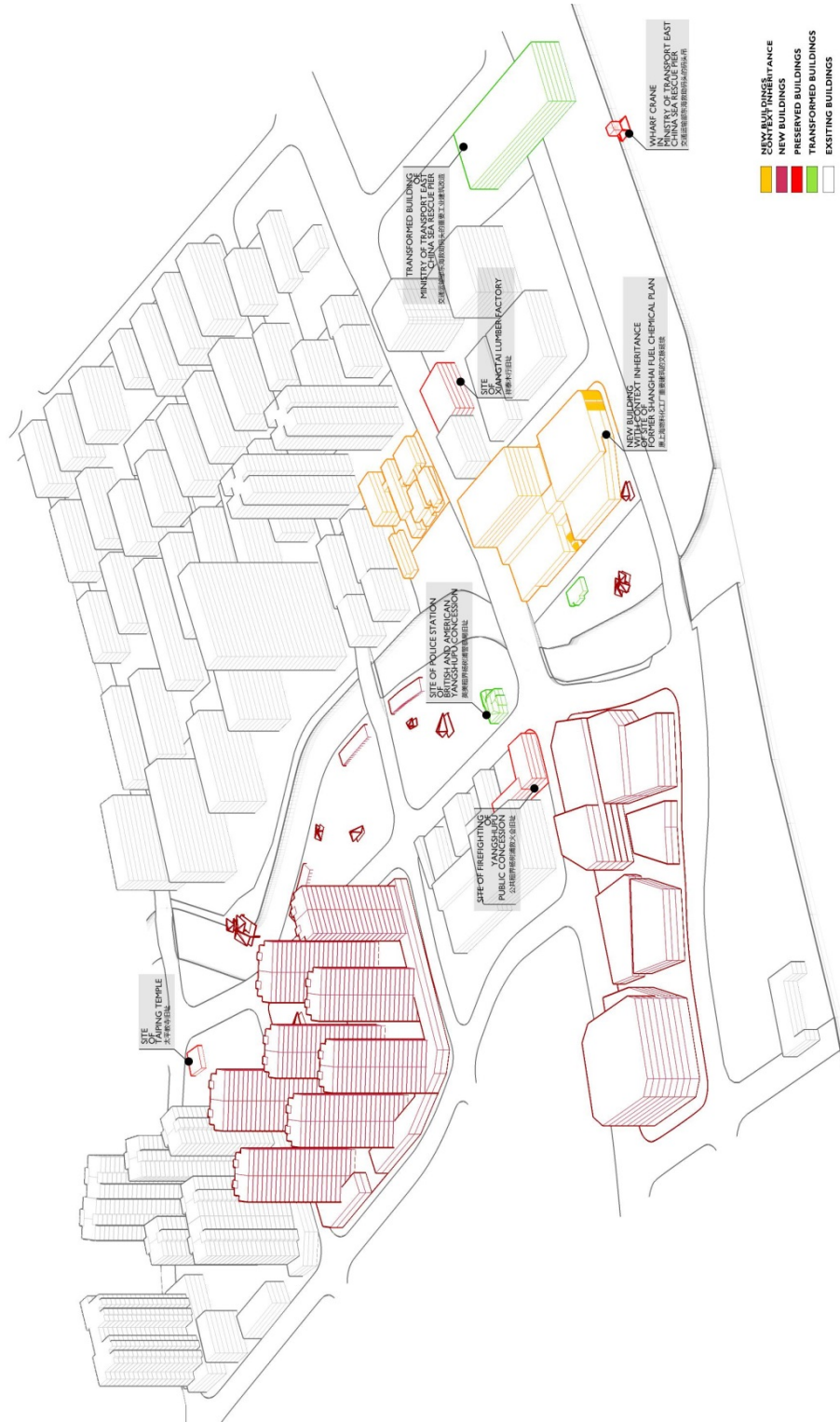


Fig.5.3 The building remains of design project¹⁵¹

¹⁵¹ drawn by author

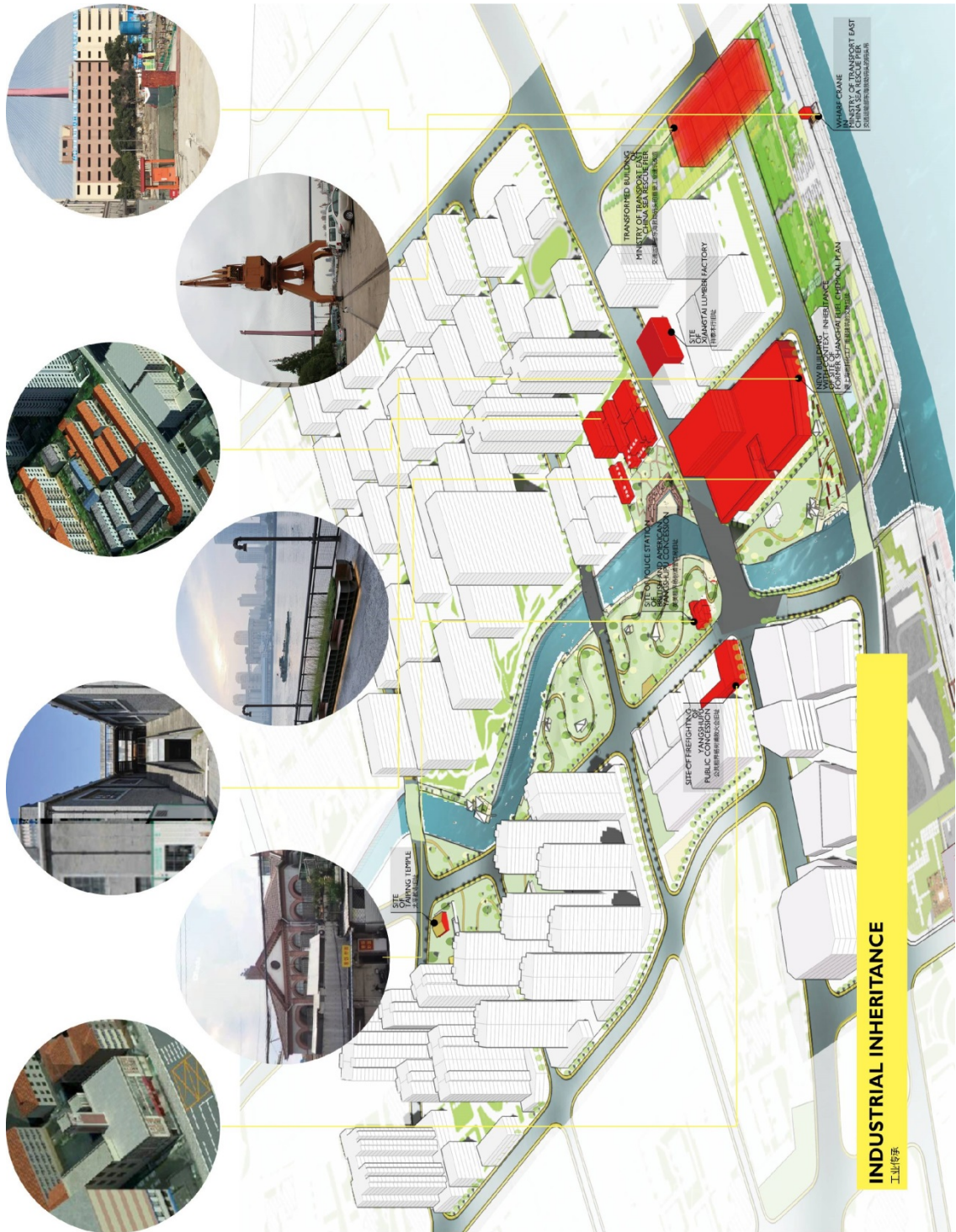


Fig5.4 the structure of industrial inheritance of design project¹⁵²

¹⁵² drawn by author



Fig5.5 The first detailed story of building remains in the site¹⁵³

¹⁵³ drawn by author

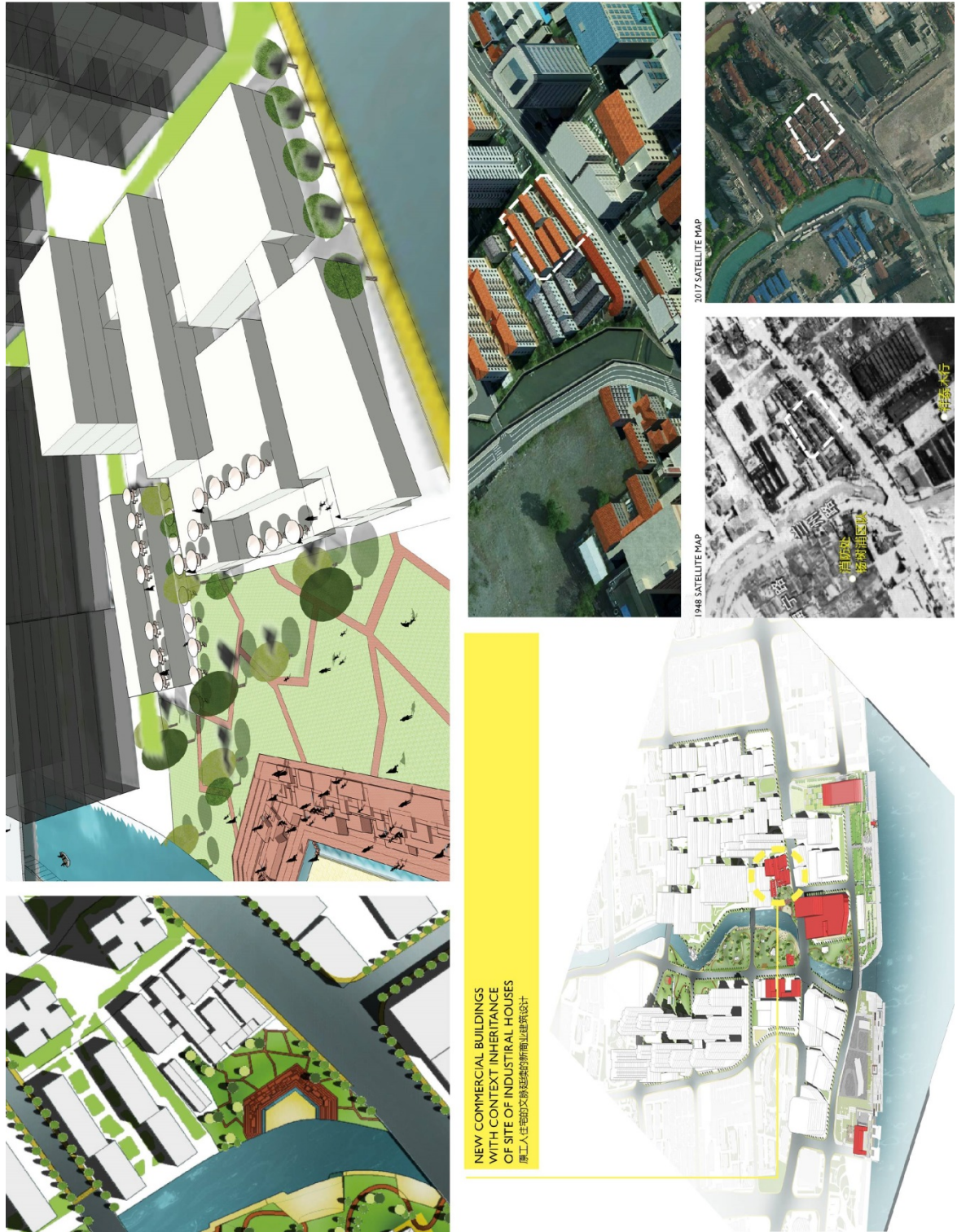


Fig5.6 The second detailed story of building remains in the site ¹⁵⁴

¹⁵⁴ drawn by author



Fig5.8 The fourth and fifth detailed stories of building remains in the site ¹⁵⁶

¹⁵⁶ drawn by author

5.3 The Regeneration Design Concept

Based on the life-oriented design concept of the regeneration of Yangpu industrial riverside and learning from the cases mentioned before, this project would like to focus on the relationship between "city-people-water". In terms of the opening and sharing shoreline to public, compared with some regrets of Yangpu industrial riverside, due to some regulation issues of Huangpu River, in this project it would be a more genial and closer interaction for people of their loving-water nature. More designed opportunities are provided for people to wander from city to public space and even play with water, reminding the sense of belonging of river.

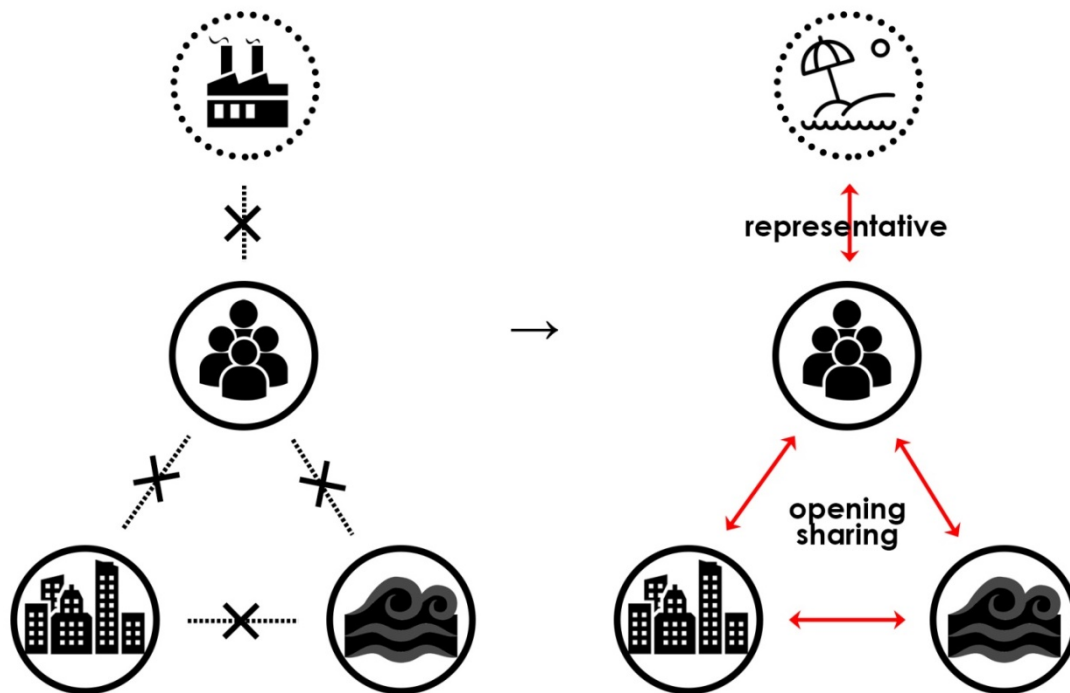


Fig5.9 The design concept of design project¹⁵⁷

¹⁵⁷ drawn by author

5.4 The Regeneration Design Strategy



Fig5.10 The existing traffic network¹⁵⁸

¹⁵⁸ drawn by author



Fig5.11 The planned traffic network¹⁵⁹

¹⁵⁹ drawn by author



Fig5.12 The landscape structure of the larger region in Yangshupu district¹⁶⁰

¹⁶⁰ drawn by author



Fig5.13 The landscape structure of design project¹⁶¹

¹⁶¹ drawn by author

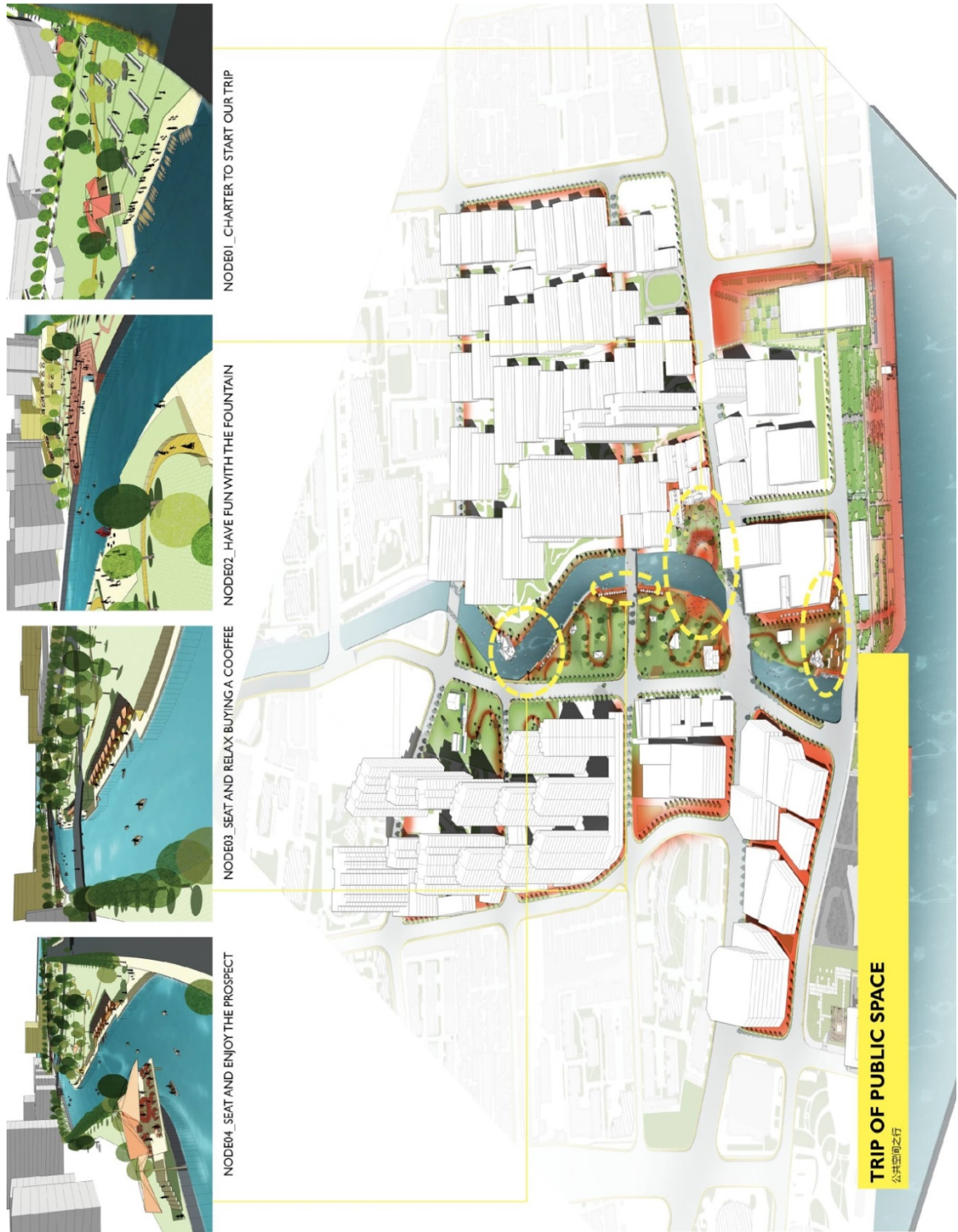


Fig5.14 The structure of public space nodes¹⁶²

¹⁶² drawn by author



Fig5.15 The perspective of first node¹⁶³

¹⁶³ drawn by author

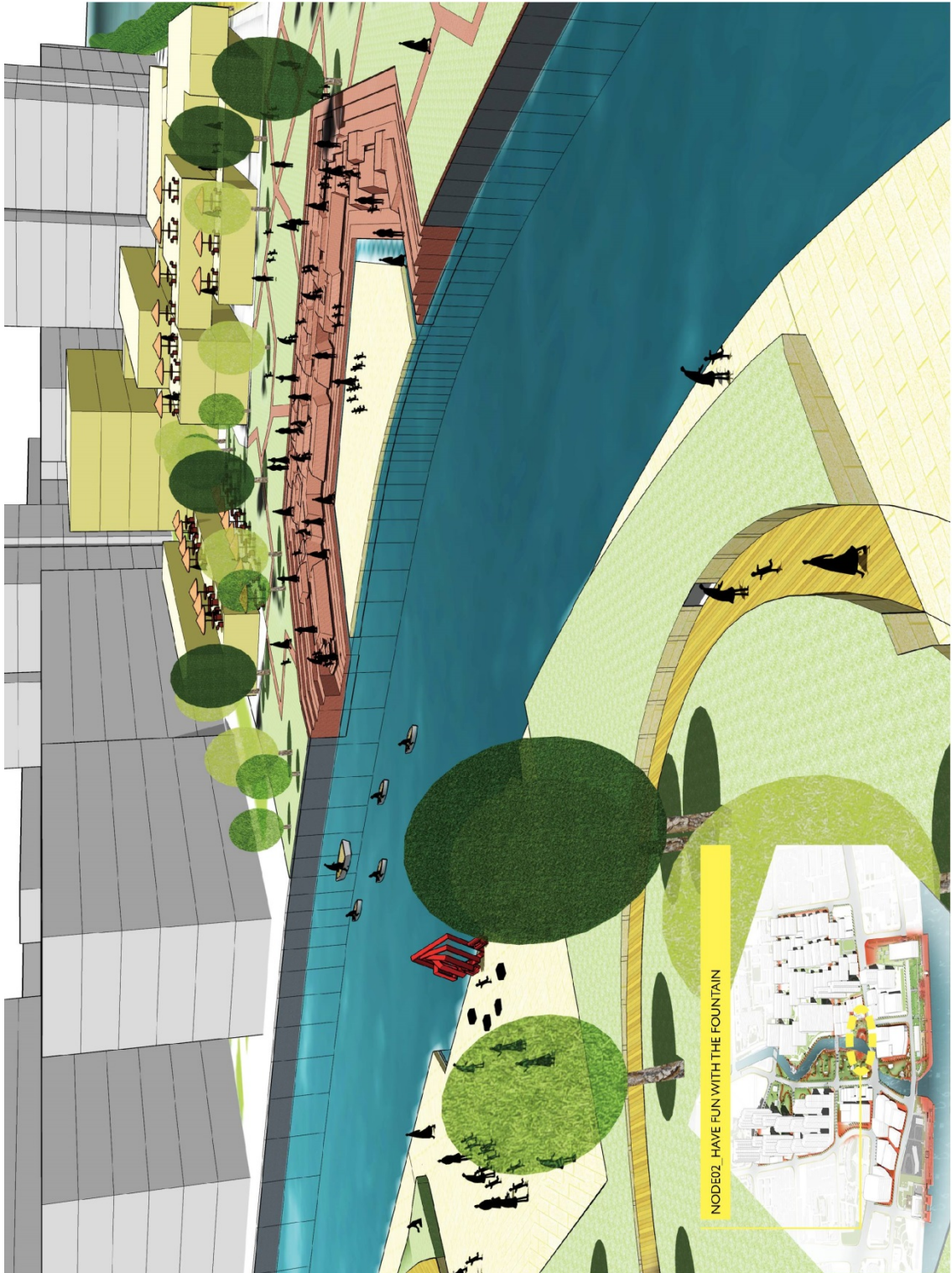


Fig5.16 The perspective of second node ¹⁶⁴

¹⁶⁴ drawn by author



Fig5.17 The perspective of third node ¹⁶⁵

¹⁶⁵ drawn by author



Fig5.18 The perspective of fourth node ¹⁶⁶

¹⁶⁶ drawn by author

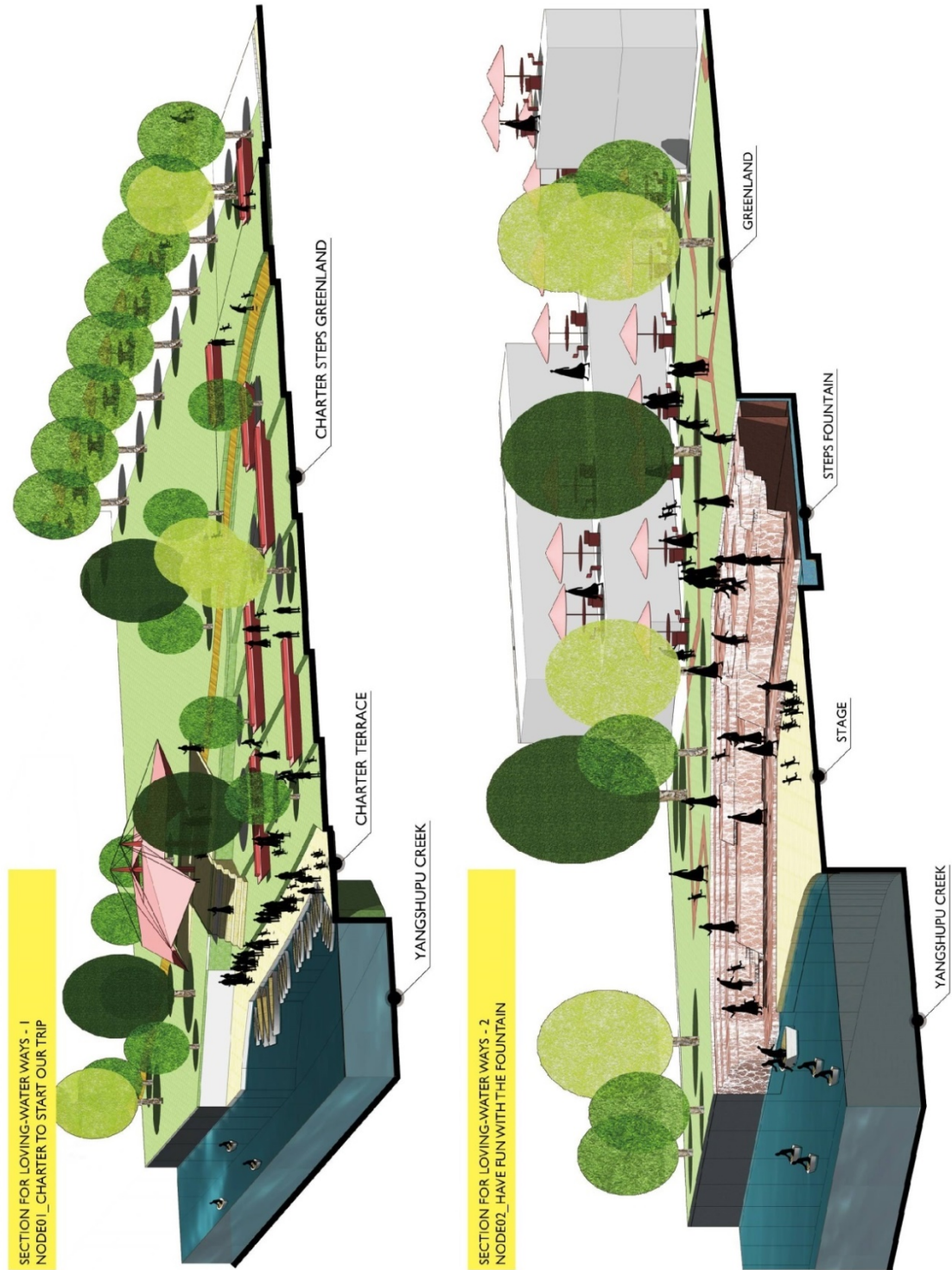


Fig5.19 The sections showing the relationship between water and people and city¹⁶⁷

¹⁶⁷ drawn by author

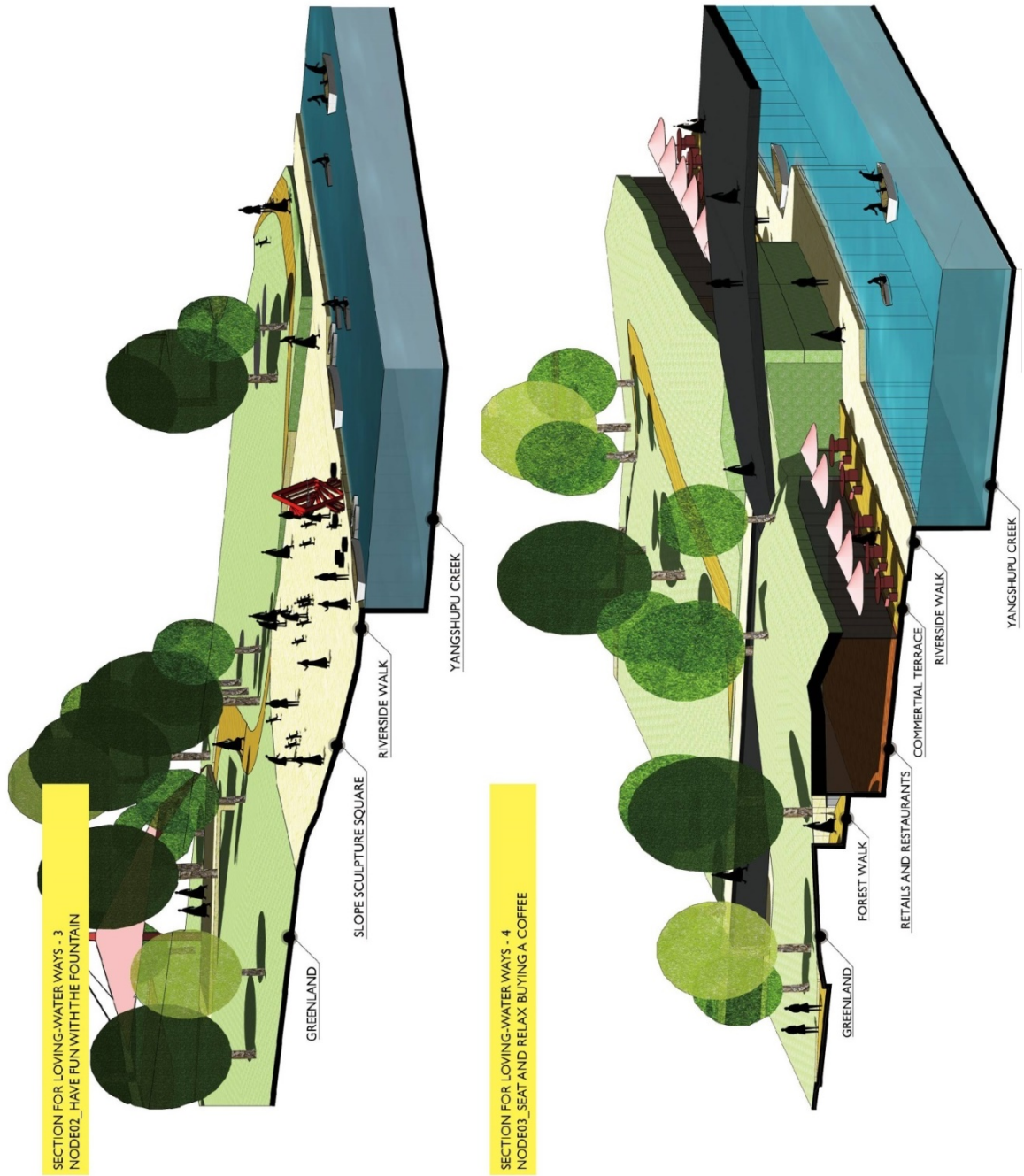


Fig5.20 The sections showing the relationship between water and people and city¹⁶⁸

¹⁶⁸ drawn by author

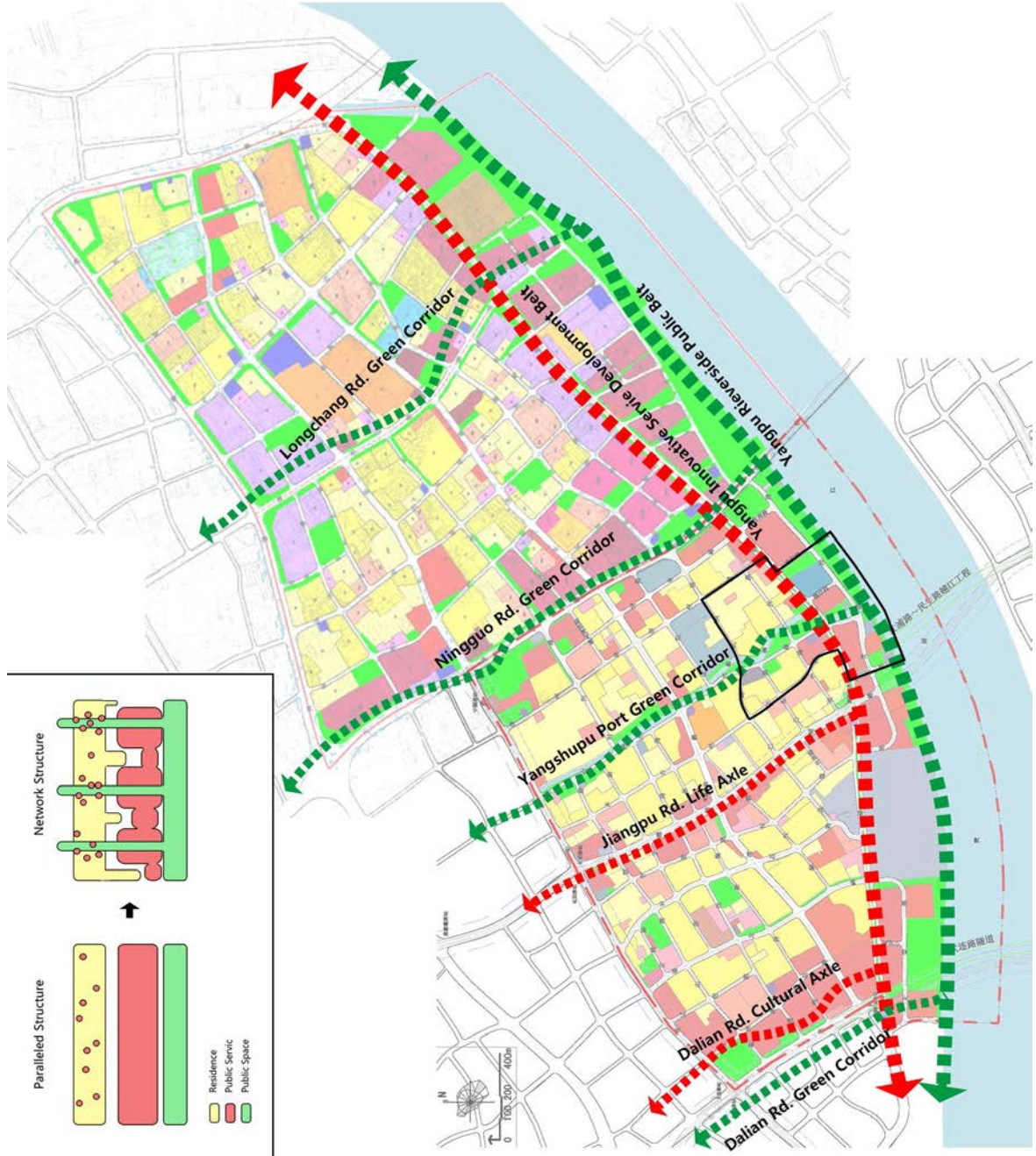


Fig5.21 The functional structure of the larger region in Yangshupu district¹⁶⁹

¹⁶⁹ drawn by author

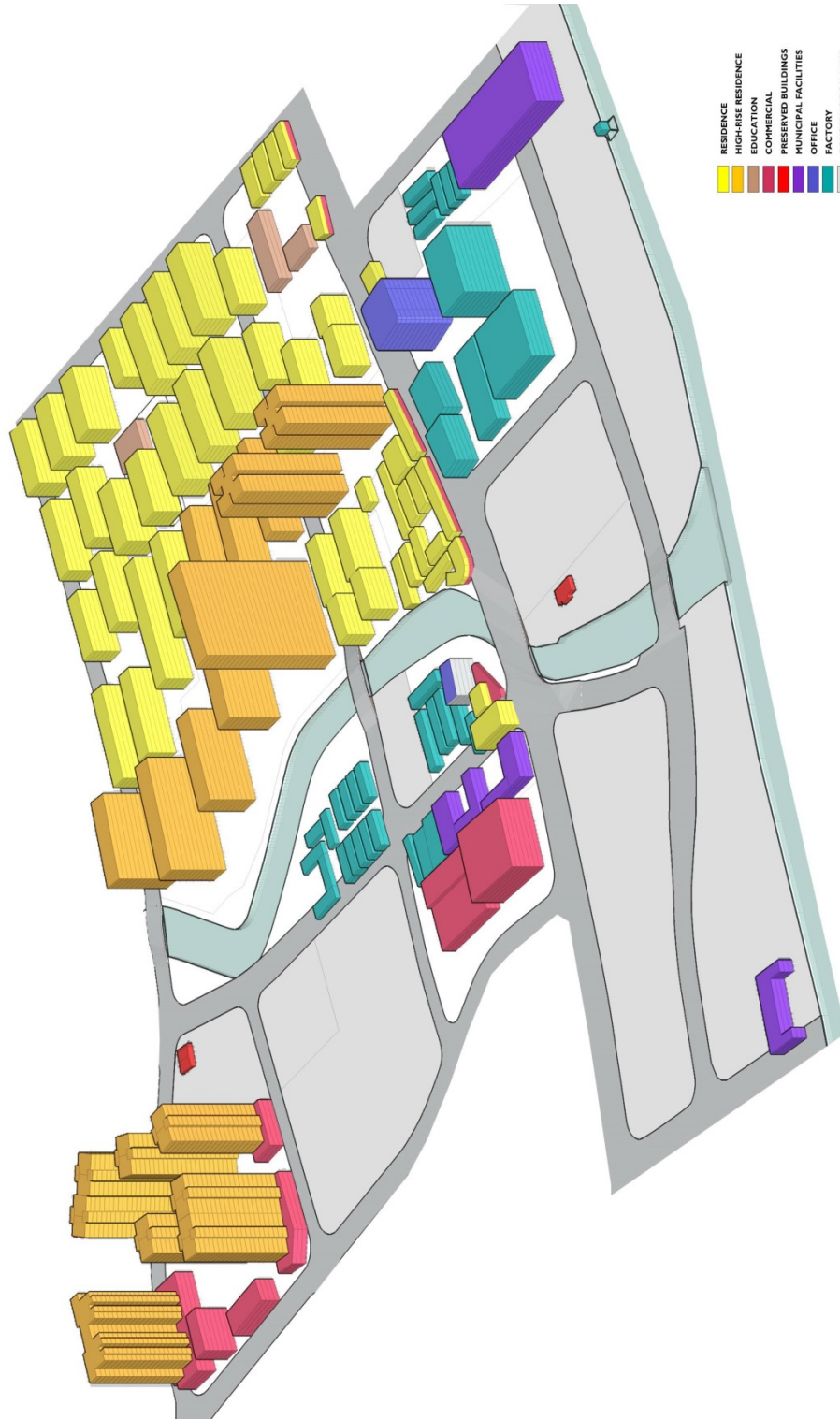


Fig5.22 The functional diagram of existing situation¹⁷⁰

¹⁷⁰ drawn by author

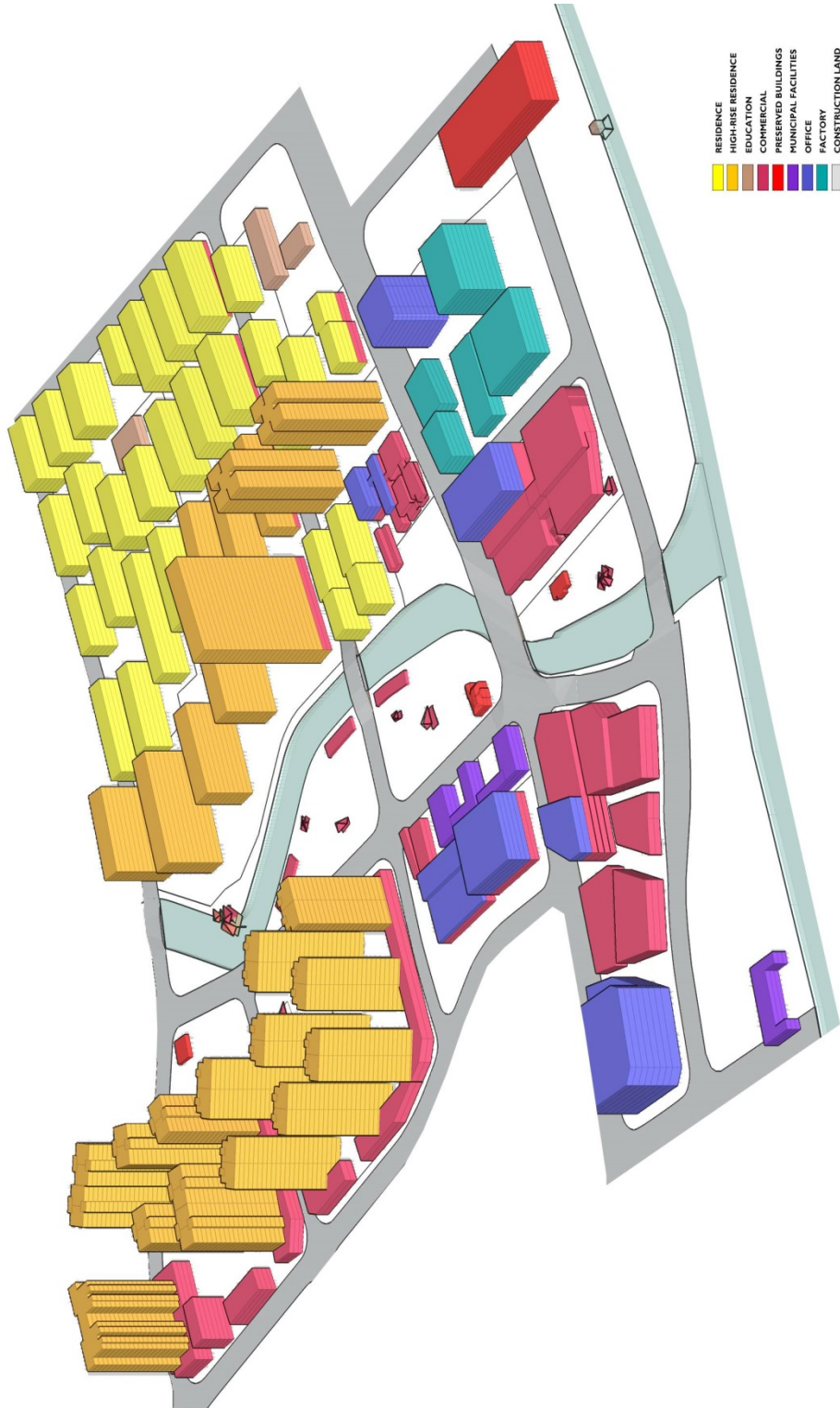


Fig5.23 The designed functional diagram¹⁷¹

¹⁷¹ drawn by author

BIBLIOGRAPHY

Journals and Conference Papers,

- [1] Zhang Li. "Industrial estate transformation research in downtown of Shanghai based on the view of urban regeneration." *2015 China Urban Planning Symposium (09 overall urban planning)* 2015:10
- [2] Zhuang Shaoqing. "Toward a Great Global City - An Innovative Probe into the New Urban Overall Planning of Shanghai." *Shanghai Urban Planning* 2016,(04):1-8.
- [3] Zou Junwen."Studies on the Penetrating Strategy of Riverside Public Space in Huangpu River - A Case Study of Huangpu District." *Urban Building* 2015,(11)
- [4] Lu Shaoming. "Research on a Regeneration Development and Design Method - Rebuilding and Utilization of Industrial Buildings." *New Building* 1999,(01):25-27.
- [5] Wang Jianguo, Rong Junqiang. "On the Industrial History of Buildings and the Protection of the Re-use." *Time Architecture* 2001,(04):10-13.
- [6] Chen Xu, Li Huimin, Yan Ruiqi. "Development and Consideration of Recycling Old Industrial Buildings in China." *Construction Technology Development* 2009,(04):45-47.
- [7] Zhang Han, Song Linfei. "A Summary of Domestic Researches on British and American Urban Renewal." *Urban Issues* 2008,(2)
- [8] Zhang Song, Li Yuxin. "Discussion on Planning Strategy of Overall Protection of Industrial Heritage Area - A Case Study of Yangshupu Area in Shanghai." *Conservation of Industrial Building Heritage* 2012,01:18-23
- [9] Jin Guangjun. "Planning and Design of Japanese Urban Waterfront Area." *Urban Planning* 1994(4):45-49.
- [10] Xu Hui. "Research on Urban Landscape Water System Planning Modes: A Case Study of Taicang City, Jiangsu Province." *Water Resources Protection* 2007,23(5)
- [11] Yu Kongjian, Fang Wanli. "Preliminary Study on Chinese Industrial Heritage." *Architecture Journal* 2006,(08):12-15.
- [12] Li Xiangning. "Urban Renewal - an Introverted Front." *Time Architecture* 2015,(06):60-65.
- [13] Adam Regn Arvidson, "Most Industrial." *Landscape Architecture Magazine* 2016
- [14] Sepe M. Urban history and cultural resources in urban regeneration: a case of creative waterfront renewal[J]. *Planning Perspectives*, 2013, 28(4) : 595-613.

- [15] Sun Shiwen, Wang Jie. "Research on the Relationship between Urban Waterfront Development and Urban Competitiveness." *Planners* 2004 (8): 5-9.
- [16] Huang W C, Kao S K. Public-private partnerships during waterfront development process: The example of the world exposition [J]. *Ocean & Coastal Management*, 2014, 92: 28-39.
- [18] Fang Lan. "Research on the Planning Adaptability of Shanghai Industrial Park in the New Situation." *Urban Planning Forum* 2008, z1.
- [19] Feng Li, Tang Zilai. "Transfer of Industrial Land from the Perspective of Property Rights System: A Case Study of Hongkou District, Shanghai." *Urban Planning Forum* 2013(5).
- [20] Chang Qing, Wei Shu, Shen Li, Dong Yiping. "'The East Bund Experiment' - Research on the Protection and Renewal of Riverside Area in Yangpu District, Shanghai." *Urban Planning* 2004,(04):88-93.
- [21] Zhang Song, Li Yuxin. "Discussion on Planning Strategy of Overall Protection of Industrial Heritage Area - A Case Study of Yangshupu Area in Shanghai." *Conservation of Industrial Building Heritage* 2012,01:18-23
- [22] Zhang Song, "Discussion on the Design Tactics of the Renaissance of Urban Waterfront Port Area - Taking the Development of the Two Rivers in Shanghai as an Example." *Urbanism and Architecture* 2010,(02):30-32.
- [23] Yang Weili, Wang Xingzhong, Zhang Dujuan. "Evaluation and Prospect of Research on the Quality of Urban Life and Living Space." *Human Geography* 2010(03):22-23.
- [25] Wang Duodong. "Application of "Low Impact Development" Mode in Compiling Soil and Water Conservation Plans." *China Society of Soil and Water Conservation, Soil and Water Conservation Society of China Soil and Water Conservation Ecological Construction Committee* 2013:5.
- [26] Wang Tieshan. "Research on Interaction and Development of Knowledge - Intensive Services and Smart Cities." *Journal of Xi'an University of Posts and Telecommunications* 2015,(04):92-96+101.
- [27] Zhang Zi, Zhang Ming. "The Cultural Expression of Power Station of Art, Shanghai." *Time Architecture* 2013,(01):120-127.
- [28] Wang Xiangrong. Ren Jingyan. "From Industrial Wasteland to Green Park Landscape Design and Industrial Wasteland Renewal." *Chinese Landscape Architecture* 2003,(3):11-18.
- [29] Wang Ling, "Study on Protection and Renewal Strategy of Historic Waterfront Industrial Zone --Taking the Revision of Controlled Detailed Planning of Yangpu Riverside (South Section) in Shanghai as an Example." *Planners* 2015,(z1)
- [30] Zhang Xiaoying. "Sponge city no longer 'see the sea'." *General Machinery* 2016,(06):14-16.

[31] Wang Zhen. "Combining Yangpu Knowledge Innovation Urban Planning to Promote the Development and Utilization of Shallow Geothermal Energy." *Shanghai Land & Resources* 2011,(02):18-20.

[32] Chen Jian, Yang Tianren, "Reflections on the Protection and Landscape Renewal of Waterfront Industrial Park under New Urbanization --A Case Study of Yangpu Riverside in Shanghai.", *Chinese Society of Landscape Architecture* 2014:5.

Theses,

[1] Zhuang Jiandi. "Research on Some Problems of Reuse of Old Industrial Buildings." *Tsinghua University* 2004.

[2] Lv Liang. "Creative Industries Involved in the History of Industrial Areas Updated." *Tongji University*,2006..

[3] Gao Jing. "Study on Recreational Regeneration of Waterfront in Metropolis." *East China Normal University* 2015.

[4] Li Zengjun. "Symbiotic Strategy of Huangpu River Riverside Industrial Heritage Protection." *Shanghai Jiao Tong University* 2010.

[5] Kui Hui. "Urban Renewal in Western Europe and Its Enlightenment." *Southeast University* 2007.

[7] Wang Meifei. "Study on the Evolution and Transformation of Old Industrial Areas in Shanghai Central City." *East China Normal University* 2010.

[8] Zhang Qiang, "Research on Yangpu Riverside Industrial Heritage Protection and Public Space Renovation." *Tsinghua University* 2013.

[9] Wang Jingbin. "On the Limited Involvement of Administrative Power in Private Fields." *Jinlin University* 2008.

[10] Wang Min, "Study on the Industrial Landscape Design of Urban Waterfront Area." *Beijing Forestry University* 2015.

[12] Li Yan, "Using Typology to Study the Renovation and Updating of Waterfront in Urban Center." *Tianjin University* 2007.

[13] Zhou Taohong. "Study on Urban Renewal Strategy in Old Industrial Area." *Tsinghua University* 2005.

[14] Guo Weidong, "Urban Port Redevelopment." *Tongji University* 2006.

- [15] Liu Weihui. "Research on the Reuse of Old Industrial Buildings in Shanghai." *Shanghai Jiao Tong University* 2007.
- [16] Fan Lijun, "Research on Spatial Renovation of Industrial Zone of Urban Wharf Based on Integration." *Harbin Institute of Technology* 2010.
- [17] Liu Ni, "Study on the Basic Model of Shanghai Industrial Heritage Building Reuse." *Shanghai Jiao Tong University* 2010.
- [18] Liu Yang, "Research on Public Space Design of Creative Industry Park in Post Industrial Landscape - Taking Shanghai as an Example." *Chongqing University* 2010.
- [19] Zhang Huiyuan, "Study on Renewal Design of Old Industrial Buildings in Urban Waterfront Area." *North China University of Technology* 2012.
- [20] Li Liping, "Study on the Historical Context Elements in the Landscape Design of Riverside Industrial Heritage." *East China University of Science and Technology* 2016.

Books:

- [1] Jacobs, Jane, "The Death and Life of Great American Cities." *Vintage Books*, 1961
- [2] [Ashihara, Yoshinobu](#), "[Ashihara, Yoshinobu](#)." *Cambridge* 1983
- [3] Zhang Tingwei. "Urban Waterfront Design and Development." *Shanghai, Tongji University Press* 2002: 1-5
- [4] Liu Binyi. "Urban Waterfront Landscape Planning and Design." *Nanjing, Southeast University Press* 2006
- [5] Wu Liangyong. "Meditation at the Turn of the World: The Future of Architecture." *Tsinghua University Press* 1999.
- [6] [Jan Gehl](#), "Life Between Buildings." *Island Press* 2011
- [7] Liu Boying, Feng Zhongping, "Urban Industrial Land Renewal and Industrial Heritage Protection." *Beijing, China Architecture & Building Press* 2009.
- [8] Zhou Deci, "Introduction to Urban Planning." *Beijing, China Architecture & Building Press* 2002:62.
- [9] Huang Yaozhi. "Urban Detailed Planning and Design." *Beijing, Chemical Industry Press* 2012: 125-126.
- [10] Wang Jianguo. "Post Industrial Protection and Renovation of Industrial Heritage." *Beijing,*

Chemical Industry Press 2008.

[11] Li Dongsheng. "Adjustment and Renewal of Industrial Land in Old Industrial Areas in Big Cities." *Tongji University Press* 2005.

[12] Zhang Song, "Introduction to Historical Urban Conservation." *Shanghai Scientific & Technical Publishers* 2001.

[13] Jeremy Davis, Mark Sauer, Devin Yoder, "Industrial Waterfront Redevelopment - Milwaukee's Inner Harbor." *University of Wisconsin - Milwaukee* 2011

Network Reference,

[1] "Shanghai Urban Master Plan"(the draft of public)

<http://www.supdri.com/2040/public/ebook01/>

[2] THE NIZHNY TAGIL CHARTER FOR THE INDUSTRIAL HERITAGE

<http://www.icomos.org/18thapril/2006/nizhny-tagil-charter-e.pdf>

[3] United Nations Publications, Population density and ranking of urban agglomerations with more than 5 million inhabitants as of 1,

http://www.keepeek.com/Digital-Asset-Management/oecd/human-settlements-and-urban-issues/world-urbanization-prospects_d480d90c-en#.WOZO2bEYy6I

[4] Population, Area and GDP Data of Shanghai in 2016

<http://www.askci.com/news/finance/20160519/1552482883.shtml>

[5] Yangpu Southern Section of Riverside: only 500 meters concentrated city industrial memory of a century

http://sh.sina.com.cn/news/m/2016-10-03/detail-ixfwkzyh4158695.shtml?_t=1477323089965

[6] Zhang Ming, Yangpu Riverside Past Life

<http://www.tjupdi.com/new/?classid=9164&newsid=17019&t=show>

Appendix I

Table 1 Protected Buildings, Controlled Historic Buildings, Newly Discovered Inventories List at the 3rd Cultural Relics Survey, Protected and Preserved Historic Buildings in Yangpu riverside district

Identity Category	No	Name		
		Current Name	Original Name	Include
Shanghai Excellent Historic Buildings	1	杨树浦自来水制水有限公司	英商上海自来水公司	
	2	杨树浦发电厂	公共租界工部局电气处新厂	
	3	上海第五毛纺厂	英商怡和纱厂	
	4	杨树浦煤气厂	上海煤气公司自来火房	
	5	上海第十七棉纺厂	裕丰纺织株式会社	
	6	上海 17 毛纺厂 (茂华毛纺厂)	密丰绒线厂	
	7	隆昌路 222-226 号住宅	隆昌路 222-226 号住宅	
	8	纺三小区	纺三小区	
	9	杨浦区老年人医院 9 号楼	圣心医院	
	10	上海第十七棉纺厂住宅区	裕丰纺织株式会社居住区	
	11	东区污水处理厂	上海市东区污水处理厂	
	12	上海梅林正广和汽水公司	正广和汽水公司	
	13	上海怡达实业公司及住宅	日本同兴纱厂工房及老板住宅	
Yangpu District	1	上港三区	黄浦码头旧址	

Registration of Immovable Cultural Relics	2	上海新一棉纺织有限公司	日商大纯纱厂旧址	
	3	杨树浦纱厂大班住宅	杨树浦纱厂大班住宅	
	4	杨浦区消防中队	公共租界杨树浦救火会旧址	
The Third Cultural Relics newly Discovered Industrial Heritage	1	上海机器造纸局旧址 (天章造纸厂)		办公楼
	2	瑞琿船厂旧址		办公楼
	3	祥泰木行旧址		
	4	永安栈房旧址		
	5	慎昌洋行杨树浦工场旧址		阀门车间
				财务大楼
	6	英商中国肥皂有限公司旧址		
	7	英商班达蛋行旧址		
	8	英商怡和啤酒厂旧址		
9	亚细亚火油公司仓库旧址			
Preservation of Historical Buildings	1	上海港务局机械修造厂		仓库
	2	上海港机械修造有限公司		北面厂房
				西面厂房
				南面厂房
3	上水工房			
4	九幢房 (龙江路 55-62 弄)			

Appendix I

5	纺三小区北部宿舍	
6	西门宿舍	
7	上海船厂修船分厂办公楼	

sorted by author

Table 2 The List of Preservation of Historical Buildings within W5 Unit in the Detailed Regulatory Plan

序号	原名称	现名称	备注
保护建筑			
1	杨树浦电厂	杨树浦电厂	上海市第二批优秀历史建筑
2	上海煤气公司	杨树浦煤气厂	上海市第三批优秀历史建筑
3	裕丰纺织株式会社	上棉十七厂	上海市第四批优秀历史建筑
保留历史建筑			
1	日商大纯纱厂旧址	上海新一棉纺织有限公司	新增保留历史建筑，为杨浦区登记不可移动文物
建议保留建筑			
1	慎昌洋行杨树浦工厂旧址	电气电站辅机厂	三普新发现历史建筑
2	英商利华公司中国肥皂公司旧址	上海制皂厂	三普新发现历史建筑
3	祥泰木行旧址	交通部海上救助打捞局	三普新发现历史建筑
4	亚细亚火油公司仓库旧址	亚细亚火油公司	三普新发现历史建筑
5	上海化工厂		
6	交通部海上救助打捞局		
7	上海电气电站辅机厂		
8	杨树浦发电厂办公楼与厂房		

table source: the detailed regulatory plan(2013)

Table 3 The List of Preservation of Historical Buildings within W7 Unit in the Detailed Regulatory Plan

序号	原名称	现名称	备注
保护建筑			
1	杨树浦水厂	杨树浦自来水制水有限公司	上海市第一批优秀历史建筑，同时为上海市文物保护单位
2	怡和纱厂	上海第五毛纺厂	上海市第三批优秀历史建筑
保留历史建筑			
1	瑞璐船厂旧址	上海船厂办公楼	原控规保留历史建筑
2	上海港务局机械修造厂	水产供销公司第一批发部	
3	杨树浦纱厂大班住宅	杨树浦纱厂大班住宅	新增保留历史建筑，均为杨浦区登记不可移动文物
4	黄浦码头旧址	上港三区	
建议保留建筑			
1	上海机器造纸局旧址	天章记录纸厂	三普新发现历史建筑
2	杨树浦路桥		三普新发现历史建筑
3	瑞璐船厂旧址	上海船厂船坞	三普新发现历史建筑
4	上海港机械修造有限公司	上海港机械修造有限公司	原控规保留历史建筑
5	上海船厂修船分厂办公楼		
6	上港三区	秦皇岛路水门	

table source: the detailed regulatory plan(2013)

Appendix II

Table 1 The List of the Status Quo of Industrial Buildings except for Ones with Protection Identity in South Section of Yangpu Riverside District

	No	Building	Now affiliated unit	Original affiliated unit	Time of construction	Function type	Building stories	Roof form	Structure form	Feature	Preserved quality	Conflicts with
W7 Unit	1	7-1-1	上海船厂船舶有限公司		20世纪20年代	仓库	3	平屋顶	钢筋混凝土结构	钢筋混凝土结构也在立面作为装饰尺度和开窗都有明显的工业特征	良好	
	2	7-1-2	上海船厂船舶有限公司		新中国初	厂房	3	平屋顶	钢筋混凝土结构	内部结构可能是预制装配立面开窗面积较大	中	
	3	7-1-3	上海船厂船舶有限公司	英商瑞塔船厂	20世纪20年代	不详	3	平屋顶	钢筋混凝土结构	结构外露,局部有钢筋混凝土悬挑的阳台内部为少有的伞状无梁楼盖结构	良好(二类)	
	4	7-1-4	上海船厂船舶有限		20世纪40年代	厂房	2	平屋顶	砖木结构	内部构件梁、柱、楼板均为木材,结构特	中	

			公司						殊			
	5	7-1-5	上海自来水市北有限公司	原上海第五毛纺厂(原英商怡和纱厂)	20世纪20年代	厂房	1	双坡屋顶	砖混结构	顶部有天窗 较明显的扶壁柱 原可能为拱形窗洞	较差(四类)	
Wei nan Roa d Sou th of W5 Unit	6	5-1-1	上海燃料化工十三厂	祥泰木行	20世纪30-40年代	厂房	2	平屋顶	钢筋混凝土结构	两栋厂房通过中间布置有楼梯的连廊连接起来 体表面有的雕花样式	良好	
	7	5-1-2	上海市烟草公司		2000年左右	厂房、仓库	6	平屋顶	钢筋混凝土结构	一层有跨度较大的覆盖悬挑结构 处理立面瓷砖贴面,还有转角长窗	良好	与规划道路相交
	8	5-1-3	上海化工有限公司		20世纪初	厂房	2	平屋顶	钢筋混凝土结构	柱头有三角梁托 建筑体量较和谐、开窗和雨棚等较优美 立面处理较成熟	较差	与规划道路相交

	9	5-1-4	上海化工有限公司		20世纪50-60年代	厂房	2	平屋顶	钢结构	内部为桁架梁,钢柱纤细立面开窗面积较大,雨棚挑梁优美	较差	
	10	5-1-5	上海化工有限公司		20世纪60-70	厂房	2	双坡屋顶	砖混结构	一层清水红砖墙,二层清水青砖墙砖柱突出于外墙,窗洞高且大	较差	与规划道路相交
Weinan - Linqing South Road of W5 Unit	11	5-2-1	上海电站辅机厂西厂		20世纪50年代	办公	2	歇山坡屋顶	砖混木结构	近期粉刷下有砖砌墙体,墙体承重但布满窗洞,用混凝土过梁屋顶是歇山木屋架是建国后杨树浦路界面的重要组成	优良	
	12	5-2-2	上海电站辅机厂西厂		20世纪50年代	厂房	1	歇山坡屋顶	钢筋混凝土结构	内部梁有整浇梁、钢桁架等多种形式,层高较高整个厂房狭长,水平线条简洁	优良	少部分与规划道路相交

	13	5-2-3	上海电站辅机厂西厂		20世纪50年代	仓库	1	波浪形双曲砖连拱	砖混结构	浪形双曲砖连拱结构与立面形制独特少有,可减少造价	优良	大部分与规划道路相交
	14	5-2-4	上海电站辅机厂西厂		20世纪30年代	仓库	2	双坡屋顶	砖木结构	外墙红砖并逐层收分,线脚精致内部为木梁柱一层层高高低应为仓储防潮	良好	
Linqing South Road North of W5 Unit	15	5-3-1	上海电站辅机厂东厂	慎昌洋行杨树浦工场	20世纪30年代	办公	2	平屋顶	钢筋混凝土结构	无梁楼盖立面开大面积钢窗	中等	少部分与规划道路相交
	16	5-3-2	杨树浦发电厂		2000年左右	汽机房	1	平屋顶	钢筋混凝土结构	存有进口大型设备中间通高,两遍有夹层	优良	与规划道路相交
	17	5-3-3	杨树浦发电厂		2000年左右	煤仓间	5	平屋顶	钢结构	建筑立面配备有各种设备,楼梯,管线空间和立面复杂,工业感强	优良	与规划道路相交

18	5-3-4	上海国际时尚中心	上棉十七厂	20世纪50-60年代	商业	4	平屋顶	钢筋混凝土结构	建筑立面配备有各种设备,楼梯,管线空间和立面复杂,工业感强	优良	
19	5-3-5	上海石油集团润滑油销售公司	英商亚细亚火油公司	20世纪20-30年代	仓库	1	双坡屋顶	砖混钢屋架结构	层高和跨度大,立面为清水红砖砌筑外墙山墙面有时代工业特征及历史感	中等	少部分与规划道路相交
20	5-3-6	上海石油集团润滑油销售公司	英商亚细亚火油公司	20世纪20-30年代	仓库	1	双坡屋顶	砖混钢屋架结构	层高和跨度大,立面为清水红砖砌筑外墙山墙面有时代工业特征及历史感	中等	少部分与规划道路相交
21	5-3-7	上海石油集团润滑油销售公司	英商亚细亚火油公司	20世纪20-30年代	仓库	1	双坡屋顶	砖混钢屋架结构	层高和跨度大,立面为清水红砖砌筑外墙山墙面有时代工业特征及历史感	中等	少部分与规划道路相交

	2 2	5-3-8	上海石油集团润滑油销售公司	英商亚细亚火油公司	20世纪 20-30年代	居住	2	双坡屋顶	砖木结构	青砖砌筑的外墙,一层有外廊,二层落地窗有殖民时期建筑风格	优良	
--	--------	-------	---------------	-----------	-----------------	----	---	------	------	------------------------------	----	--

sorted by author

Table2 The List of the Status Quo of Industrial Facilities and Equipment except for Ones with Protection Identity in South Section of Yangpu Riverside District

	No	Building	Now affiliated unit	Original affiliated unit	Time of construction	Function type	Building stories	Roof form
W7 Unit	1	烟囱	上海自来水市北有限公司	怡和纱厂纺织厂	不祥	红砖砌筑,设立明显,超 20 米	良好	
	2	蓄水池	杨树浦水厂		使用中	体量大,特征明显,是标示性设备	良好	
Weinan Road South of W5 Unit	3	码头吊	交通运输部东海救助局			形态醒目而有特色,具有很强的标示性	优良	
	4	烟囱	上海化工有限公司		停产	一个约 20 米,一个约 10 米工业锈迹,生产特征明显	良好	
Weinan - Lin	5	烟囱	杨树浦发电厂	杨树浦发电厂	使用中	是杨浦滨江段标志性的风貌特征,构成天际线的重要组成部分,也是筑杨树浦	优良	

qing Sout h Roa d of W5 Unit						电厂建筑群的重要组合元素		
	6	烟囱	杨树浦发电厂	杨树浦发电厂	使用中	构成滨江天际线的组成,是杨树浦电厂建筑群的重要组合元素	良好	与规划道路相交
	7	泵房地下	杨树浦发电厂	杨树浦发电厂	不详	地下空间很有特色,是发电厂工业特征的重要体现	良好	与规划道路相交
	8	泵房地下	杨树浦发电厂	杨树浦发电厂	不详	地下空间很有特色,是发电厂工业特征的重要体现	良好	
	9	输煤栈桥	杨树浦发电厂	杨树浦发电厂		区位明显,体量较大 具有较高的艺术和科学价值	良好	
	10	码头吊	杨树浦发电厂	杨树浦发电厂		区位明显,体量较大 具有较高的艺术和科学价值	良好	
	11	传送带	杨树浦发电厂	杨树浦发电厂		区位明显,体量较大 具有较高的艺术和科学价值	良好	
	12	清水池	杨树浦发电厂	杨树浦发电厂		区位明显,体量较大 具有较高的艺术和科学价值	良好	
	13	湿灰储灰罐	杨树浦发电厂	杨树浦发电厂		区位明显,体量较大 具有较高的艺术和科学价值	良好	

Appendix II

						科学价值		
	14	干灰 储灰 罐	杨树浦 发电厂	杨树浦 发电厂		区位明显,体量较 大 具有较高的艺术和 科学价值	良好	

sorted by author