



# live BY water

Designing the Historic Canal System of Guangzhou as  
Urban Landscape Infrastructure

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Guangzhou is one of the biggest cities in China, and it is located in Pearl River Delta, which has a vulnerable natural environment. In history, the development of Guangzhou city was inseparable from its canal system, which was developed from the natural dense river network. On the one hand, this system had played its role in water management very well. It could quickly discharge rainwater into the Pearl River during the rainy season to prevent floods, and it could also function in water storage during the dry season. On the other hand, the canals were also an important part of people's daily life. It carried most of the people's main activities, such as sailing, trade, and socializing. The historic canal system was the lifeline of Guangzhou. However, in the rapid development of the city in the past 100 years, due to the rise of the automobile road system and the improper planning of the drainage system, the historic canals in Guangzhou have gradually left only a single drainage function. Different kinds of industrial wastewater and domestic wastewater are discharged into the canals, causing the canals and the surrounding environment to become bad; at the same time, the river is narrowed and the drainage function has deteriorated. In the rainy season, the surrounding area of the river is often flooded. The historic canals have gradually become the backside of the city, the disease of the city.

In recent years, the government has begun a series of restoration projects for historic canals. However, these projects just aimed to copy-paste the historic scenes to attract tourism and did not pay attention to the historic canal itself and the surrounding communities. As a landscape designer, how the historic canals worked with the city in history has greatly fascinated me, and I have concluded design principles from it, seeking their possibilities in the current situation. This project is not about restoring the canals, is about learning from the history, and designing the historic canal system of Guangzhou as urban landscape infrastructure.



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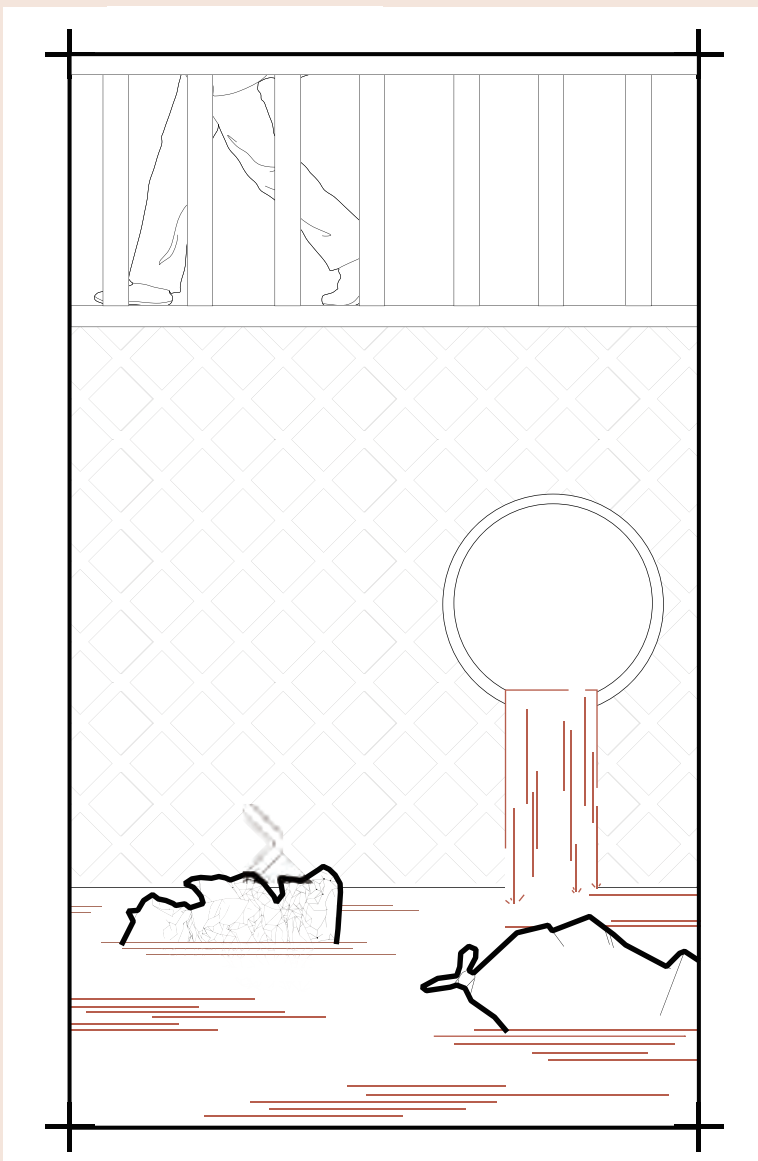
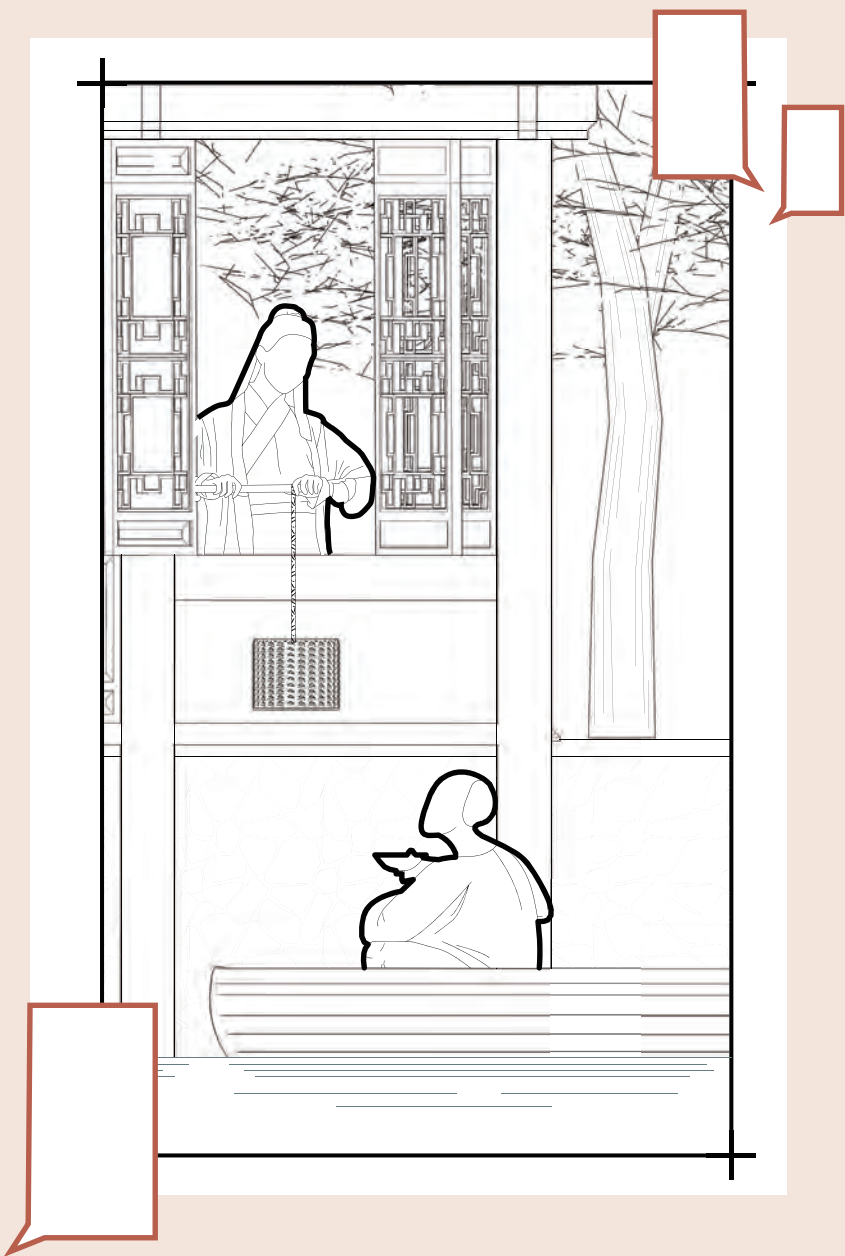
# 1

## INTRODUCTION

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“All six canals lead to the sea, and the green mountain lays at the back of the city” is the description of the landscape of ancient Guangzhou. However, since the 1980s, With the rise of industrialization at the beginning of the epoch, the rapid economic development of the Pearl River Delta, and the continuous expansion of the city’ s territory, large and small rivers flooded. The water system was buried and shrank, and the natural river bank was destroyed. Moreover, due to the endless pouring of industrial wastewater and domestic sewage, the rivers that used to be the scenery of the water village have become shocking sewers, stinky drains, and black water everywhere, with serious siltation and rancidity. Unbearable, most of the rivers have lost the scene of clear waves in the past.







Located in the Pearl River Delta, Guangzhou is one of the biggest cities in China. Its geographic characteristics determine that its urban development is inseparable from water. The historical district of Guangzhou not only has the characteristics of Chinese traditional urban culture but also has distinctive characteristics of water town.

The urban water system is an important driving force for the development of Guangzhou, and it is the lifeline of Guangzhou.

Figure 1-1 Pearl River in Guangzhou. Source:: <https://shipin520.com/>

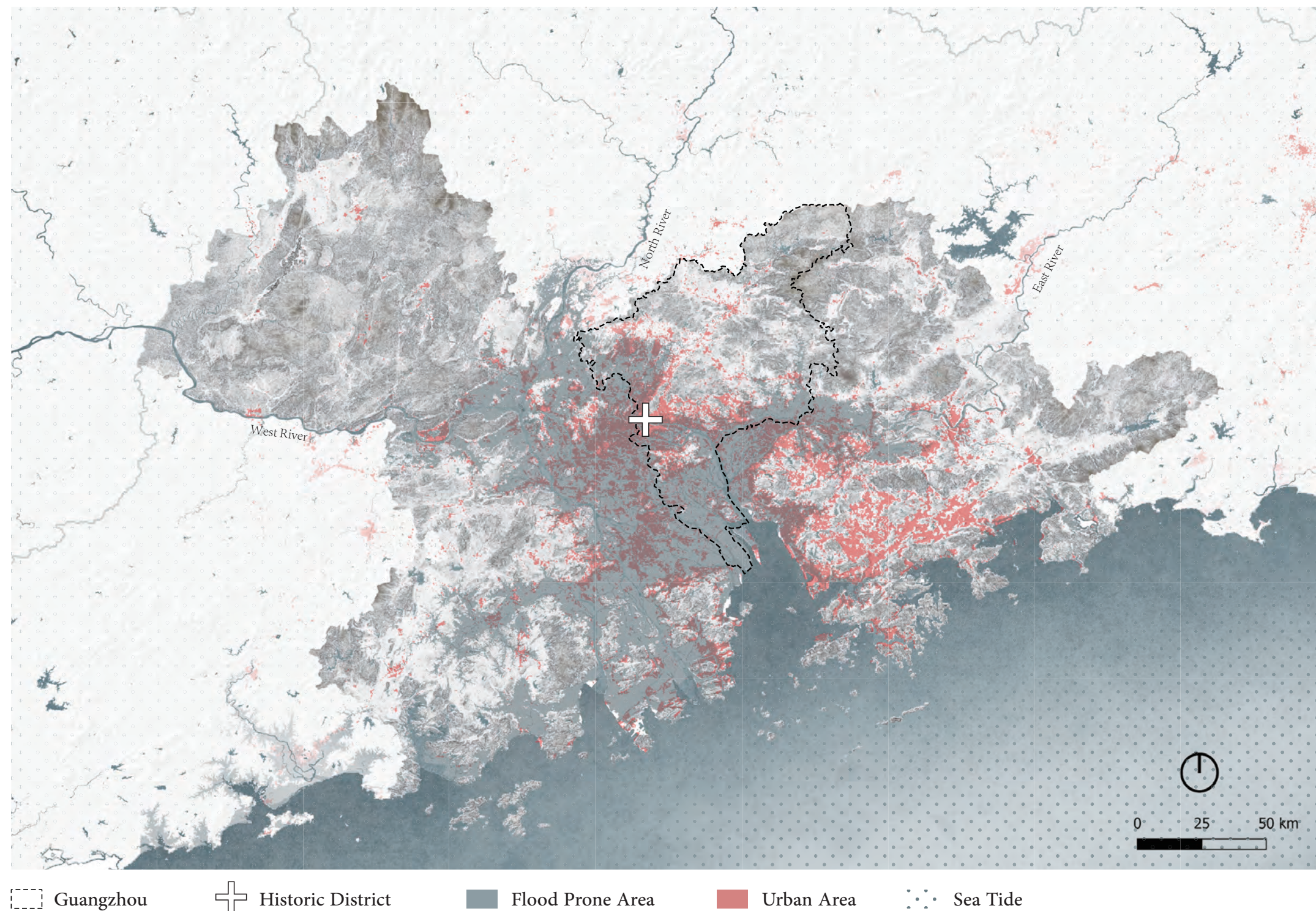




# 1. Fascination

## 1.1 Guangzhou

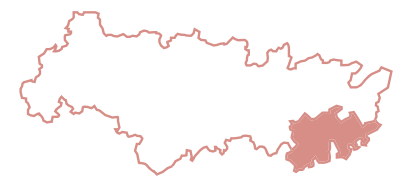
### Pearl River Delta



### China



### Pearl River Basin



Due to the geographical location, Guangzhou has the natural base and need of a dense canal network.

A number of studies have shown that throughout the 21st century, extreme weather events and increased floods are likely to occur in southern China. In China, Guangzhou has the largest number of rainstorm days. Some previous studies have found that due to strong storms and rising sea levels, Guangzhou is facing the risk of high waterlogging. After analyzing the temporal and spatial changes of extreme precipitation in the Pearl River Basin, it was found that the daily intensity showed a significant positive trend in this study. Regions, including Guangzhou City. Guangzhou's central city is high in the north and low in the south. There are Baiyun Mountain, Huolu Mountain and Shougou Mountain in the north, and the Pearl River in the south. When it rains, rainwater will flow down the mountain and flow through the city in seven rivers. In addition, under the support of the Pearl River tidal water, if local heavy rain occurs during the astronomical tide, flooding is extremely prone to occur. (Meng et al., 2019)

Figure 1-2 Geographical Location of Guangzhou, Drawn by Authur





Figure 1-3, 1-4 Pollution,  
Source: [http://news.ifeng.com/a/20140728/41331223\\_0.shtml](http://news.ifeng.com/a/20140728/41331223_0.shtml)

Figure 1-3, 1-4 Waterlogging,  
Source: [https://m.tunnelling.cn/news\\_detail.aspx?-Type=NewsDetail.aspx&Id=28884](https://m.tunnelling.cn/news_detail.aspx?-Type=NewsDetail.aspx&Id=28884)

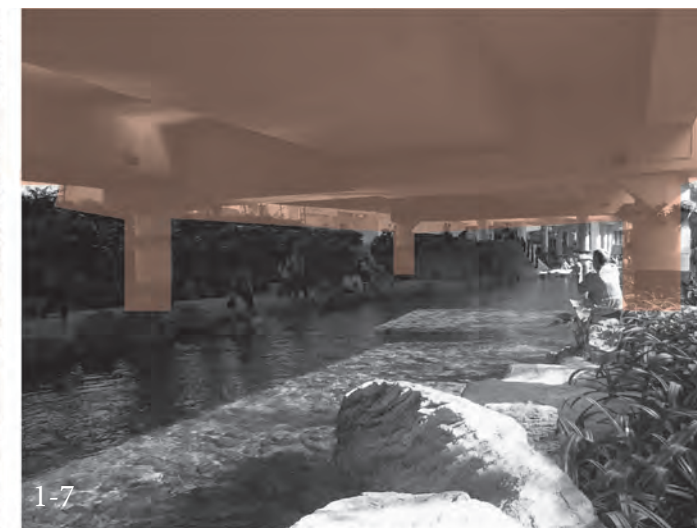
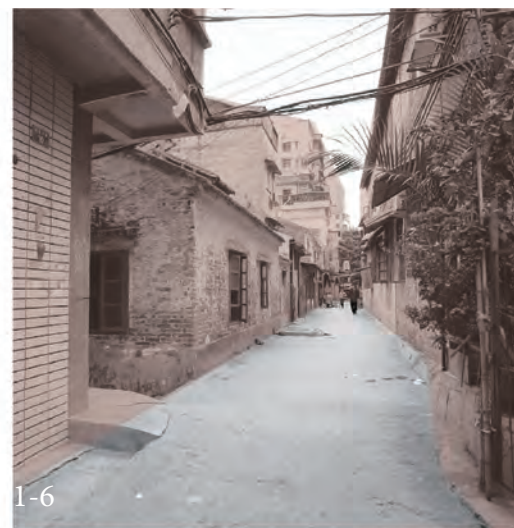


Figure 1-5 Messy Public Space, Photo by Gzda  
vidwong

Figure 1-6 Limited Public Space,  
Source: <https://mapio.net/>

Figure 1-7 Decline of Canal,  
Source: <https://mapio.net/>

## WATER

The historical canals have suffered from pollution and overflow in modern urban development.

However, with the rapid development of the city, the construction of historical rivers cannot meet the needs of modern cities. All kinds of sewage are directly discharged into the canals without treatment, causing the water in the canals to be polluted and the bad condition of the canal environment. Additionally, because of the increase of impervious surface, waterlogging often occurs in historical urban areas.

## PUBLIC SPACE

The water issues of the historic canals have greatly affected the spatial quality of its surrounding area, they are losing their local identity as the historical waterfront area, and gradually been separated with the water.

Water pollution and waterlogging problems have led to a decline in the spatial quality of areas along the historic canals. With the rapid development of road networks, the riverfront area, which was originally the center of the city, has gradually become the backside of the city. The neglect of management and the attention to the construction of the canal area resulted in the narrow and dark public space along the canal. The historical canal system that was once the lifeline of the city and the backbone of development is being forgotten







“

-As a native of Guangzhou, I miss the forgotten historical river course and its water culture.

-As a landscape architect, I want to do my best to explore how the historical canal can be reborn in a fast-developing city.

”

Figure 1-9 Historical Canal in Guangzhou  
Source: <https://shipin520.com/>





Figure 1-10, 1-13

Watertown in the Ancient Time

Source: <http://www.laozhaopian5.com/minguo/1127.html>

Figure 1-11

Flooding

Source: [https://www.sohu.com/a/234836224\\_100306](https://www.sohu.com/a/234836224_100306)

Figure 1-12

Busy road network nowadays

Source: <https://www.guangzhougrt.com/guangzhou-transportation-situation/>



Guangzhou used to be a water town, with this systematic water network. However, in recent years, the inner-city is threatened by frequent waterlogging. The historic canals and their surrounding area used to be in harmony with the natural environment, but now the water is polluted by sewage water and industrial waste. The development of the road network accelerated the decline of waterway transportation. These reasons led to the decline of the historical canals and its surrounding area, which was the hotspot of the city, the center of urban life of Guangzhou people. The canals and the canal area used to be a zone, with the interaction with urban tissue, and now the canals are isolated, and only used in drainage. In conclusion, the historical canal used to be a well-functioned water landscape infrastructure and now is a single-used drainage canal.

With city development, the potential of the historic canal system in Guangzhou as water landscape infrastructure has been ignored, leading to water pollution in the canals, and the decline and greater risk of flooding in the canal area.

Due to natural conditions, Guangzhou is vulnerable to flooding, and this problem is getting even worse because of the neglect of historic canals and the poor construction of the drainage system during urban development.

The development of the road network and the water problems of canals have led to the decline of the canal area. In the canal restoration projects carried out these years, the designers did not fully understand the historical canals and did not consider them as a system. Therefore, the public space in the projects hardly functions.

### 3. Research Objective and Questions

**The research objective is:**

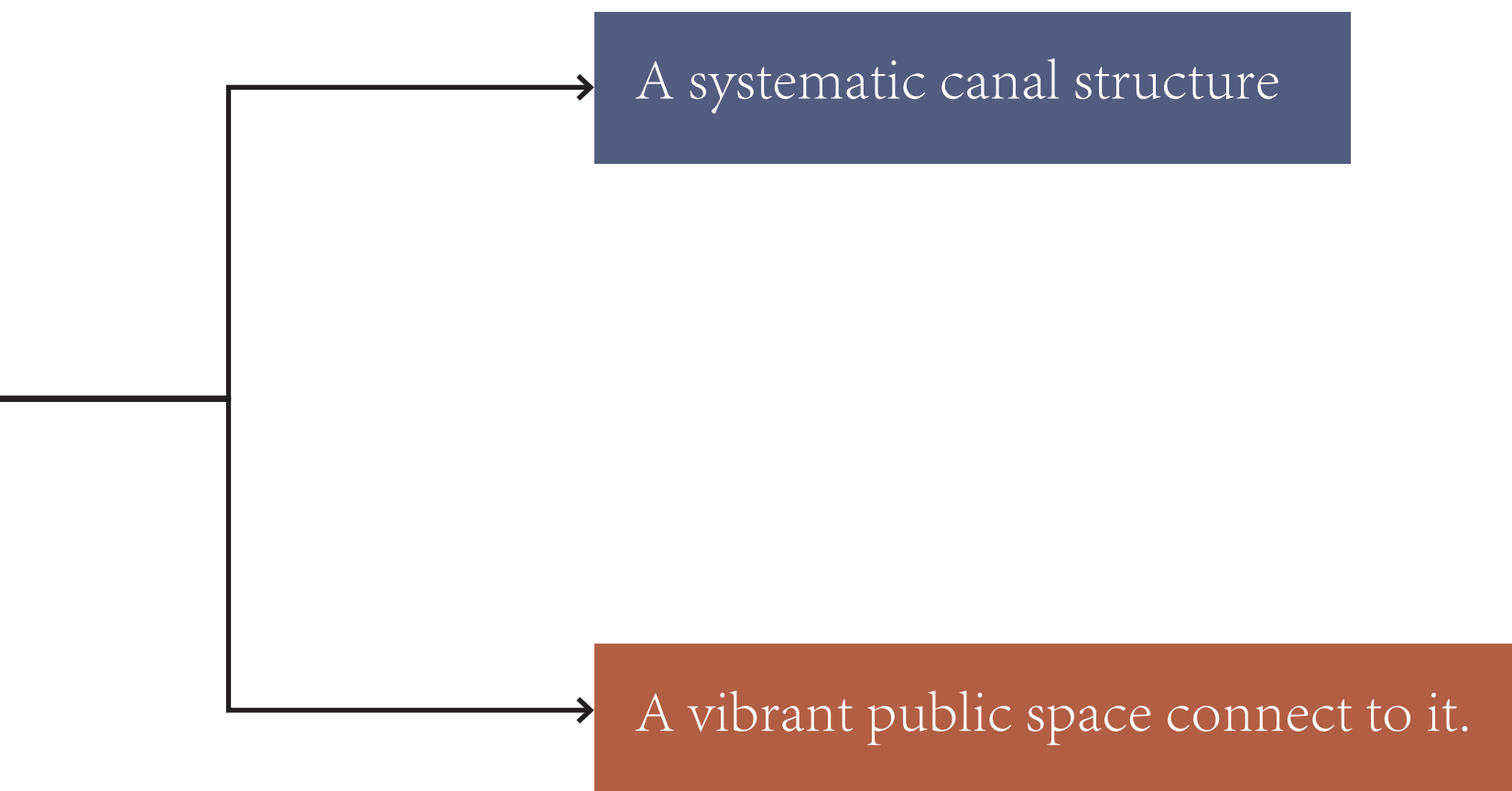
How to redefine the role of the historic canal system in Guangzhou as water landscape infrastructure adapting to future urban development?

**In order to address this main question these sub-questions need to be answered:**

- What are the challenges Guangzhou faced with in the rapid urban development as a coastal city?
- What can we learn from the history and how can we apply the design principles in history in today's situation?
- How can the canal system as a landscape infrastructure work with canal area, and what layers and local identity can be added to the urban area?

Firstly, I need to indicate what kinds of challenge Guangzhou are faced with in such rapid urban development with fragile delta condition, and what role the historical canals play in it. Secondly, because the core of this subject is the historical canal, understanding how they worked in ancient times is necessary. Figuring out how it worked well at that time, I need to learn and conclude design principles from this history study. To apply these design principles, I also need to indicate how can the design principles be transformed based on specific site conditions. Lastly, this research also focuses on how the design could work on the canal and its surrounding area culturally and socially in the future.





Concluded from my observation and fascination, the canal and its surrounding area can not be separated when designing the canal into a landscape infrastructure. They affect each other. The pollution and the flooding affect the quality of public space in the canal area. The decline of the original waterfront area also leads to neglect and the lack of management of the canals. Therefore, to solve this research question, my design assignment includes these two parts and research on how they work together in the future.

# Structure

What are the challenges Guangzhou faced with in the rapid urban development as a coastal city, and what role does the historical canal play in it?

- Analysis
- Natural Base/ Historic District/ Canal/ Canal Area

How to redefine the role of historical canal system in Guangzhou?

- Principles & Strategies
- Landscape Infrastructure/ Resilient Landscape/ Learning from History
- Regional Strategy/ Strategies in Medium Scale

What is the potential of historical canal system in Guangzhou?

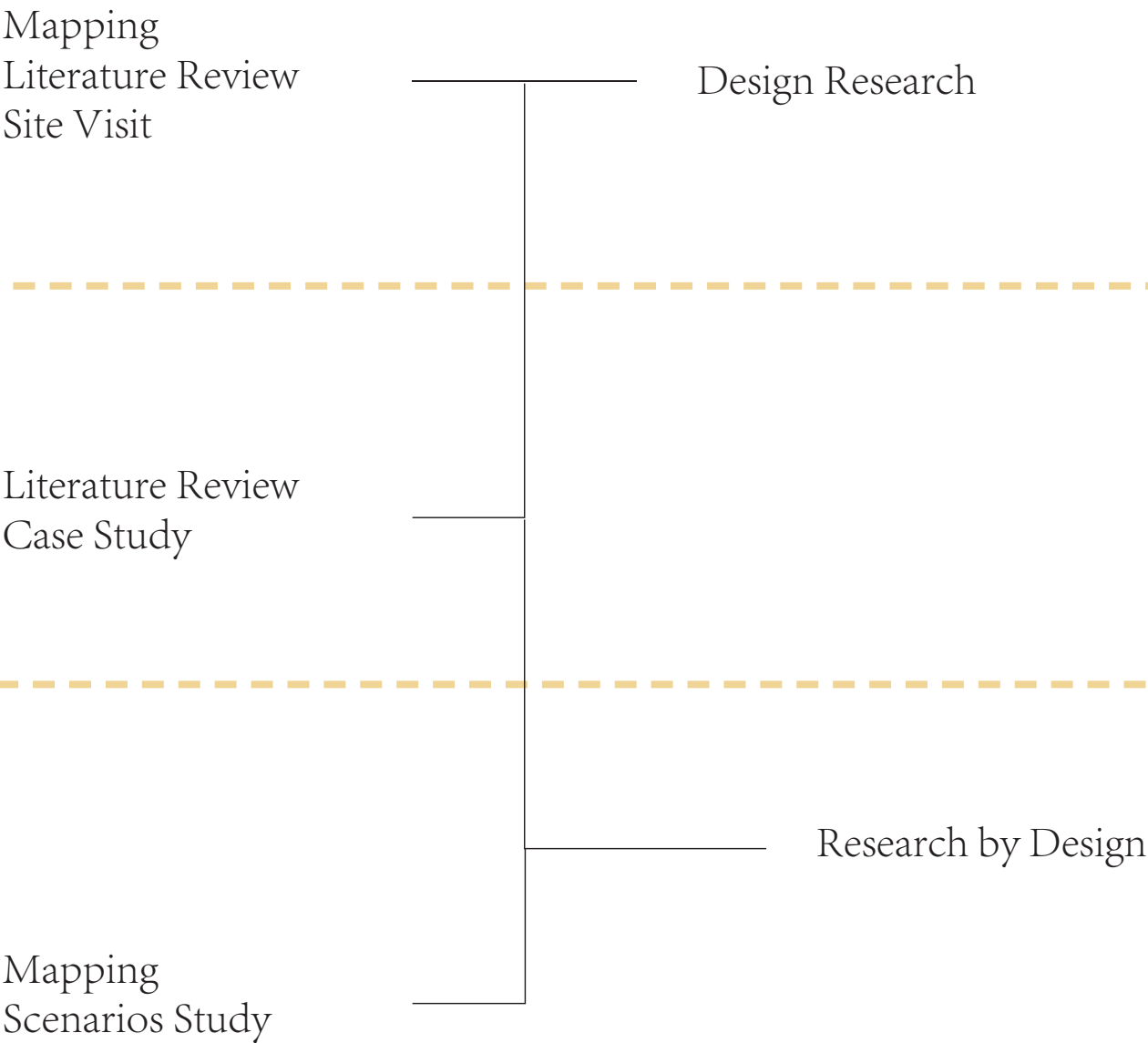
- Design Exploration
- Conceptual Design/ Scenarios Development
- Master Planning/ Design Intervention
- Detailed Design 1/ Detailed Design 2/ Detailed Design 3/ Detailed Design 4



## Reflection



Methodology



The research approach has concluded the kinds of analysis I should do in this project, and how can I label them. In the design research, I need to understand the situation and identify design principles from the study. The research by design part mainly focuses on how to apply the principles in specific sites.

## 6. Scope & Relevance

My research topic is to explore the potential and role of the historic canal system in resilient urban development, which is able to adapt further city expansion and possible extreme climate event, as a landscape infrastructure. In my hometown, Guangzhou, a coastal city experiencing rapid urban development, its historic canal system was used to be an essential and active part of the city, because of its function as water infrastructure and important urban landscape, having great social-cultural value. However, in the last century, the function of the canal system as an important of public space and its potential for shaping the urban environment were abandoned. The quality of the canal system in social and ecological aspects has greatly decreased, and the canals could not meet the need as a water infrastructure facing the possible extreme climate events and urban expansion.

Therefore, my research is to help readers to understand the importance of the historic canal system, its social-cultural influence on the surrounding area and what can it do in climate change. In my graduation topic, I want to bring the social-cultural and ecological value of water infrastructure back, and explore how it influence the built-environment surround it.

### Relevance

Guangzhou is not the only city, which once rich in canals and works closely with water, and the canals faded away in local' s life during modern urban development, suffering from the water problem, such as flooding, because of its geographical condition and city development. This graduation project providing a new perspective on solving this problem by looking back into history and exploring the potential of historic waterways in the city on cultural-social value and spatial quality. The design can provide a possibility for resilient and adaptive coastal city development and give a guideline for other similar projects.





# 2

## THEORETICAL FRAMEWORK

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From the fascination, the main problem I focus has been pointed out in the previous chapter. Theoretical framework includes the theories I apply in this project, and introduces the two general approaches, design research and research by design. The framework is the basis of this project, it guides the research and how the design plays in it.

Landscape infrastructure focuses on the potential these infrastructure systems have for performing the additional function of shaping architectural and urban form. Resilient landscape means how the design could adapt to different possibilities. Learning from the history is the basis of the study, to understand the historical system, and learn from it critically. (Strang, 1996)



Landscape Infrastructure

Resilient Landscape

Learn from History



Design Research

Research by Design



- Mapping
- Look back to history
- Site Visit
- Literature Review & Case Study

- Design Exploration

# 1. Theoretical Backgrounds

## 1.1 Landscape Infrastructure

Infrastructures, by virtue of their scale, ubiquity and inability to be hidden, are an essential component of the urban landscape (Strang, 1996). In this research, the main object is the canal system in Guangzhou city, which is an important infrastructure for the urban system.

In this theory, flow scape explores infrastructure as a type of landscape and landscape as a type of infrastructure. The hybridisation of the two concepts seeks to redefine infrastructure beyond its strictly utilitarian definition, while allowing spatial design to gain operative force in territorial transformation processes. (Nijhuis et al., 2015)

The potential these infrastructure systems have for performing the additional function of shaping architectural and urban form is largely unrealized. [...] They can be designed with a formal clarity that expresses their importance to society, at the same time creating new layers of urban landmarks, spaces, and connections. (Strang, 1996) By exploring this theory, I research the potential and possibility of the historic canal system working as landscape and infrastructure, and how it affecting its surrounding environment physically and social-culturally.

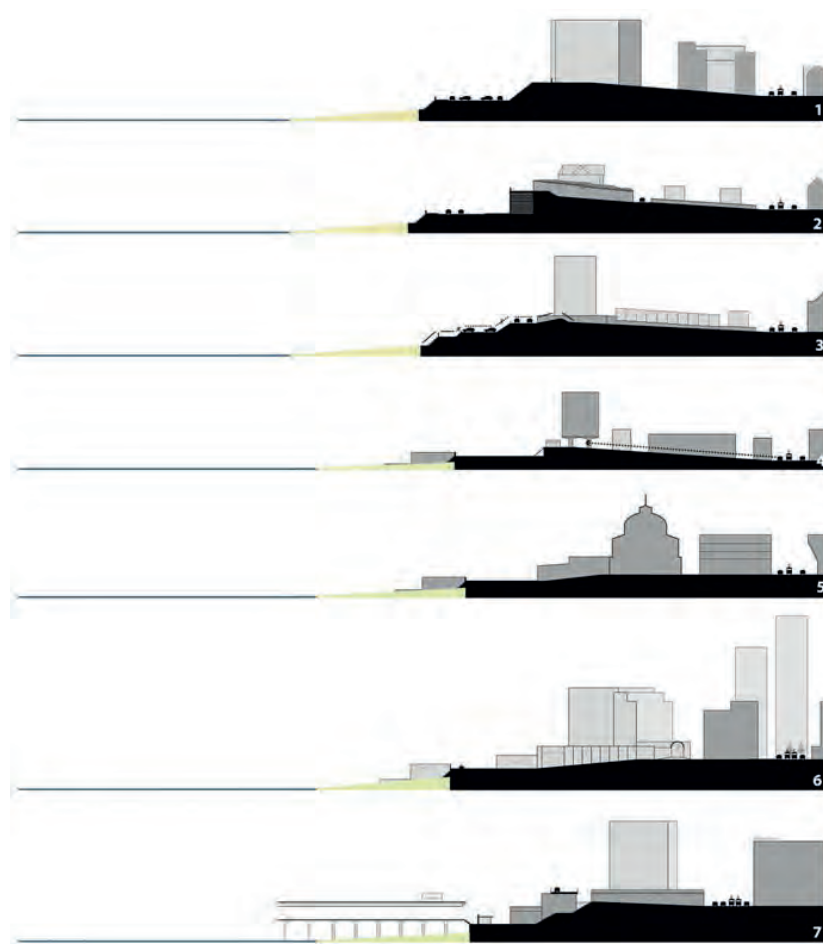


Figure 2-1, 2-2 Dutch Delta in Scheveningen

Source: The synergy between flood risk protection and spatial quality in coastal cities, Nillesen, A. (2015).



# 1. Theoretical Backgrounds

## 1.2 Resilient Landscape

In popular terms, resilience is having the capacity to persist in the face of change, to continue to develop with ever changing environments. Resilience thinking is about how periods of gradual changes interact with abrupt changes, and the capacity of people, communities, societies, cultures to adapt or even transform into new development pathways in the face of dynamic change. (Folke, C., 2016)

The resilient landscape means having the capacity to persist in the face of change, to continue to develop with ever change environments. It has developed into an approach for understanding complex adaptive systems and serves as a platform for interdisciplinary and transdisciplinary research with an emphasis on social-ecological systems. (e.g., Levin et al., 2013)

In this project, a resilient landscape focuses on improving the ability to adapt to future urban development and climate change. The historic canal would stay in the same stage, and it could develop and grow with the city. In this process, the interdisciplinary and transdisciplinary research help to work in the social-cultural aspect.

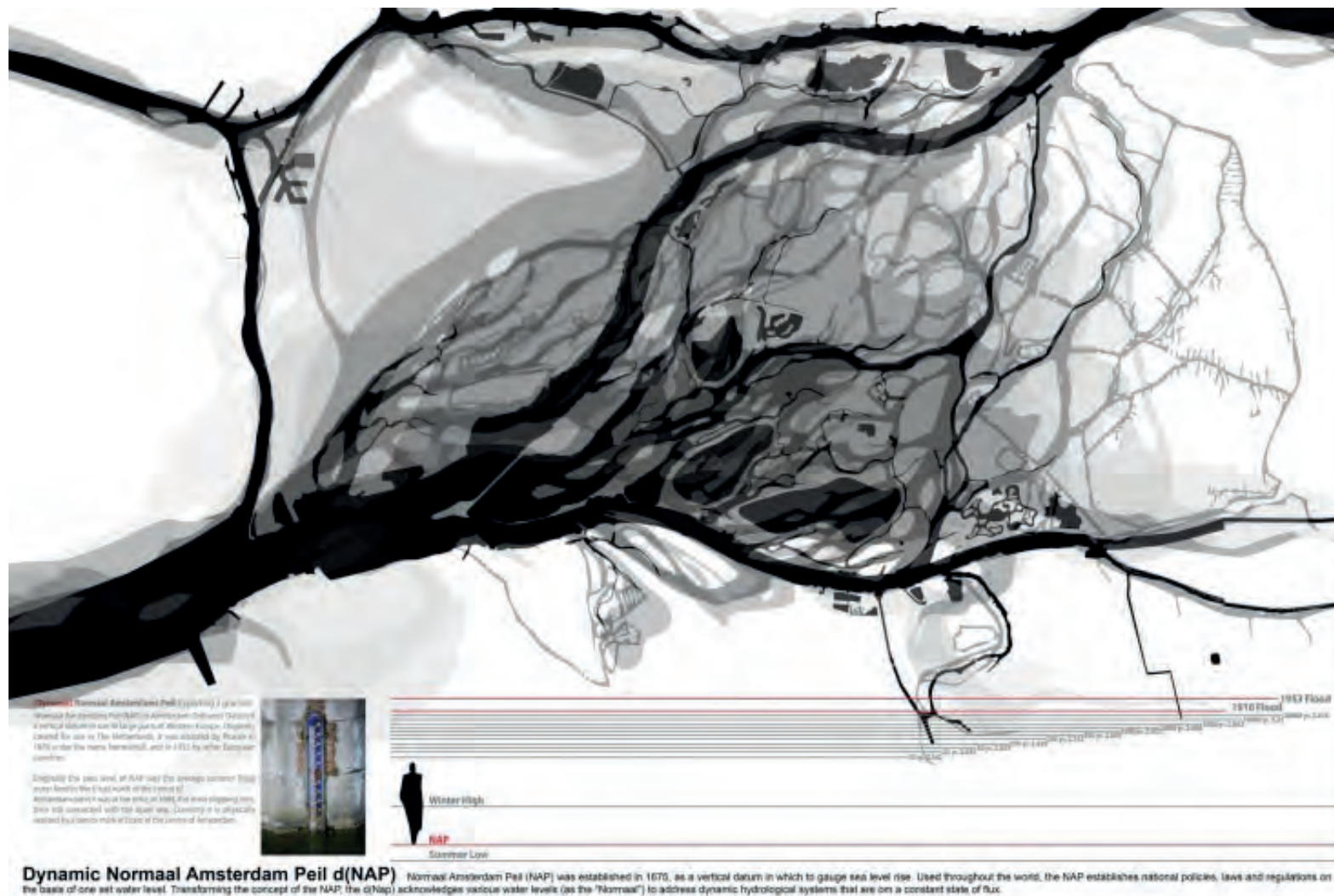


Figure 2-3 Room for the river

Source: <https://worldlandscapearchitect.com/room-for-the-river-nijmegen-the-netherlands-hns-landscape-architects/>





Figure 2-4, 2-5, 2-6  
Cheonggyecheon Stream in  
Seoul, South Korea  
Source:  
<http://www.tripvivid.com/articles/14740>

## Cheonggyecheon Stream in Seoul, South Korea

At the beginning of the 21st century, after the rapid economic development in South Korea, the government began the construction of an ecological city to solve the problems of urban environmental pollution, urban ecology, and lack of historical and cultural protection in the extensive rapid development stage. In July 2003, the South Korean government invested heavily in the restoration and reconstruction project of Cheonggyecheon to restore the natural features lost in a long period and reproduce the 600-year history of Seoul. Cheonggyecheon restoration is not a simple restoration of the original appearance of the river, which not only considers the natural characteristics of the river itself, has recreational and leisure functions, but also combines history and modern culture to develop modern commerce.





Figure 2-7 Dragon Boat Festival  
by Anonymous person, Qing Dynasty

Landscape architecture is one of the few arts in which history can be created. Landscape doesn't have to honor history. Pillaging an endless bank of history, landscape architects play the role of critical historians. That being said, these artists of the built environment should always study history. If they are good, they can then invent their own. (John Dixon Hunt, 2011)

History can help us better understand (or should seek) the ways, times, and causes of large-scale changes. Those who don't study history are destined to repeat the same mistakes. These words were originally said by George Santayana, and because of their authenticity, they are still very relevant today. History provides us with the opportunity to learn from the mistakes of the past. It can help us understand the many reasons why people behave in their own way. As a result, it helps us become more compassionate and become more decision-makers.

“ As an old saying goes in Chinese, looking into the mirror of history, you will know the rules of prosperity and changes. In this subject, I can also look into the mirror of history to search for the answer of the today's question.

”



Design is a way to ask questions, Design research, when it occurs through the practice of design itself, is a way to ask larger questions beyond the limited scope of a particular design problem. When design research is integrated into the design process, new and unexpected questions emerge directly from the act of design. (Brenda Laurel, 2003)

Design research is to understand the situation carefully, do the research for design, and research which would inform the design.

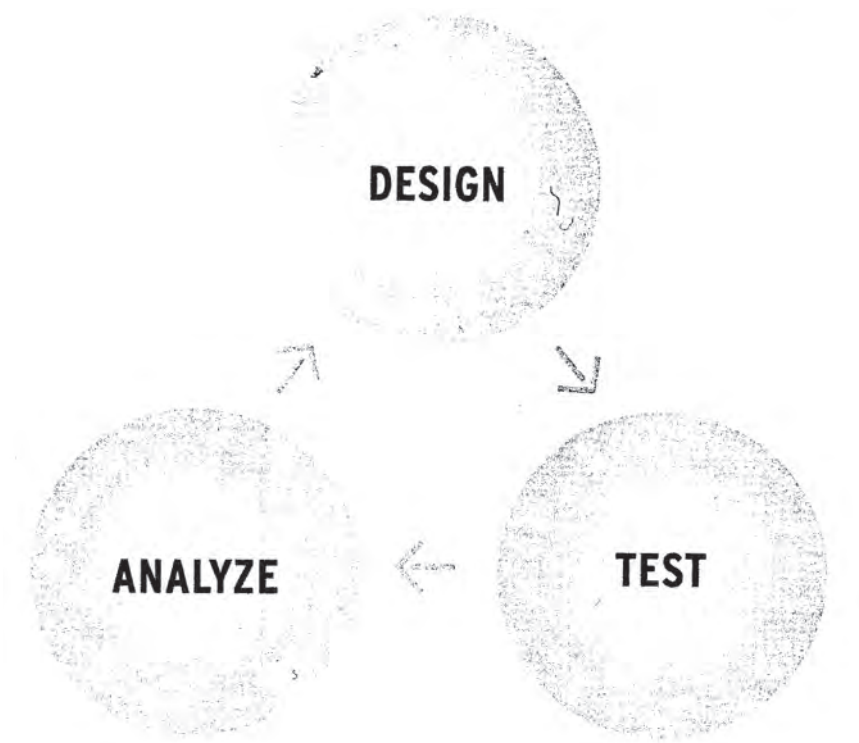


Figure 2-8 Design and Research (Brenda Laurel, 2003, p177)

## 1. Mapping

Mapping landscape spaces by means of manual and modern technology enables landscape architects to describe, understand, and interpret spatial-visual properties of landscape. This can help to strengthen the body of knowledge of spatial design in landscape architecture through measurement and visualization of common concepts in the field, as well as through the possibility to explore spatial-visual landscape features that was not possible before. (Mei Liu, 2020)

In this project, to first understand the situation of Pearl River Delta and Guangzhou city, I focus on the water elements in the urban development, by comparing now and before, to see how the canal network developed with the city. Zoom into the historic district, the canal system is carefully illustrated on the map to see the challenges and the potential. In the later design exploration, in the local scale, mapping the transportation system, commercial spot, and natural area to understand the sites and seek opportunities.



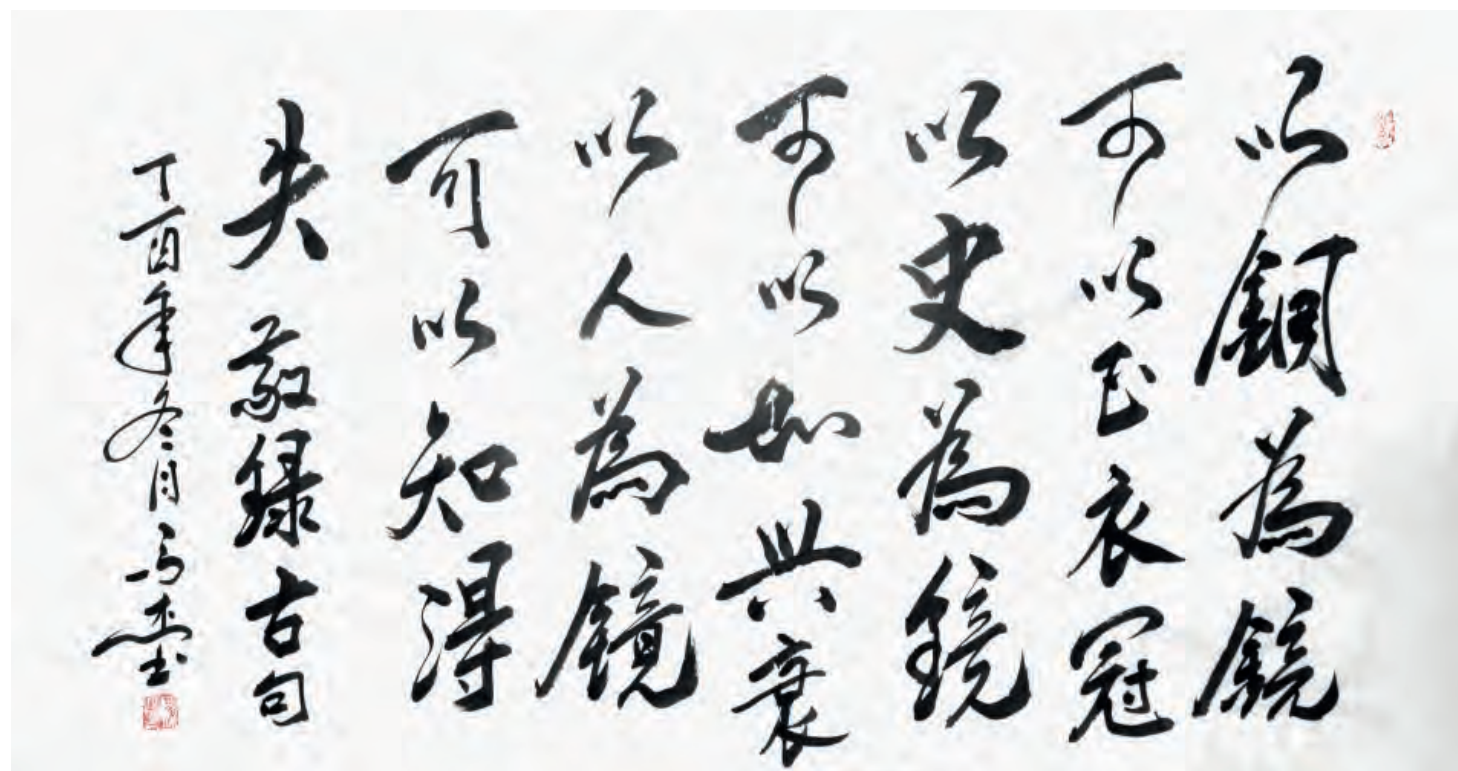
Figure 2-9 Compare of maps between 1950 AD and 2015 AD in landscape, water infrastructure and urbanization of Pearl River Delta  
Source: Xiong L., Nijhuis S. (2019) Exploring Spatial Relationships in the Pearl River Delta. In: Ye X., Liu X. (eds) Cities as Spatial and Social Networks. Human Dynamics in Smart Cities. Springer, Cham. [https://doi.org/10.1007/978-3-319-95351-9\\_9](https://doi.org/10.1007/978-3-319-95351-9_9)



### 2. Look back to history

In the history study, I look into different landscape types of historic canals in the ancient time, to analysis how them work and identify the principles.

We look back to history to learn from it. The reason why the ancients chose Guangzhou to settle down was that of its dense river network. In the long history, Guangzhou people have gradually developed a set of the water system with regional characteristics. This system condenses the wisdom of the Guangzhou people and reflects that the ancient river not only as an important infrastructure but also a part of public space, occupied an important position in people's life. However, in today's River construction projects, people always ignore the valuable knowledge inherited from history and tend to blindly copy the projects in other places. Therefore, in this study, I hope to be able to learn from history critically, to develop a new canal system with local characteristics.



‘Looking into the mirror of history, you will know the rules of prosperity and changes.’

-- Tang Taizong, ‘Jiu Tang Shu’

Figure 2-10 History as Mirror (Jie Ma, 2017)

## 2. Research Approaches

### 3. Site Visit

After the mapping analysis and historical study, I have a basic understanding of the site and how the canal system works. In the site visit, I can check if the previous study matches the actual situation, and add more detail for the spatial analysis. For the local scale, the site visit is the base for detailed design. The site visit is important to feel the site, and also provides the opportunity to observe.



Figure 2-11, 2-12, 2-13, 2-14, 2-15 Site Visit on the East Moat Canal, Photo by Author

### 4. Literature Review & Case Study

The literature review helps to build up the knowledge base of this project, and identify design principles. Besides, it is also essential in working on the technical aspect.

In this case study, I can observe its subsequent impact and changes in projects that have been established for a period of time. I can understand the principles of identity design from successful cases and learn from failed cases. Due to research concerns, urban areas have different system characteristics, and case studies of design projects have similar backgrounds in the international context. For example, in Amsterdam, how to protect and use historical canals is also an important topic in urban development. The Netherlands has always had advanced experience in water issues. However, the proposed design strategy should integrate different areas into a coherent system. The significance of the case study is to extract the useful aspects of each project and summarize the design strategies and principles. In this case, research based on the theoretical framework will be more practical.



### 3. Research Design

Research by Design uses design as a form of research, is to focus on how to apply the principles in specific situation, explore the possibility within it.

Design research is both the study of design and the process of knowledge production that occurs through the act of design. Design research involves an investigation of strategies, procedures, methods, routes, tactics, schemes and modes through which people work creatively. Design involves the testing of ideas, materials and technologies. It involves innovative conceptual development, product evolution and market modification. It also involves research into cultural, social, economic, aesthetic and ethical issues. (Rob Roggema, 2016)

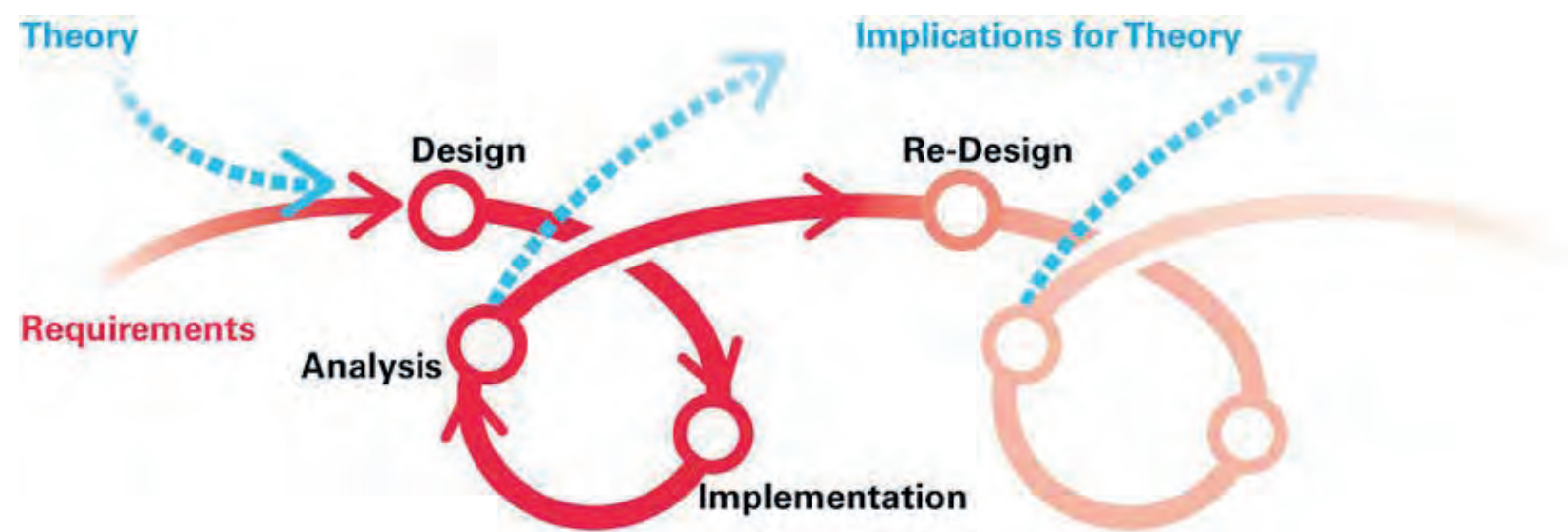


Figure 2-16 Diagram of research by design.  
Source: made by Urban Fraefel

#### Design Exploration

Design exploration means to explore possibilities of the design principles for different sites.

This method is aiming at modelling the future: knowledge based design (design research) of place, space image and program resulting in a landscape composition. (S.Nijhuis, I.Bobbink, 2012) Using the power of design is an approach to make the research convincing and persuading to academics and societal development proposal.

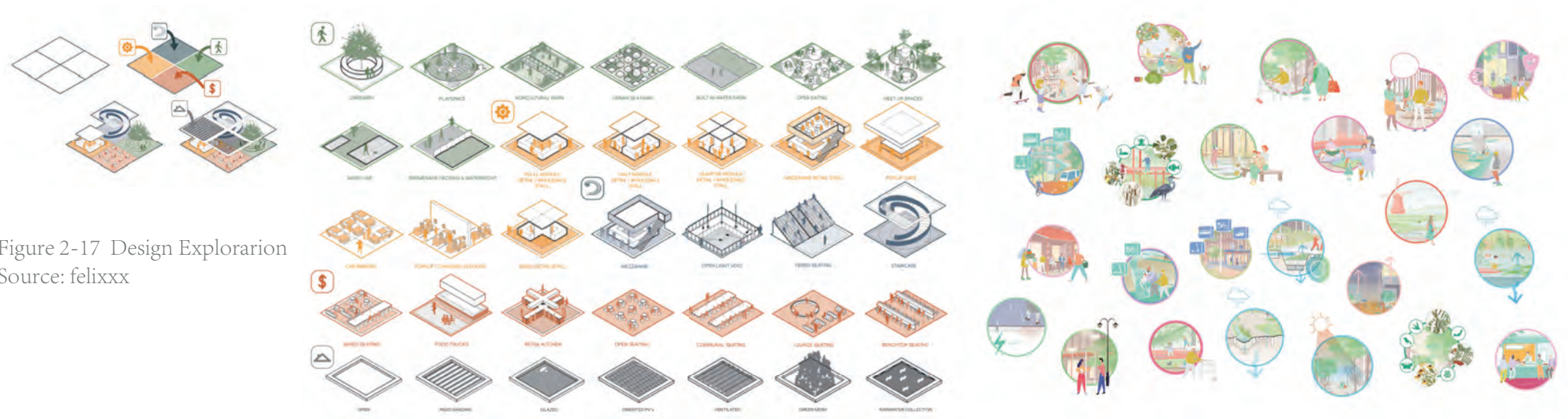
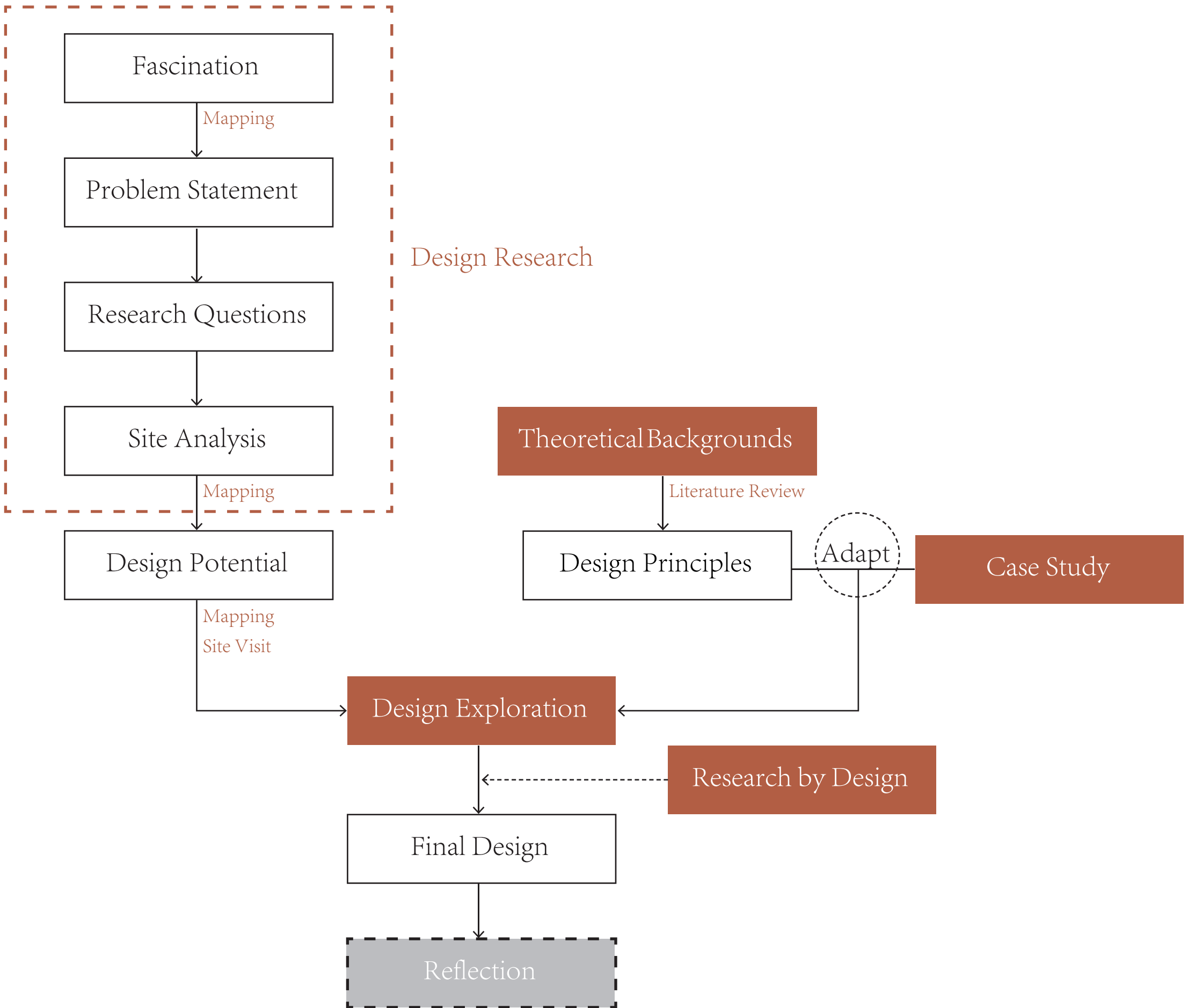


Figure 2-17 Design Exploration  
Source: felixxx





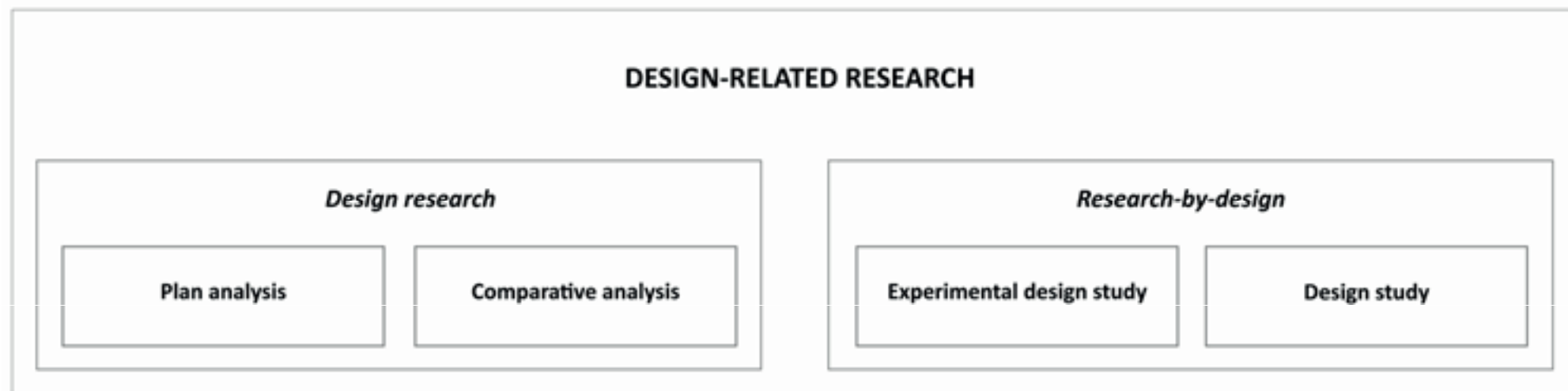


Figure 2-18 The research domains of design research and research-by-design and the involved modes of research  
Source: Adapted from Steenbergen et al. (2008) and De Jong and Van der Voordt (2002)

## Role of Research through Design

In order to engage in the different realms of landscape architectonic design, design research and research-by-design are combined in a systematic way for knowledge-based and creative design. Design research concerns analysis of existing designs or precedents, and research-by-design concerns study through design. In fact, the two research domains cannot be seen apart from each other: design research is an indispensable step in research-by-design. From this point of view, we can consider this a form of heuristics, a research approach that leads to new discoveries and inventions by following a sequence of methodical steps (Steenbergen et al., 2002).

The toolkit of the design principles are enriched by the design exploration, in which I tested the possibility of them in different situation. Therefore, design is not only the orientation of the research in this project, it also an important tool for the research. We define design as a form of research and identify how design relates to other more conventional definitions of research methods. We elaborate on research-through-design as a concept and the types of knowledge that it generates. (Nijhuis, De vries, 2020)

# 3

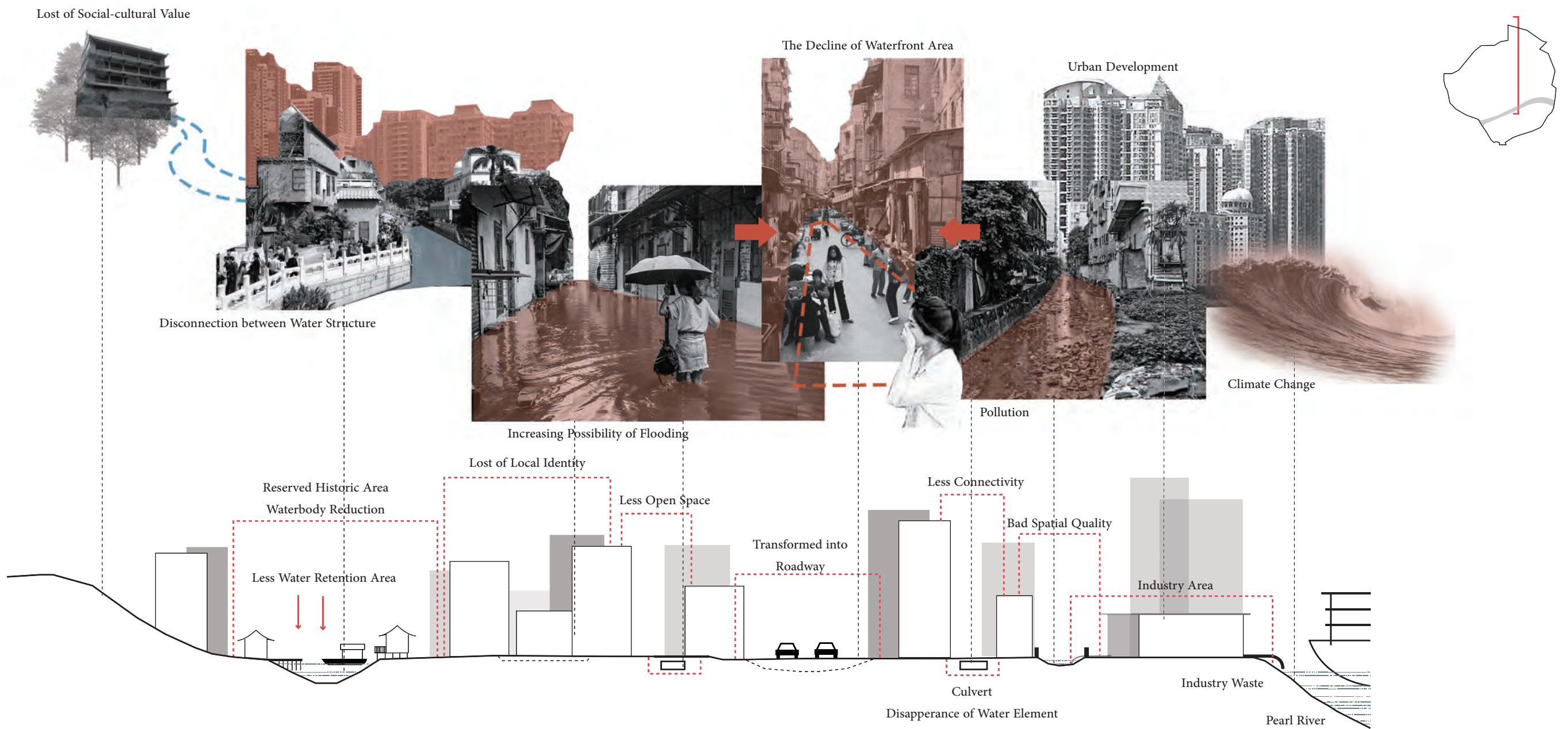
## CHALLENGE & OPPORTUNITY

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### HISTORIC CANAL IN GUANGZHOU CITY

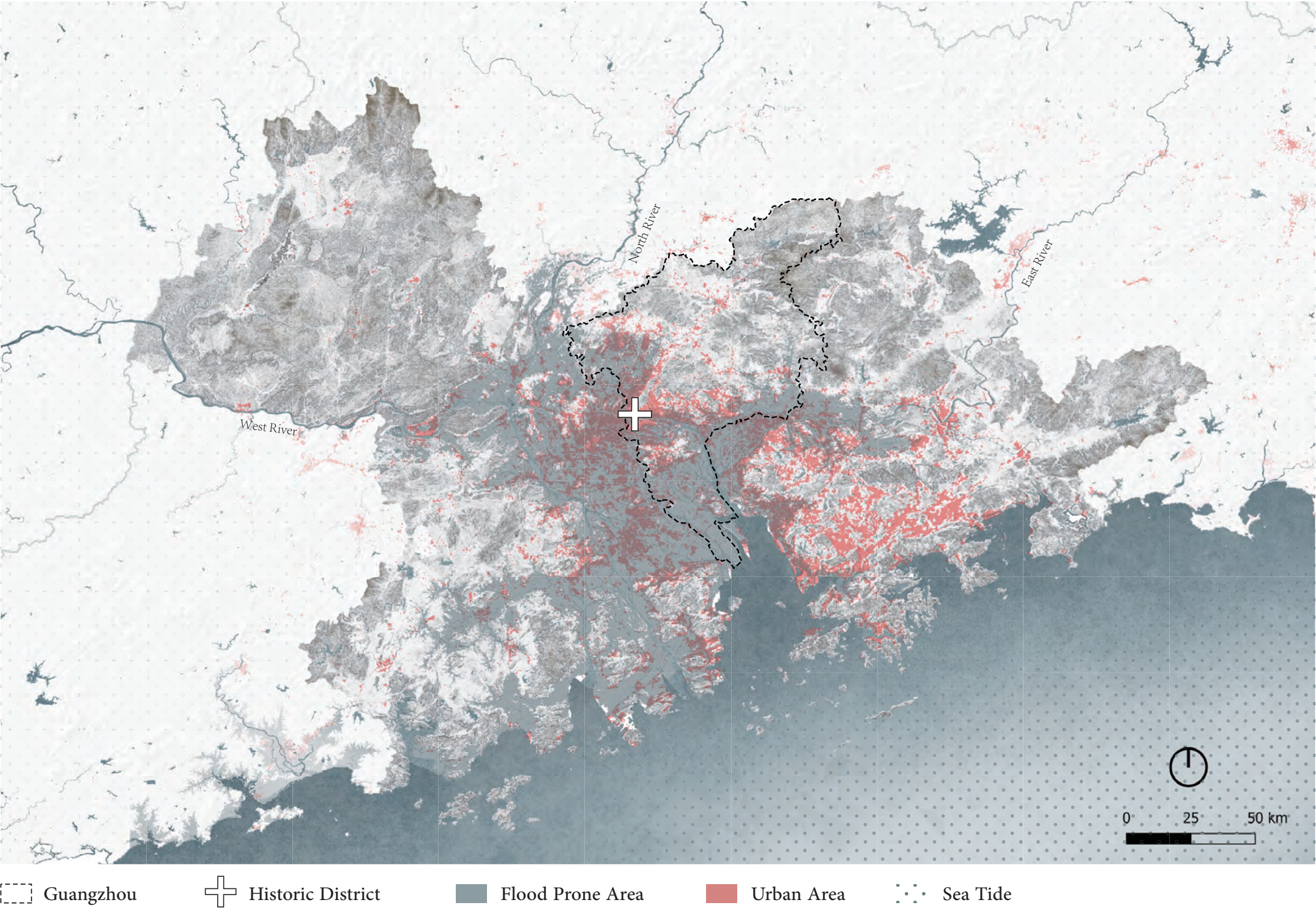
The problem statement is elaborated more in this chapter, in the zoom-in analysis about the historic district, the challenges and opportunities are pointed out. As has been mentioned above, the canal and its surrounding area could not be separated in the research. The reduction of canal area leads to less water retention area, the loss of local identity, and the disconnection in water structure. The increasing possibility of flooding and pollution exacerbated the decline of the water area.







Pearl River Delta

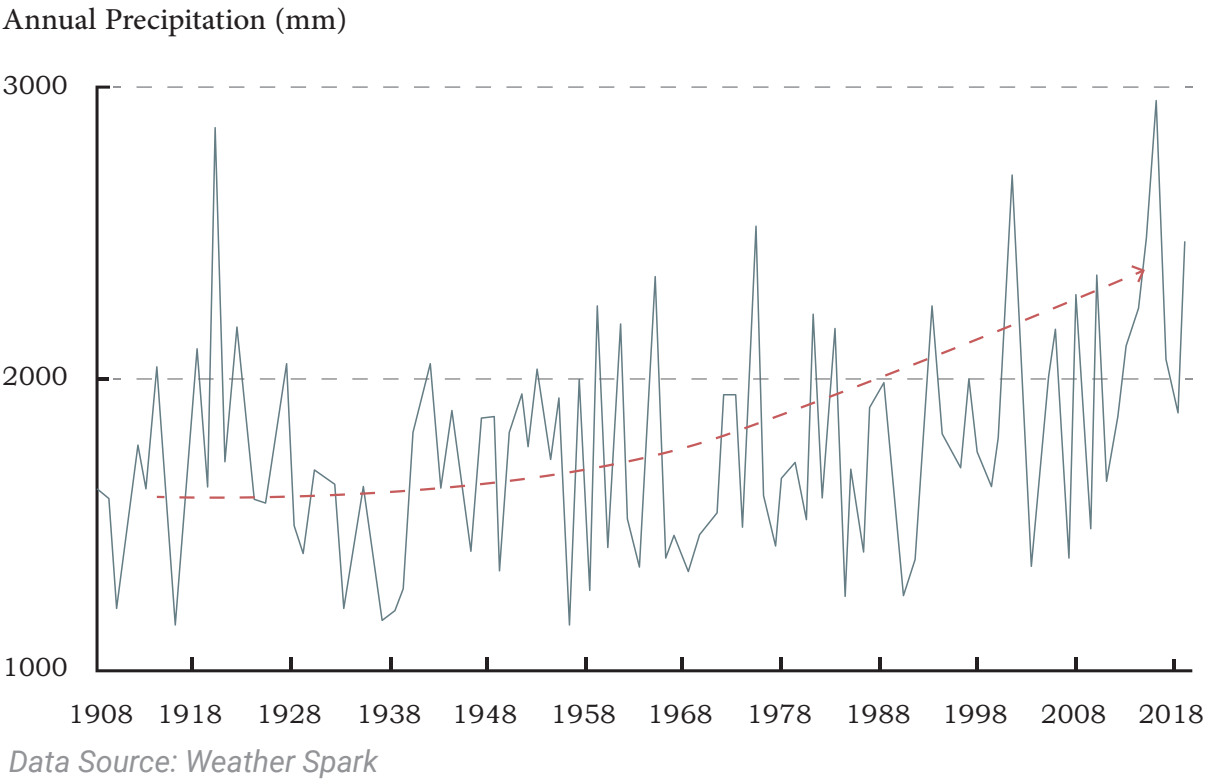
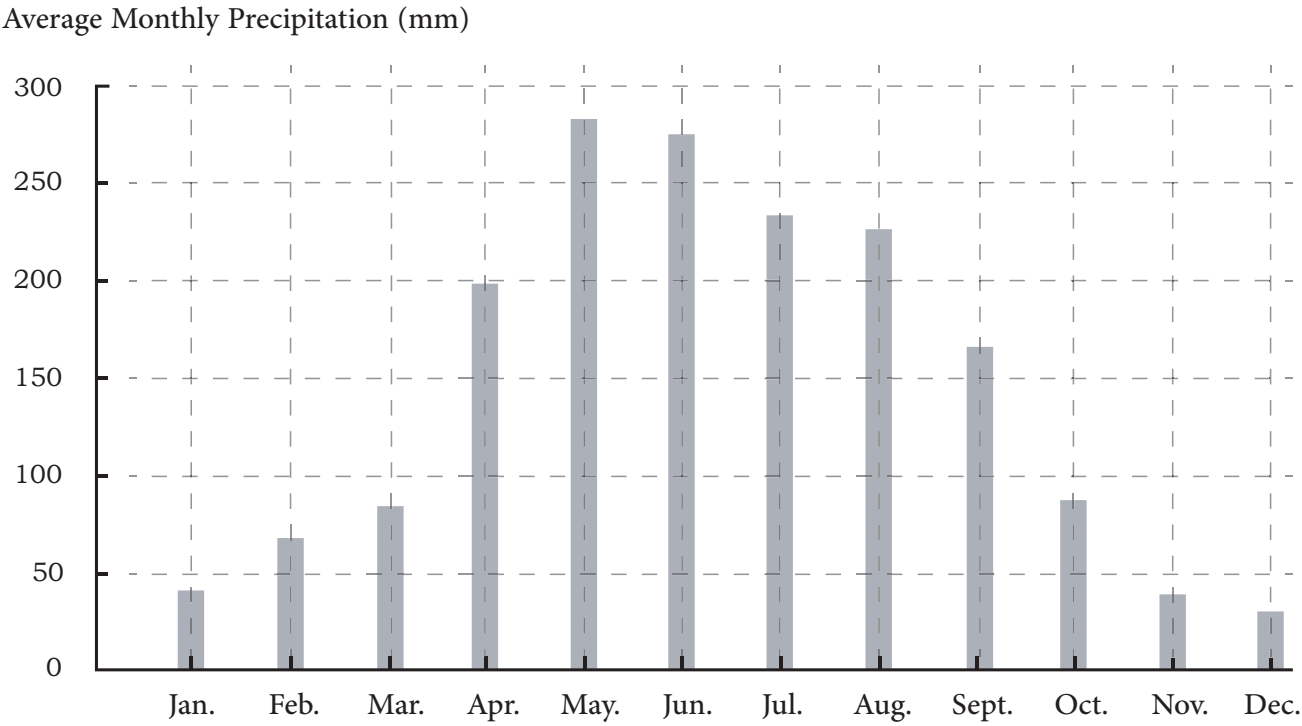


Guangzhou is always threatened by the sea tide, the sea level rise on the south side, and the flooding water from the rivers from north side.

Figure 3-1 Geographical Location of Guangzhou, Drawn by Authur

From a geographical point of view, Guangzhou’ s central urban area is high in the north and low in the south. There are Baiyun Mountain, Huolu Mountain, and Shougou Mountain to the north, and the Pearl River to the south. When it rains, rainwater will follow the mountain and flow through the city in seven rivers. Also, supported by the tide level of the Pearl River, it is very prone to waterlogging if local heavy rain occurs during the astronomical tide.





The flood threat from precipitation is exacerbated by more frequent extreme events.

A number of studies have shown that throughout the 21st century, extreme weather events and increased floods are likely to occur in southern China. Guangzhou is located at the mouth of the Pearl River and is the economic center of southern China. China has the most rainstorm days. Some previous studies have shown that due to intense rainstorms and rising sea levels, Guangzhou faces a high risk of flooding. Zhao et al. By analyzing the temporal and spatial changes of extreme precipitation in the Pearl River Basin, it is found that the daily intensity presents a significant positive trend in the entire study area (including Guangzhou). (Zhang et al., 2018)

Figure 3-2 Monthly and Annual Precipitation of Guangzhou, Drawn by Authur







## 2. Urban Context



The increasing area of impervious surface and the decline of the historic waterfront district.

In the last 50 years, because of the rapid growth of population and limited land. The built-up area has quickly expanded in the district. Because of the rapid increase of impervious surface, cause more rainwater could not infiltrate into the land directly, leading to a greater risk of flooding. The urbanization of Guangzhou is accelerating. However, due to the lack of scientific concepts and unified planning, the rapid construction of eager quick success neglects the protection of the original water system and historical culture. People pay more attention to the traditional culture and historical landscape. The continuous expansion of new buildings, the new buildings built along the banks of the river have seriously affected the development of water bodies and polluted water resources. (Zhang et al., 2018)

Figure 3-3 Historical Inner-city Center in Guangzhou  
Source: <https://shipin520.com/>  
Figure 3-4 Impervious Surface and Population of Guangzhou, Drawn by Author



Degradation of water network shipping function, waterways have been neglect in urban development.

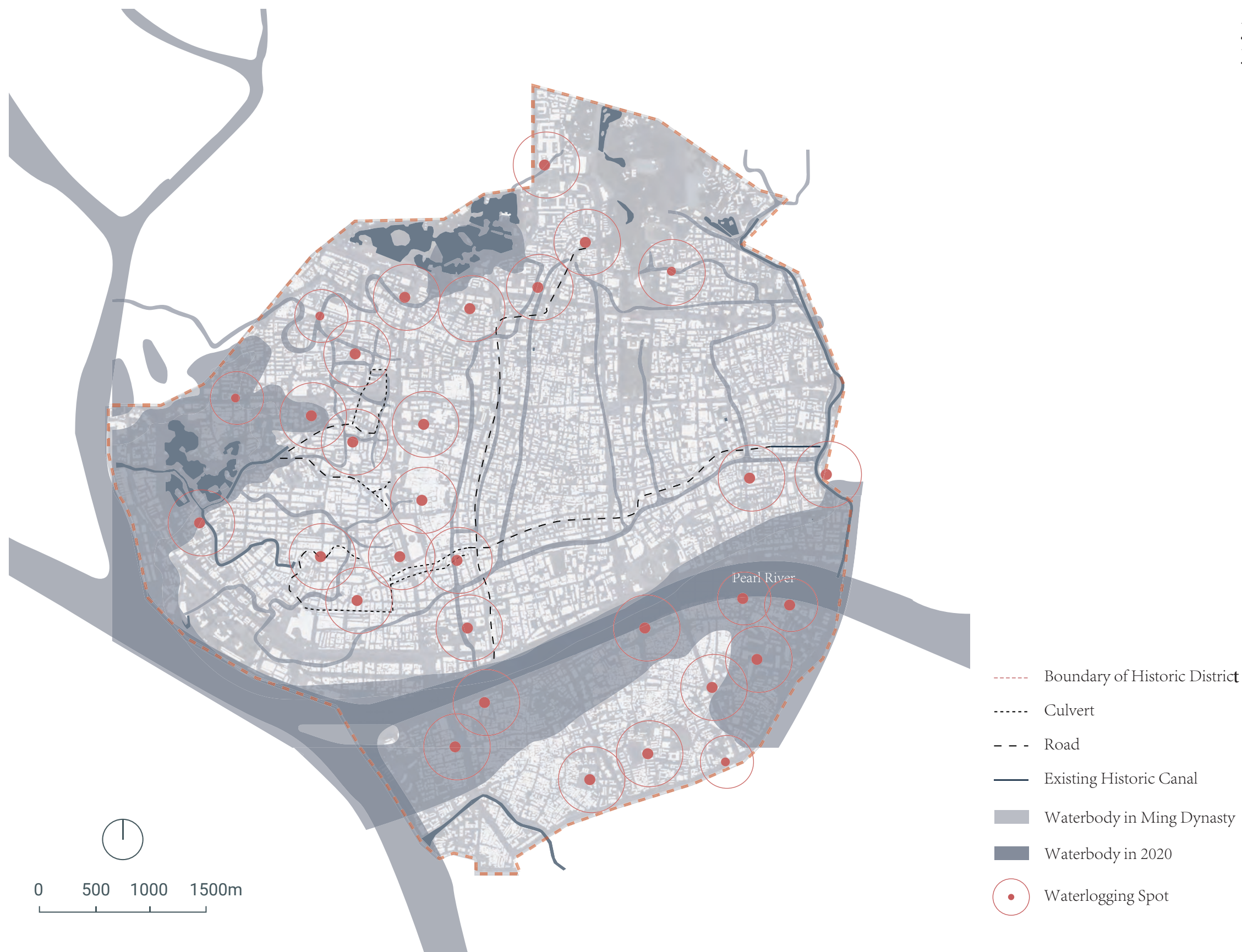
In addition to the water supply and drainage function, the excavation of the water network is also related to the water transportation function. With the development of society, land transportation is more and more developed, including trains, subways, buses, and private cars. The use of water transportation has become popular, and people use water transportation less and less frequently. This has caused water transportation to become weaker and weaker, and people's awareness of water protection has gradually diminished. Some rivers are buried or open channels are turned into culverts and disappear from the city map.

Figure 3-5 Overview of Historical Inner-city Center in Guangzhou, Drawn by Authur



### 3. Historic Canals

#### 3.1 Flooding



The reduction of canal area and the bad construction of drainage system have led to the increase of flooding risk.

Figure 3-6 Drainage Canals and Flooding Spots in Guangzhou, Drawn by Author

Besides, the expansion of built-up area also means the decrease of drainage canals. Compared with the water area in Ming dynasty. Main part of the historical canal has been transformed into culvert, or been filled into road. And the place where drainage canals used to be now become the waterlogging spot.



### 3. Historic Canals

#### 3.1 Pollution

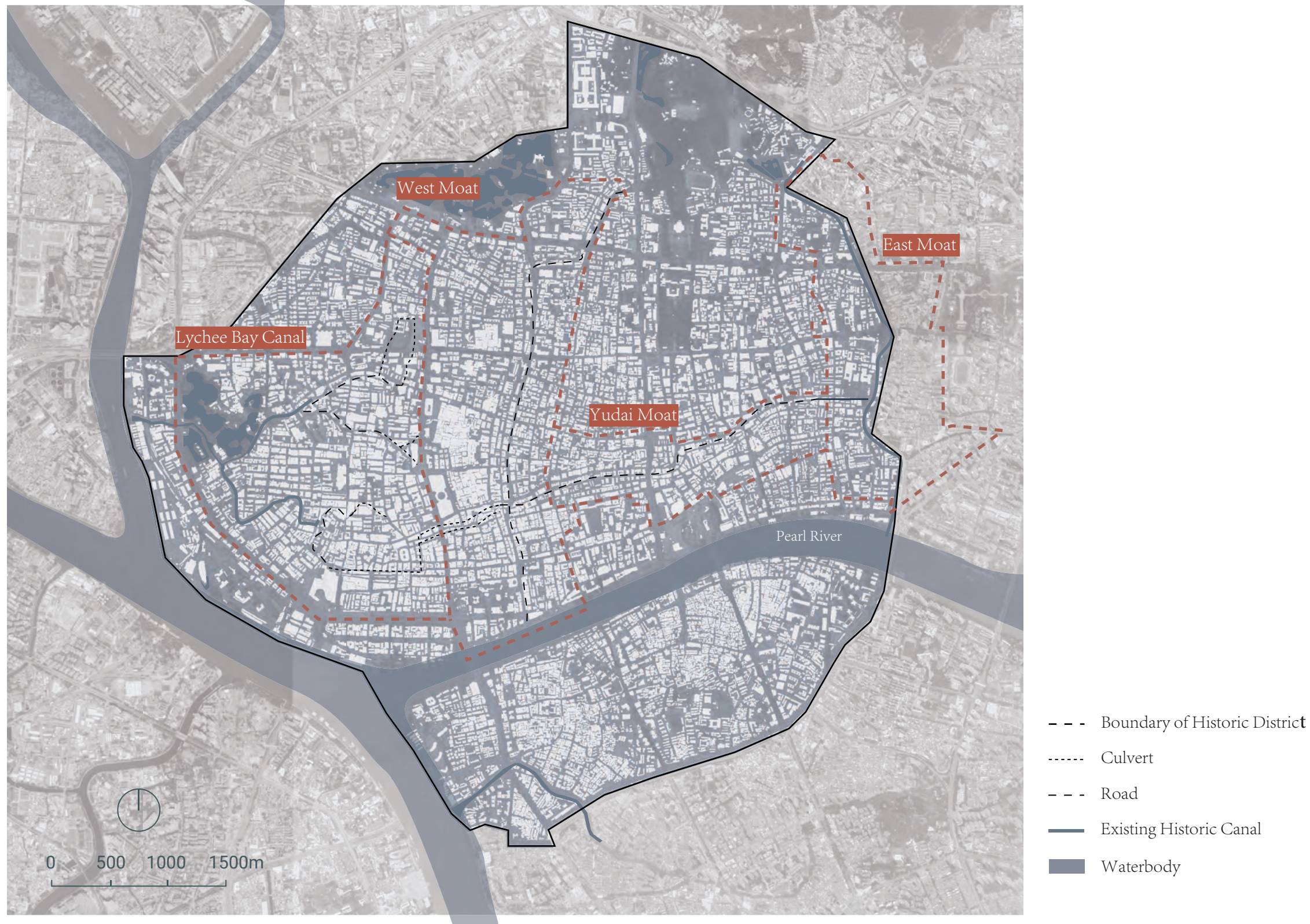


Figure 3-7, 3-10  
Watertown in the Ancient Time  
Source:  
<http://www.laozhaopian5.com/>  
Figure 3-8, 3-9  
Heavy Pollution in Current Situation  
Source:<https://zhuanlan.zhihu.com/p/95054326>

## Pollution

Due to its proximity to Hong Kong and Macao, the Pearl River Delta in South China has become one of the most active industrial production areas in the world and a famous world factory, which has brought serious water ecological damage and paid a heavy price for the natural environment. Water pollution is the most serious ecological and environmental problem in Guangzhou. Nearly 70% of the river systems are polluted to varying degrees. If we do not take timely and effective action, Guangzhou will face a serious water shortage crisis caused by pollution.





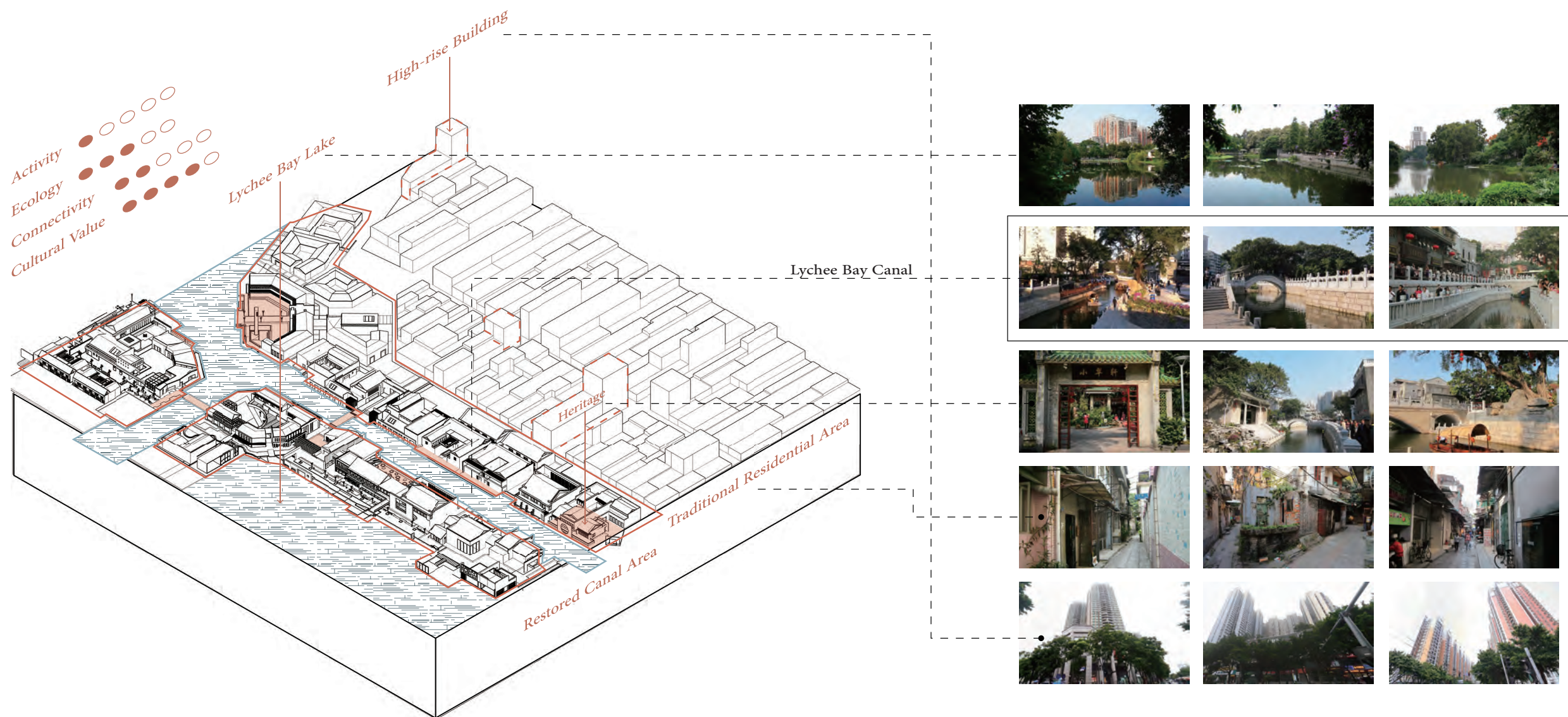
The existing historic canal structure in Guangzhou city. The West Moat and the Yudai Moat have been filled into a road and partly transformed into the culvert underground. After the canal restoration projects in the past ten years, Lychee Bay Canal has been renovated into an invisible canal, and the polluted problem has been improved in East Moat.

Figure 3-11 Historical Canals in Guangzhou, Drawn by Authur



## 4. Canal Area

### 4.1 Lychee Bay Canal



The heritage is well preserved in this canal area, it has high cultural-social value. It was surrounded by a traditional residential area.

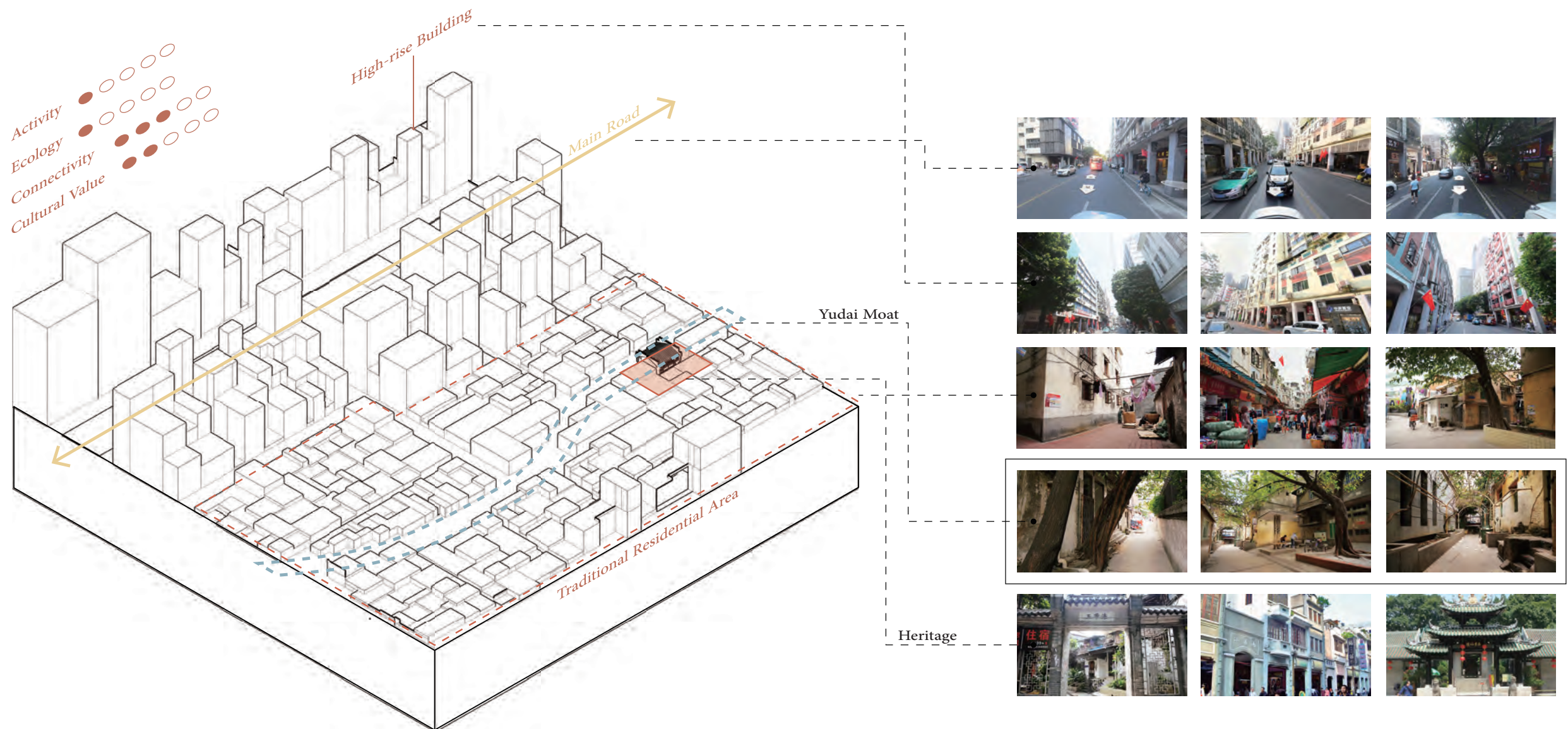
The Lychee Bay Canal Restoration Project was started in 2010. In this project, the government aimed to recreate the historical scene of this canal. The project connects the existing heritage and uses them with the canal and diverse river banks to create the space for activities that happen in history, such as water markets and waterfront theater. However, this project did not create the public space which the residents need. The crowded visitors also bring the noise problem. Besides, maintaining the water level in certain high level to meet the need of these activities also increase the risk of waterlogging when it rains.

Figure 3-12 Analysis of Lychee Bay Canal, Drawn by Author  
 Figure 3-13 Surrounding Area of Lychee Bay Canal  
 Source: Baidu Map Street View, retrieved December 20, 2020, from <https://map.baidu.com/>



## 4. Canal Area

### 4.2 Yudai Moat



### An invisible historic canal in a dense and old neighborhood

This canal now is in the middle of a traditional residential area, and it is gradually replaced by the surrounding high-rise buildings, which make the public space inside more limited, and this area is losing its local identity as a historic canal area and been forgot by the city. The public space is in poor management.

Figure 3-13 Analysis of Yudai Moat, Drawn by Author  
 Figure 3-14 Surrounding Area of Yudai Moat  
 Source: Baidu Map Street View, retrieved December 20, 2020, from <https://map.baidu.com/>





“

In the expanding urban area, the canal systems with natural and artificial waterways were buried and filled, and the natural river banks are destroyed.

”

Figure 3-15

East Moat

Source: <https://mapio.net/>

Figure 3-16

Lychee Bay Canal

Source: <https://dp.pconline.com.cn/photo/2016383.html>

Figure 3-17

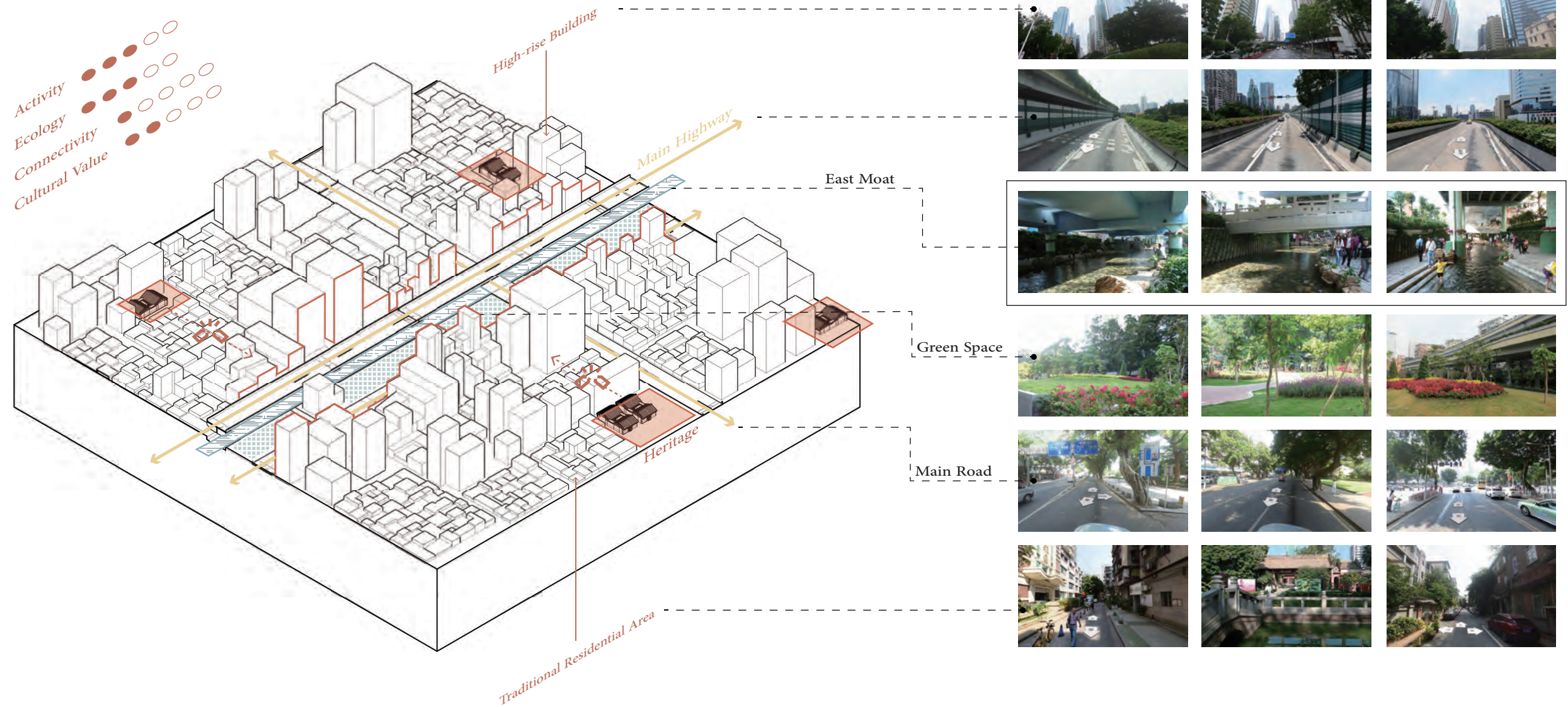
Yudai Moat

Source: <https://mapio.net/>



## 4. Canal Area

### 4.3 East Moat

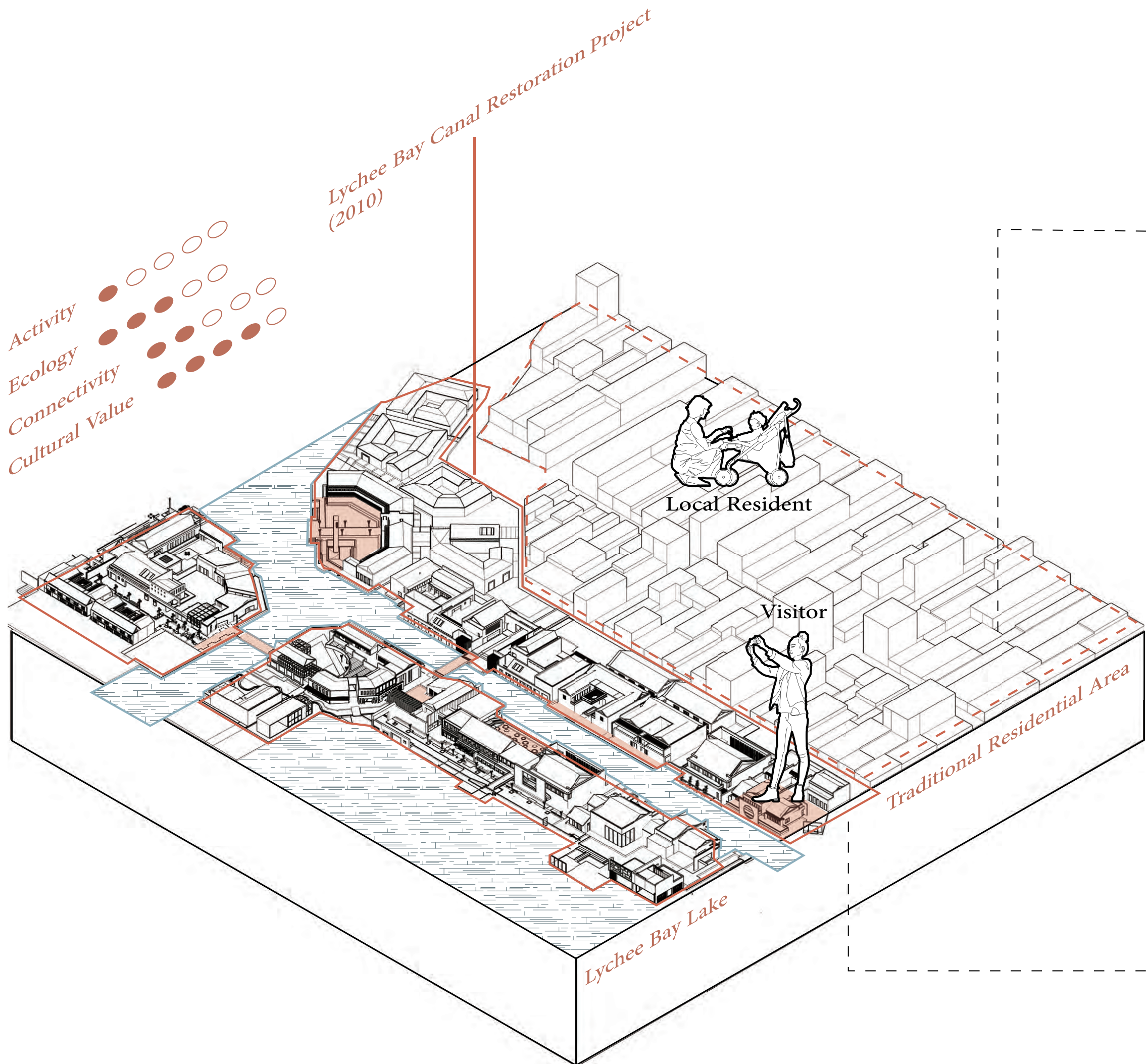


A historic canal is underneath a high-rise road and disconnected with surrounding neighborhood

The third one is the East Moat, the only visible historical canal before the Lychee Bay Canal restoration projects, and also a canal underneath a highway. Besides the highway, it has also been separated from the residential area with the main road alongside, and it is crossed by several other main roads. The related cultural heritages are disconnected from the canal. Also because of the surrounding high-rise building, the east moat is visually inaccessible from the outside.

Figure 3-18 Analysis of East Moat, Drawn by Author  
 Figure 3-19 Surrounding Area of East Moat  
 Source: Baidu Map Street View, retrieved December 20, 2020, from <https://map.baidu.com/>





- It does not meet the need of local residents.
- To recreate a scene of a historical water town, actually, some of intervention increase the risk of flooding.



5. Canal Restoration Project  
5.1 Lychee Bay Canal

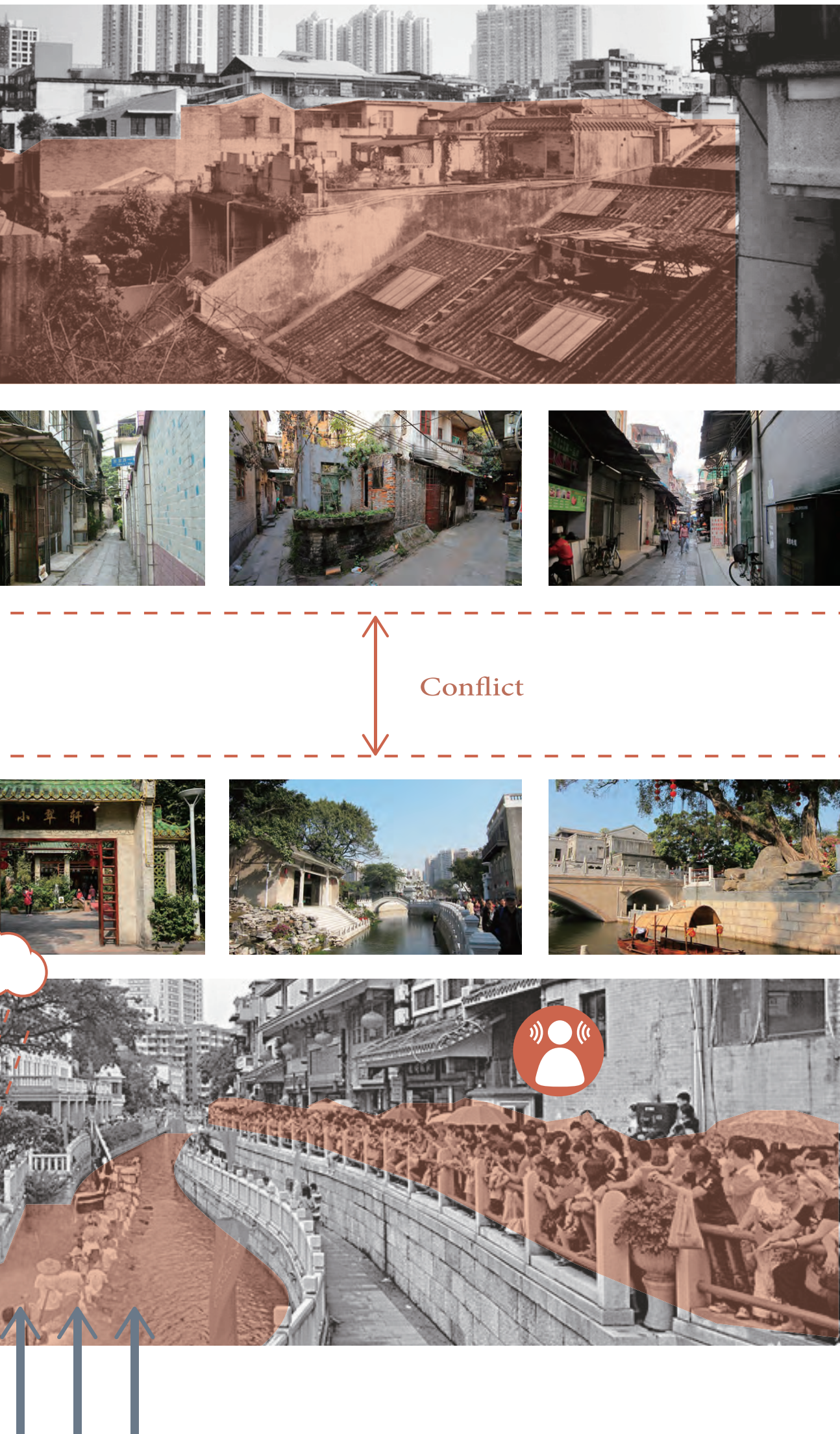
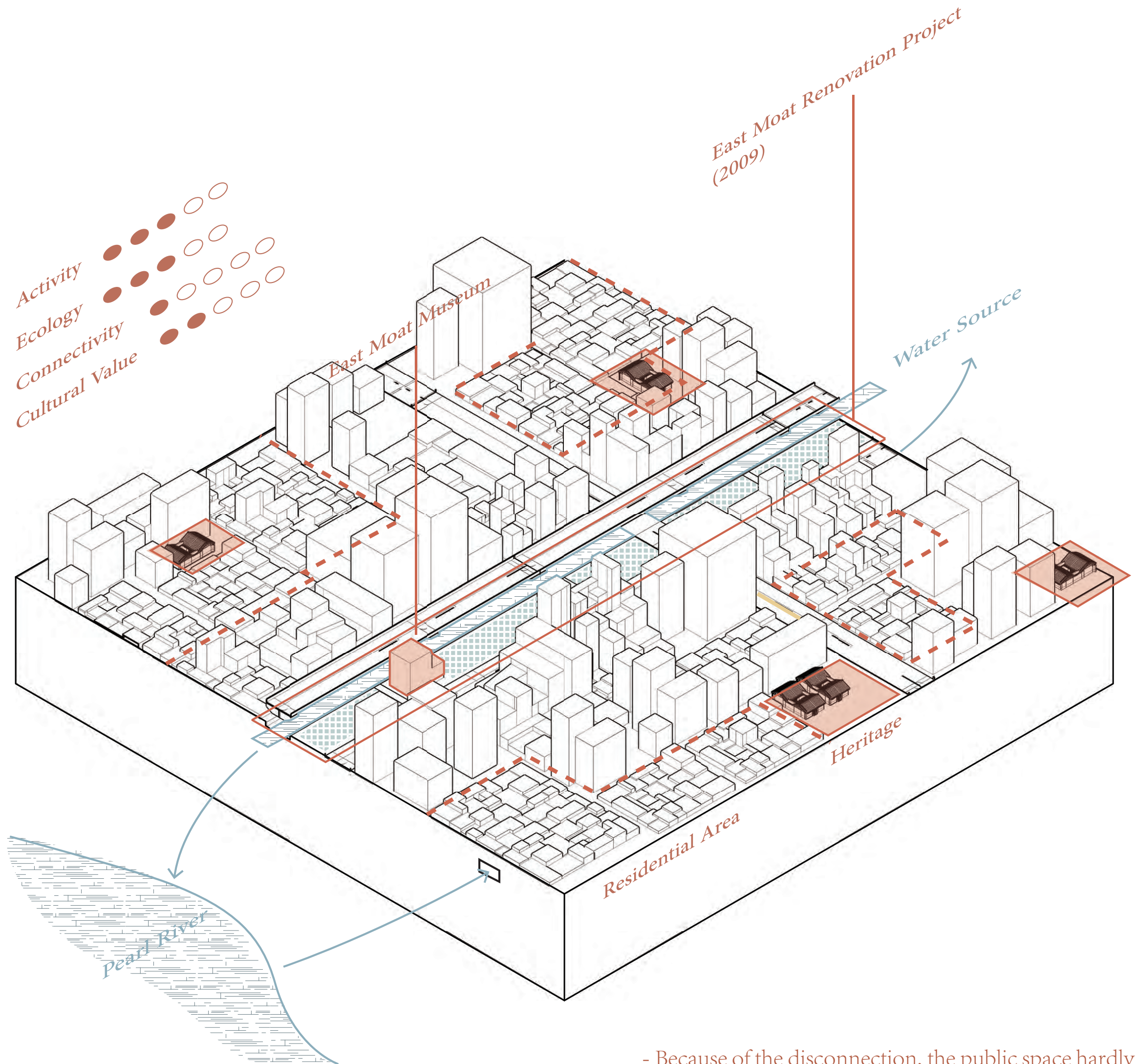


Figure 3-20 Analysis of Lychee Bay Canal Restoration Project, Drawn by Author





Stone



- Because of the disconnection, the public space hardly used.
- It cost a lot of money to pump and purify the water to this canal from the Pearl River..



## 5.2 East Moat

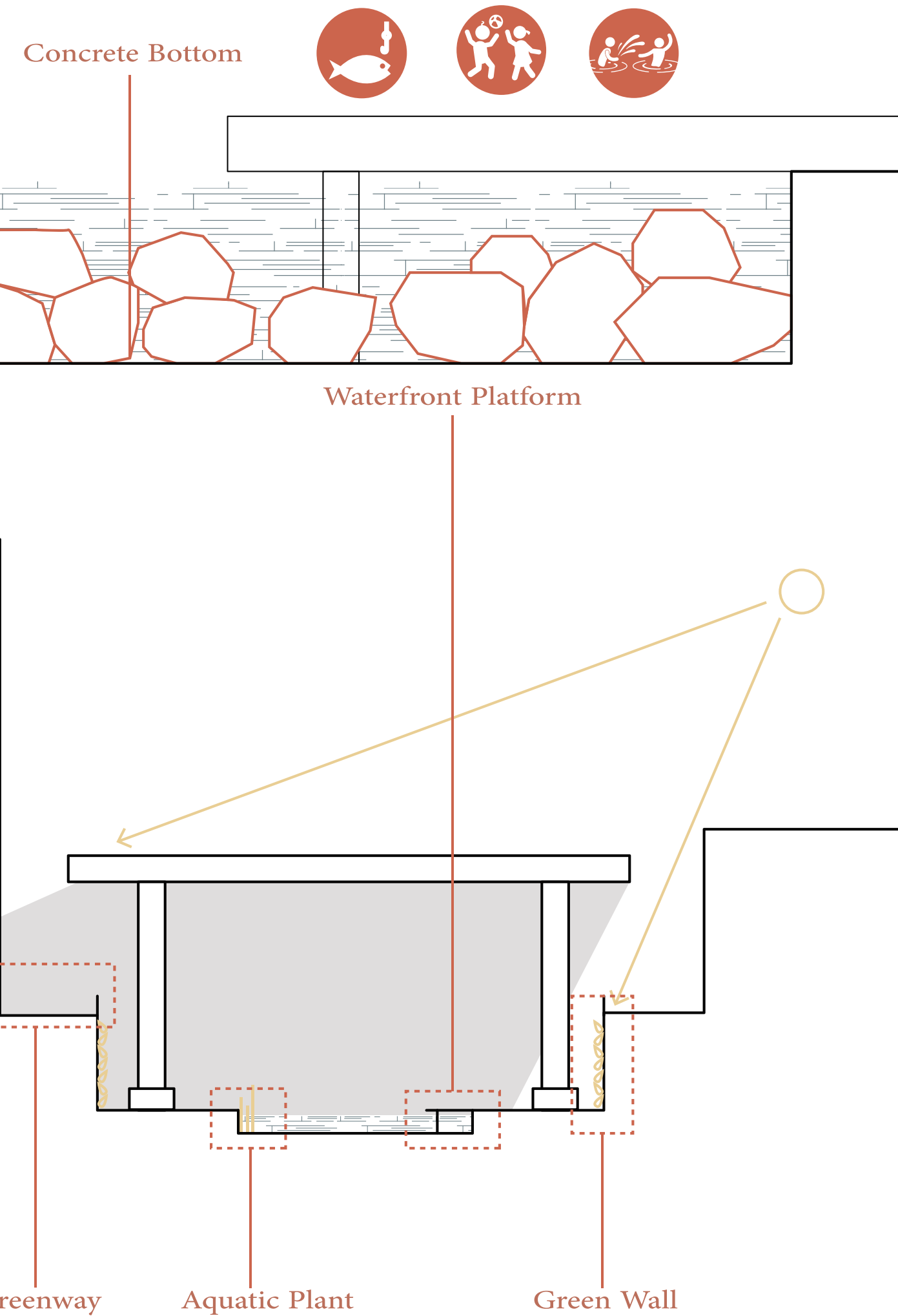
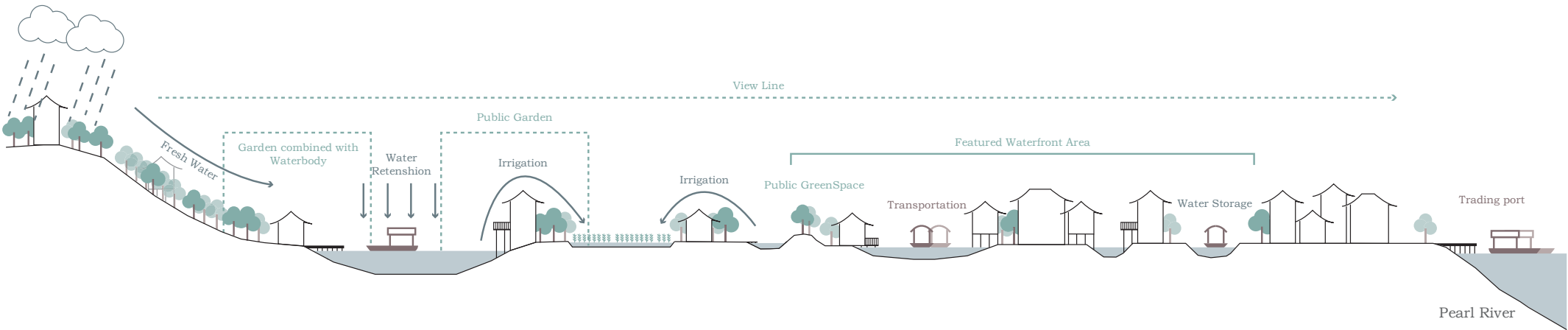
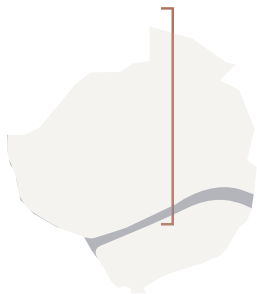


Figure 3-21 Analysis of East Moat Restoration Project, Drawn by Author

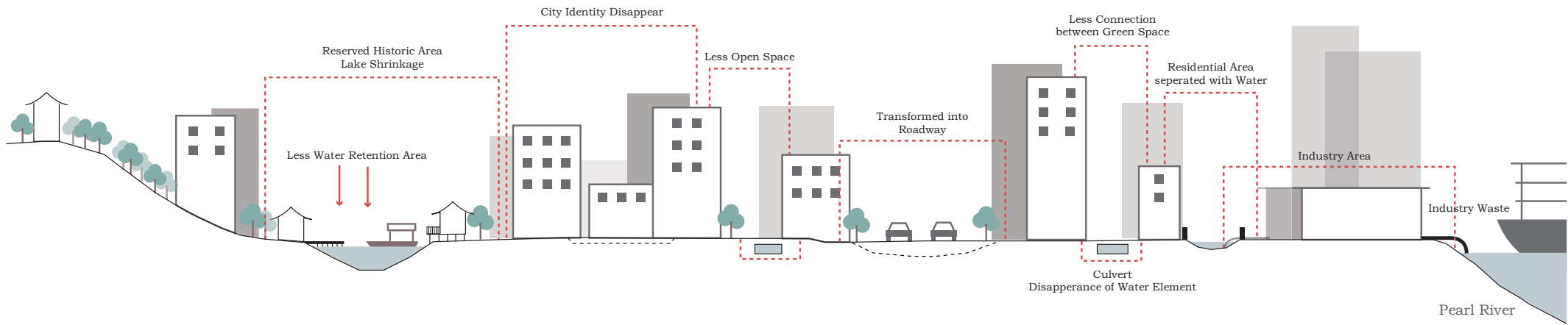
Challenge

Before modern urban development (-1919)



Multifunctional

During rapid modern urban development (1919-)



Single-purposed Use

Figure 3-22 Comparison between historic canals and current situation, Drawn by Authur



Guangzhou lacks a systematic spatial development plan for the water system. In the flood control construction of urban rivers, it only pays attention to the construction of bank revetments along the river. It lacks management of the discharge of water and the functions of the water body, and it is unable to achieve fundamental water system remediation. Additionally, the restoration projects also did not pay attention to the water system's complex functions, historical heritage, and urban characteristics in-depth consideration.

The development of the road network and the water problem of canals has led to the decline of the canal area. In the canal restoration projects carried out these years, the designers did not fully understand the canals and did not consider them as a system. Therefore, the public space in the projects hardly functions.

Compared with the ancient situation, the potential of the historical canal as landscape infrastructure is unrealized, and also does not work well as a basic infrastructure for Guangzhou city. In the design part, I can focus on reorienting the city towards the water, digging out the social-cultural value of the canal system, and create a new-born blue structure for the historic inner-city.

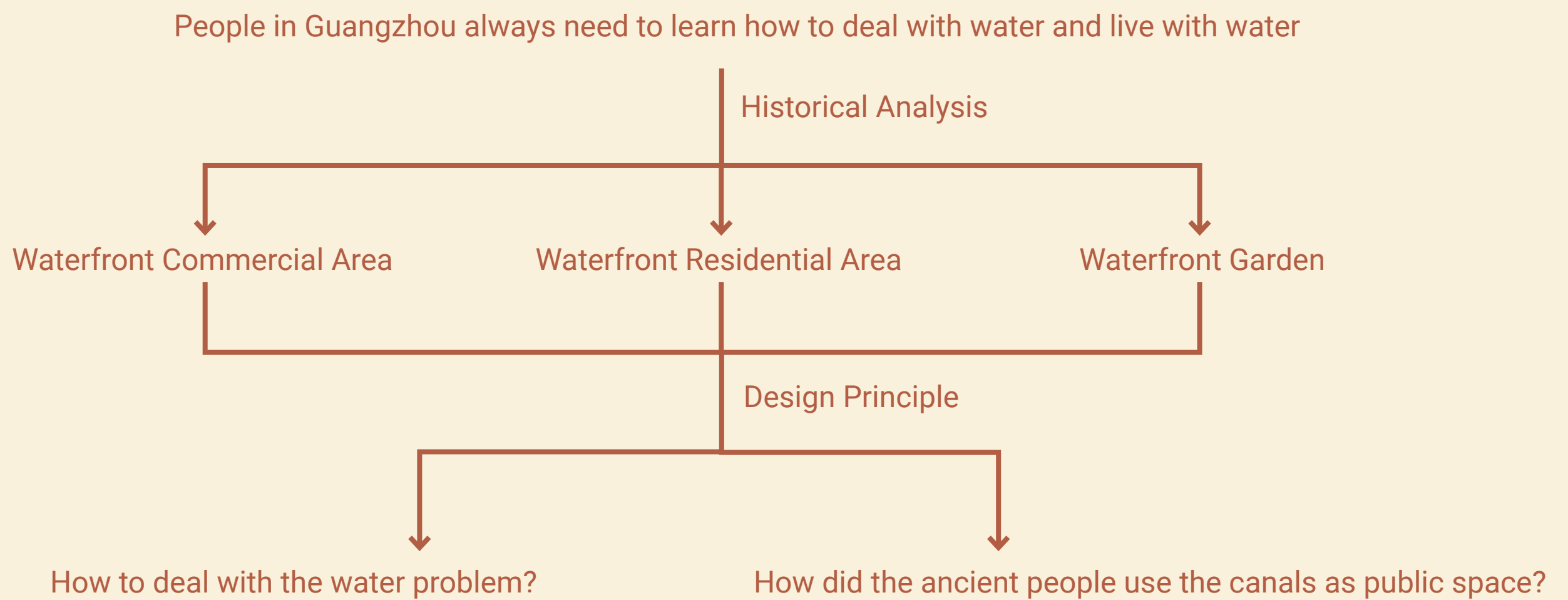
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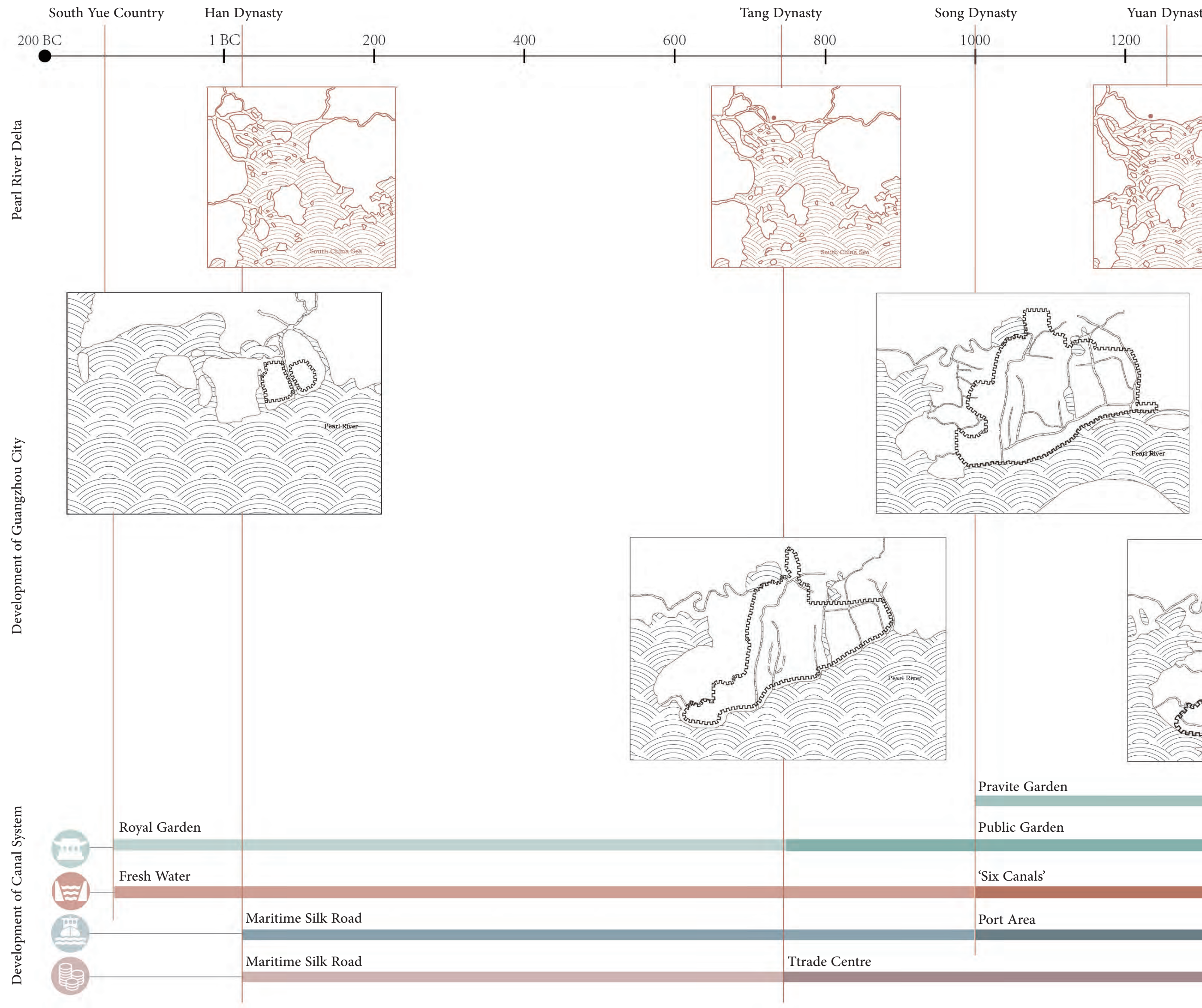
## HISTORICAL STUDY

### HOW THE ANCIENTS LIVE WITH CANAL SYSTEM IN GUANGZHOU

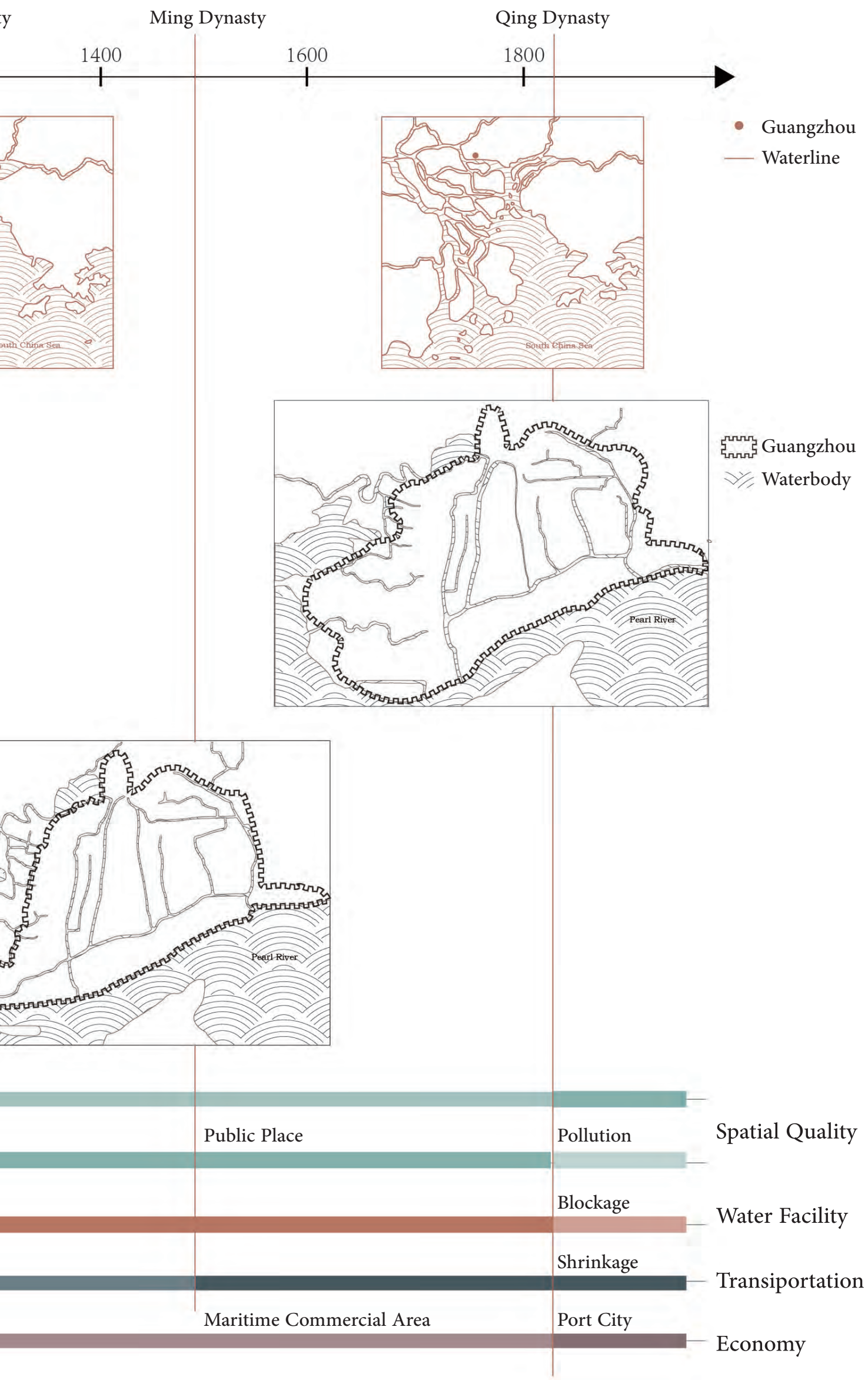
In the previous chapter, the historical study has been pointed out that it is the knowledge base of design principles and the core of research questions. How people live with water is also mentioned earlier. This chapter focuses on the historical water system and how it is used as a part of the city's important public space, a detailed study of people's community activities related to the river. There are three landscape types for the canal system with people. They are waterfront commercial areas, waterfront residential areas, and waterfront gardens. They are located in different areas according to their characteristics, therefore, there are diverse activities with canal system.











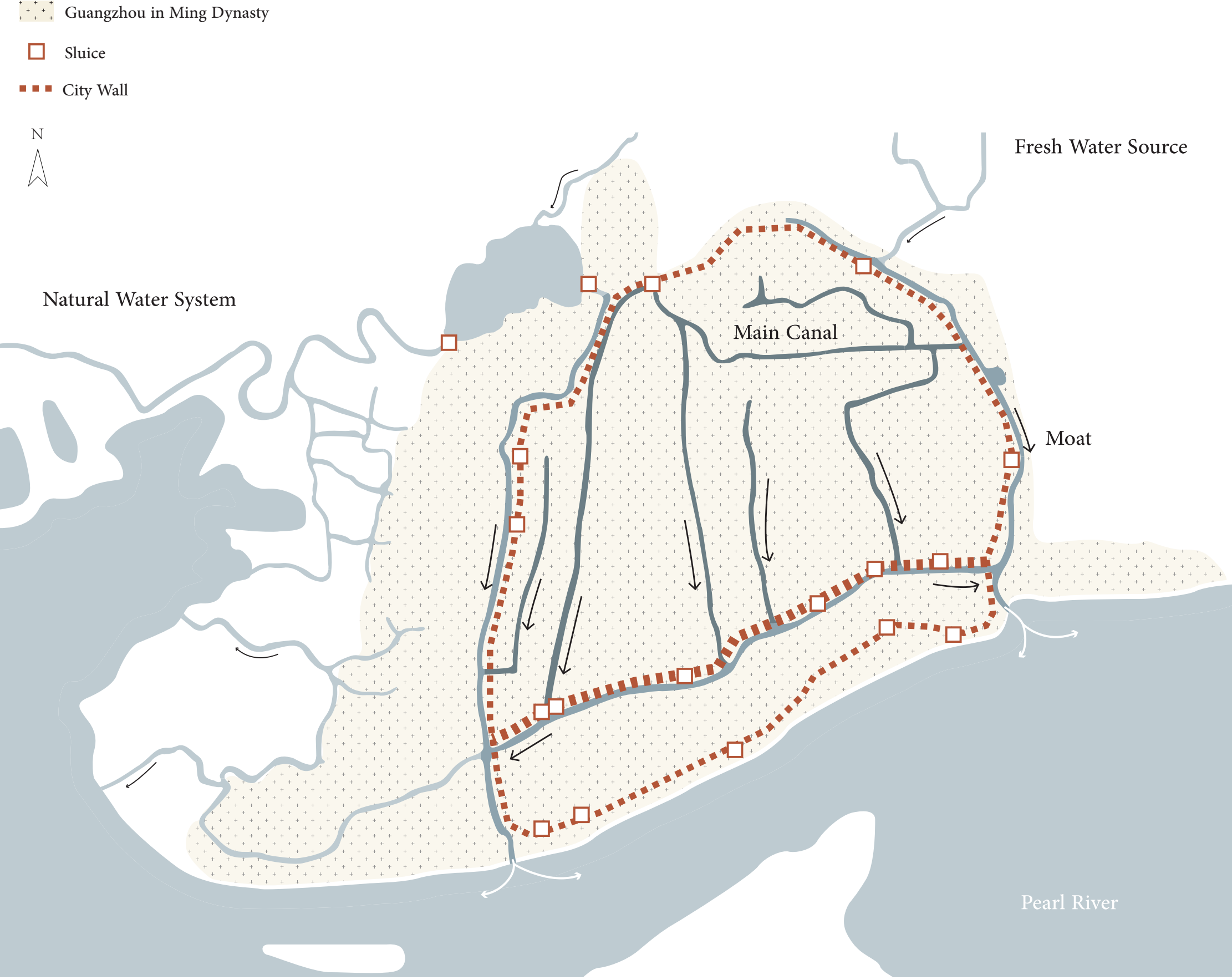
The canal system was originally built as a landscape infrastructure, even though the ancients did not realize it. It was firstly constructed with a royal garden to drain the freshwater from the mountain. Gradually, with the expansion of the city, the canals communicate everywhere, and it closely connects to people's daily life.

The development of a city cannot do without water. Therefore, sufficient water source has become one of the important prerequisites for city location. To study the evolution and development of urban water system in Guangzhou, we need to deeply understand the current situation of urban water system; to understand the current situation of urban water system, we must fully understand its formation and development history, as well as the development and evolution of urban spatial structure and the characteristics of ecological environment in different historical periods. The water system of Guangzhou runs through the history of urban development, bearing various cultural and needs, including urban space, ecology, military, transportation, culture, etc., presenting the social, natural, economic and other values of the whole city in an all-round way. It can be seen that a comprehensive review of the evolution history and related governance process of water system in the main urban area of Guangzhou, and then a summary of the status and elements of water system development in different periods, will help to provide reference for the renovation of water system landscape in modern Guangzhou.

Figure 4-1 Development of Historical Canal in Guangzhou, Drawn by Authur

“Connect the waterways into a network, and let the water flow in its own way.”

To deal with the flooding and the lack of freshwater, there are four main hierarchies in the canal system. The street drainage collects the rainwater into the six main canals at the center of the city. Between the main canals and the moat, there are city walls and sluices to control the in and out of the water. The canal system includes the natural water system, the lake, and the wetland. The rainwater lastly flows into the pearl river. The main canal could also store water in drought season.





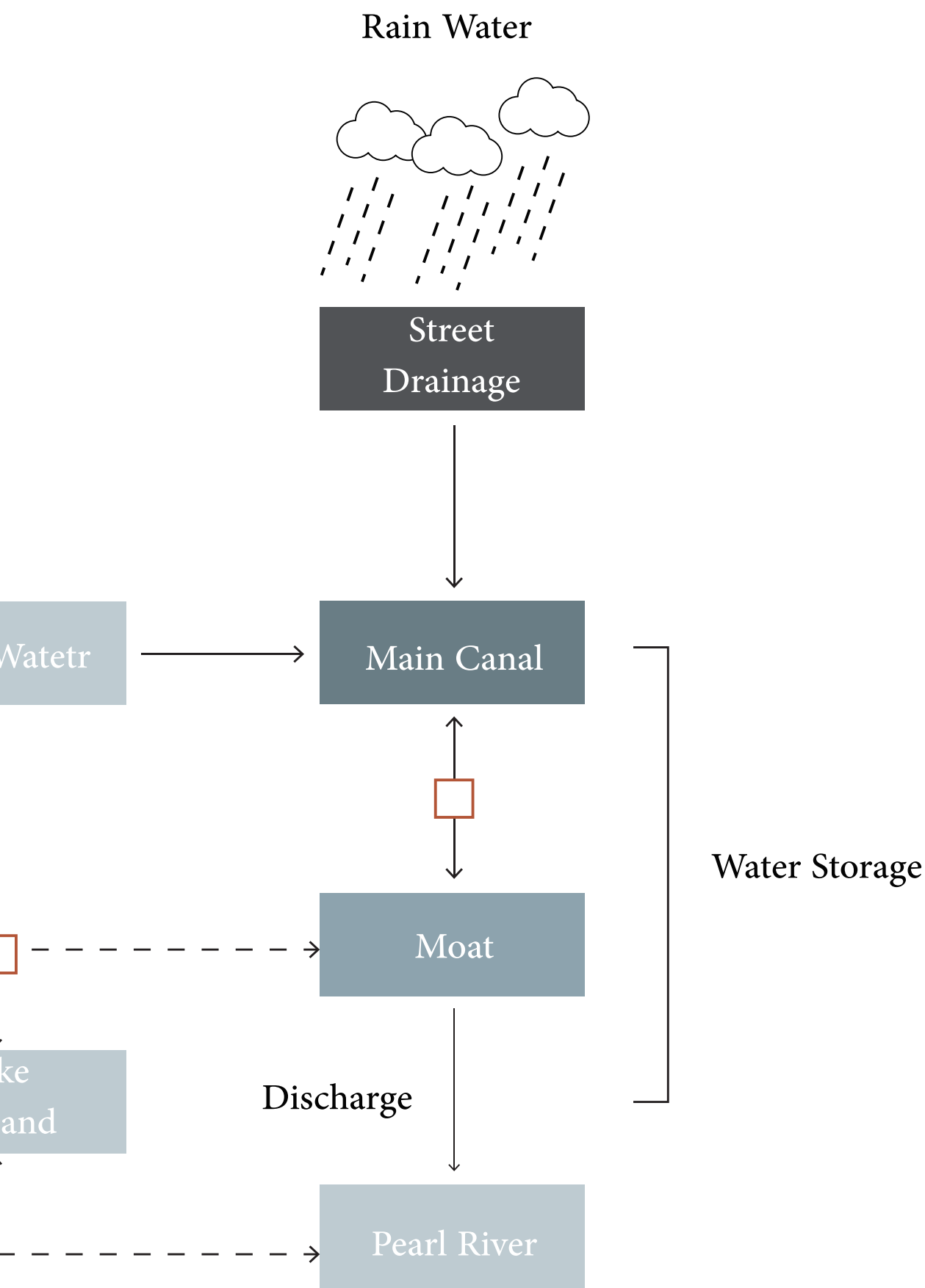


Figure 4-2 Analysis of Water System in History, Drawn by Au-  
thur

North

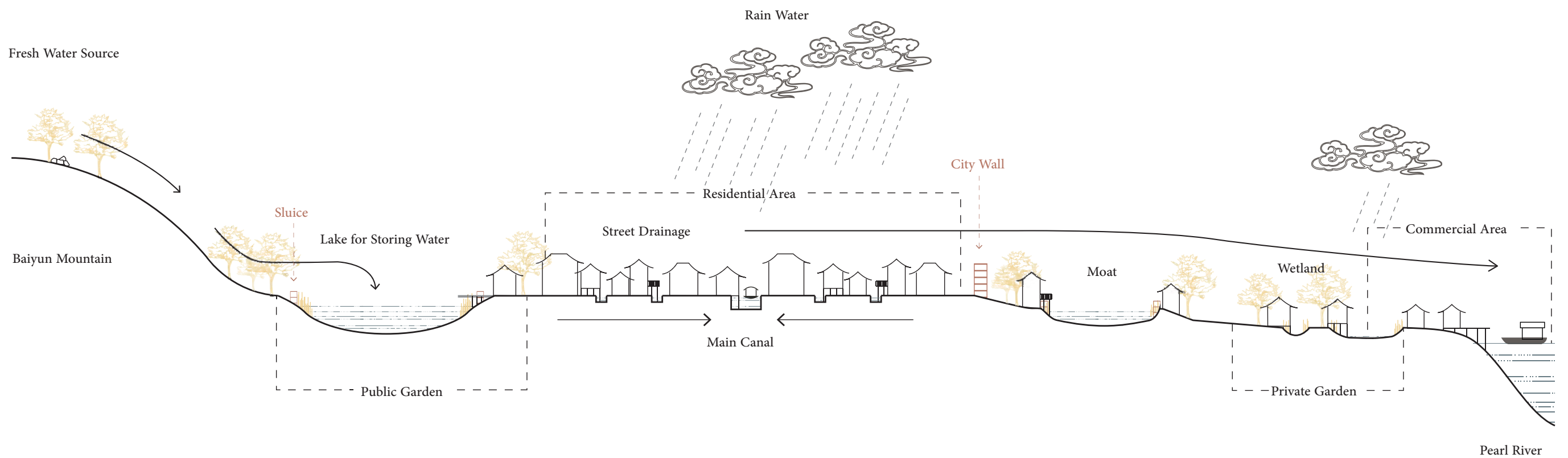


Figure 4-3 Analysis of Water Town in History, Drawn by Authur

This section shows that the canal system was constructed based on the terrain, and the city was built upon it. The residential area was built with the street drainage and the main canals, and it forms a characteristic canal area, private gardens located in the suburb with a nice natural landscape.

The water system landscape of the ancient city of Guangzhou mostly relies on the formation and development of water systems, not only extending along with the linear water systems such as rivers, creeks, and rivers but also along the shorelines of lakes and ponds. The landscape composition relationship between urban space and canal system presents the development of different functional forms. As water forms streets, cities, and gardens, it provides rich and profound water landscape forms for the ancient city of Guangzhou.



# 1. Introduction

## 1.2 Water System

### -Imperial Garden of South Yue State (204 B.C.)

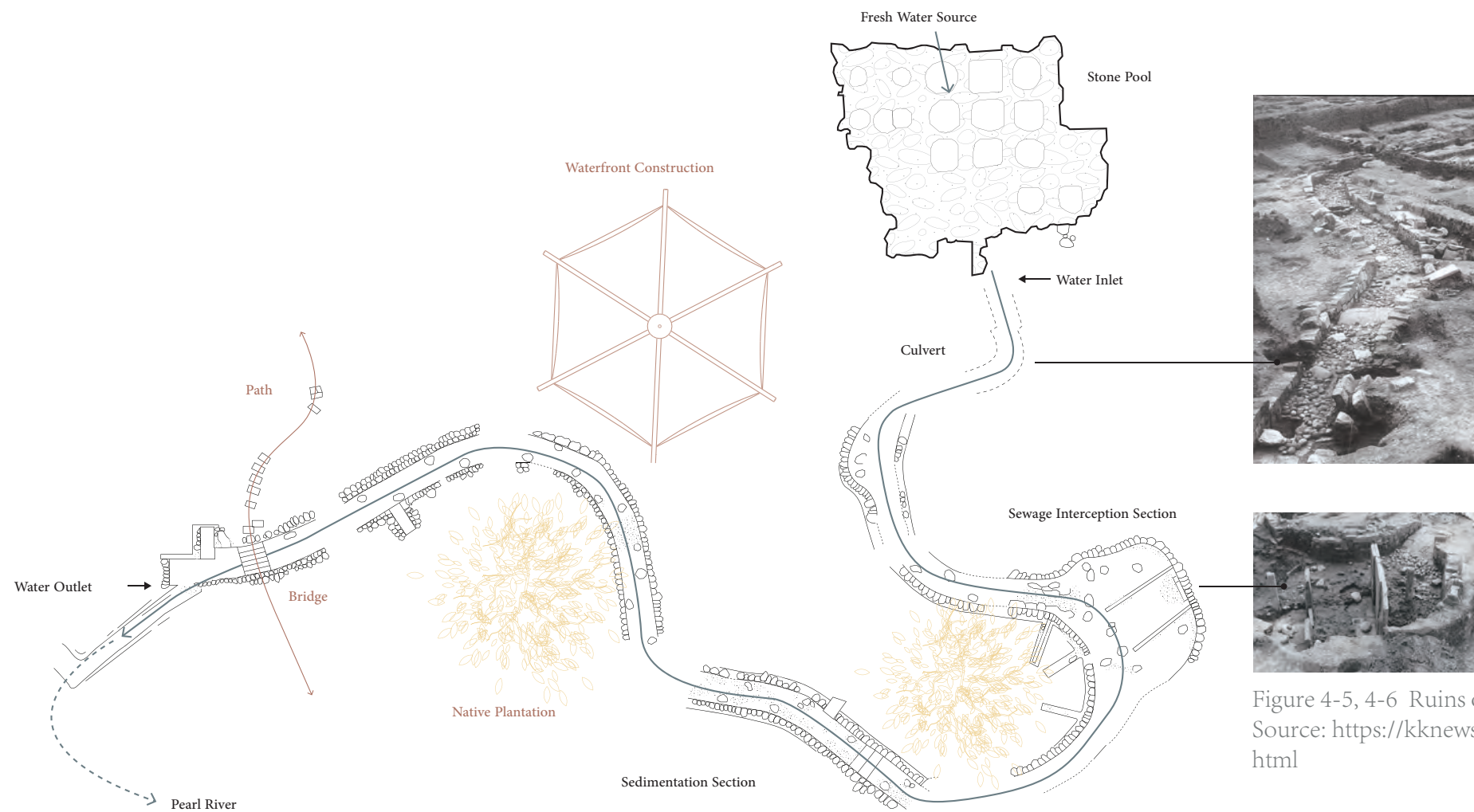


Figure 4-5, 4-6 Ruins of Imperial Garden  
Source: <https://kknews.cc/zh-my/culture/zkeg64l.html>

Figure 4-4 Imperial Garden of South Yue State, Drawn by Author

### -West Lake in Tang Dynasty (618-697)

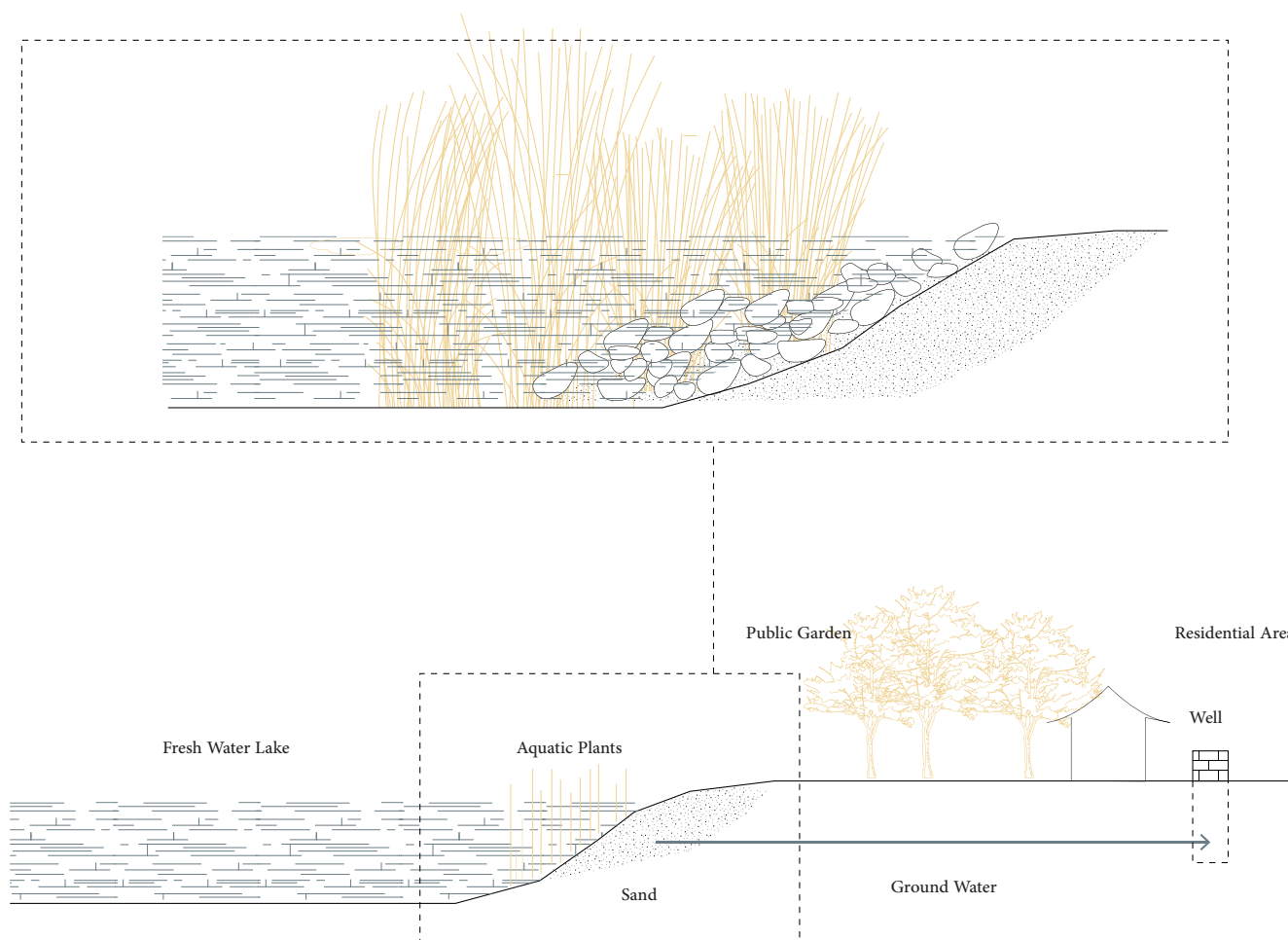


Figure 4-7 West Lake in Tang Dynasty, Drawn by Author



Figure 4-8 Zhou Mao Shu Ai Lian  
Tu by Ying Qiu, Ming Dynasty







## 2. Landscape Type

The location and the formation of these landscapes are strongly related to the geographical condition, the natural environment, and the function of different areas.

Waterfront residential areas, waterfront commercial areas, and waterfront gardens are water system landscape types with significant regional characteristics in the ancient city of Guangzhou. They reflect the organizational relationship between waterfront space and water system in water system landscapes of different functional levels, but they share common water management characteristics, reflecting Guangzhou. The integration of the water landscape of the ancient city water system landscape and the urban water veins greatly enriches the connotation of the water system landscape of the ancient city of Guangzhou, both in terms of regional customs and landscape construction. (Cai Yijun, 2018)

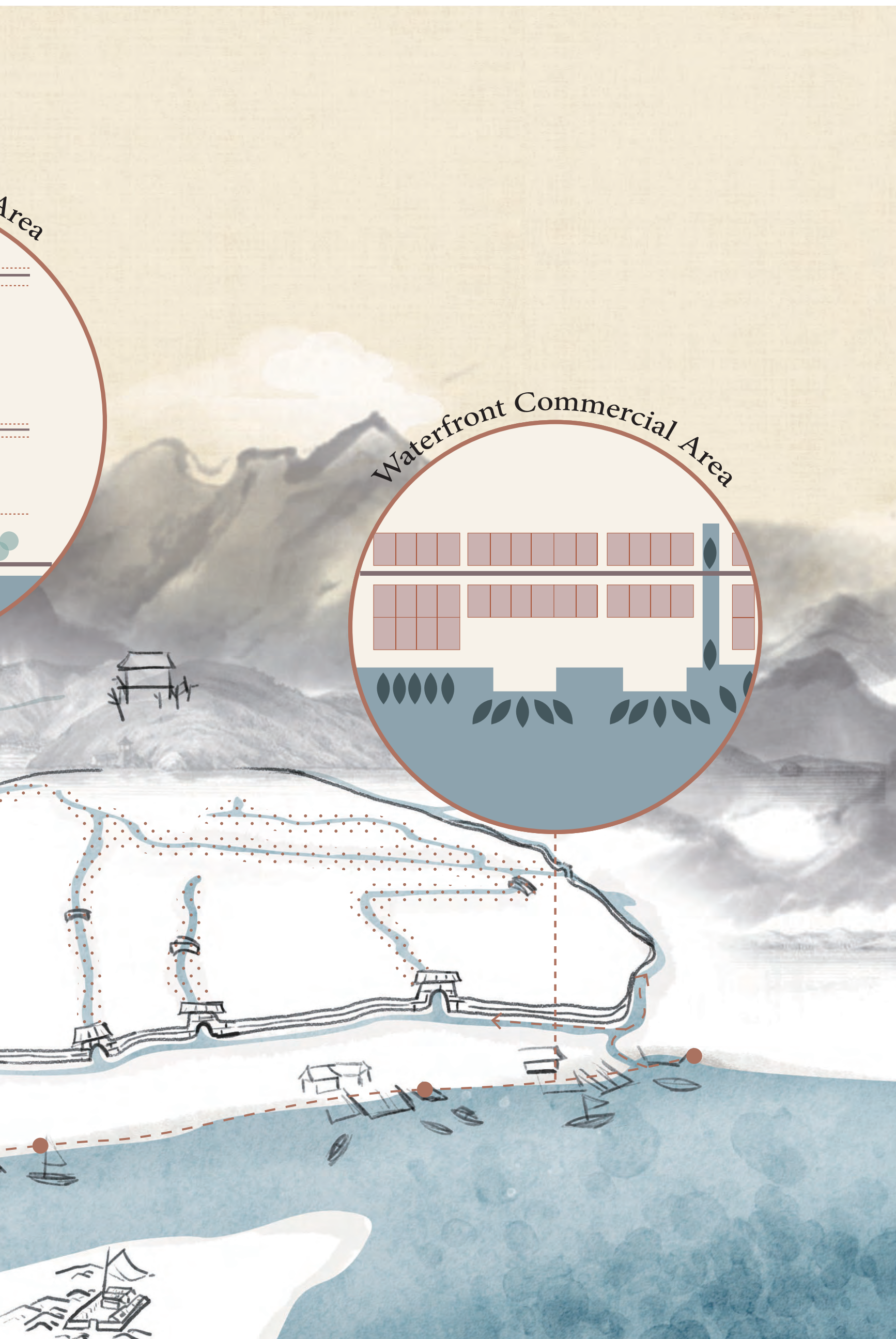


Figure 4-9 Landscape Types of Historical Canals, Drawn by Author



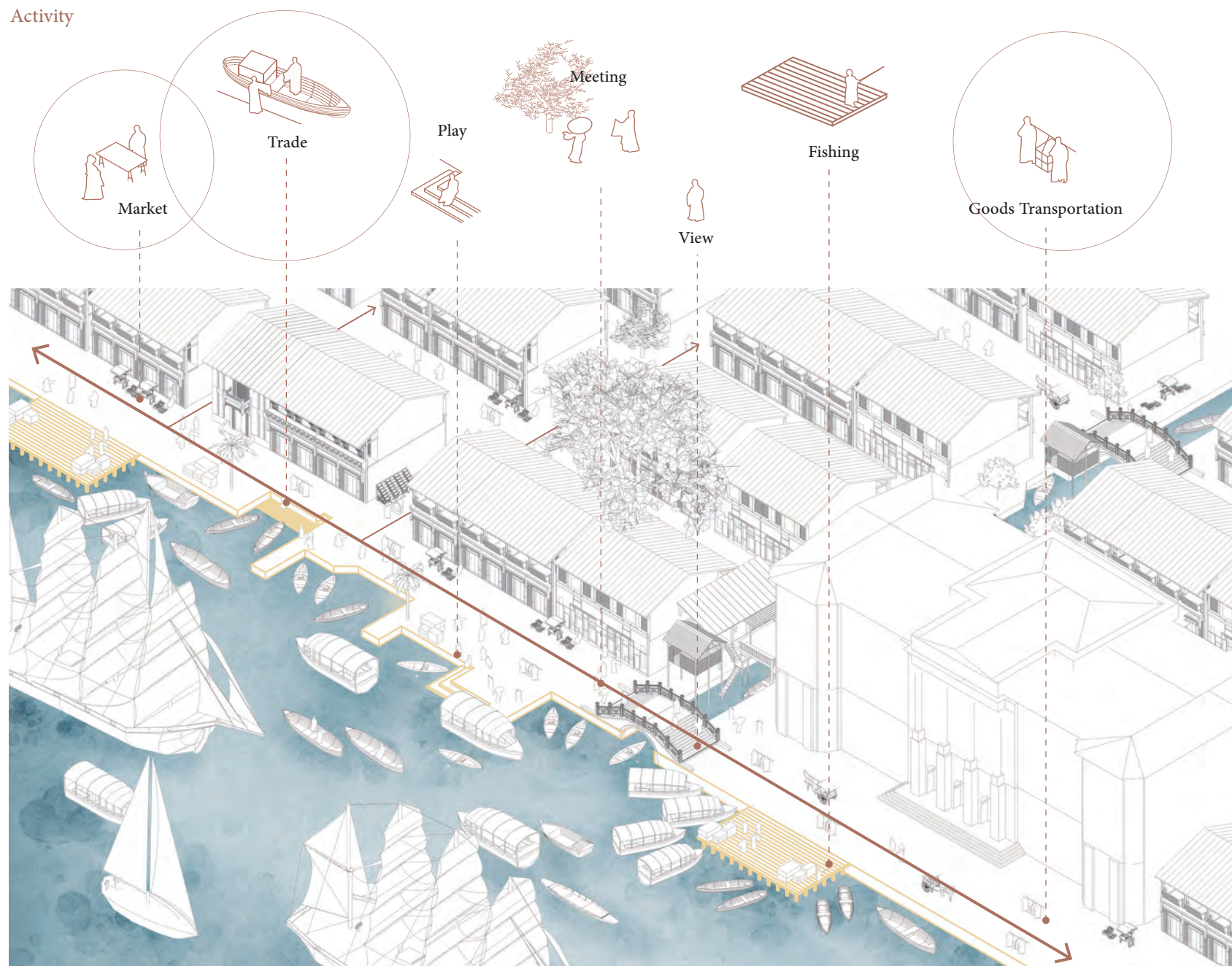
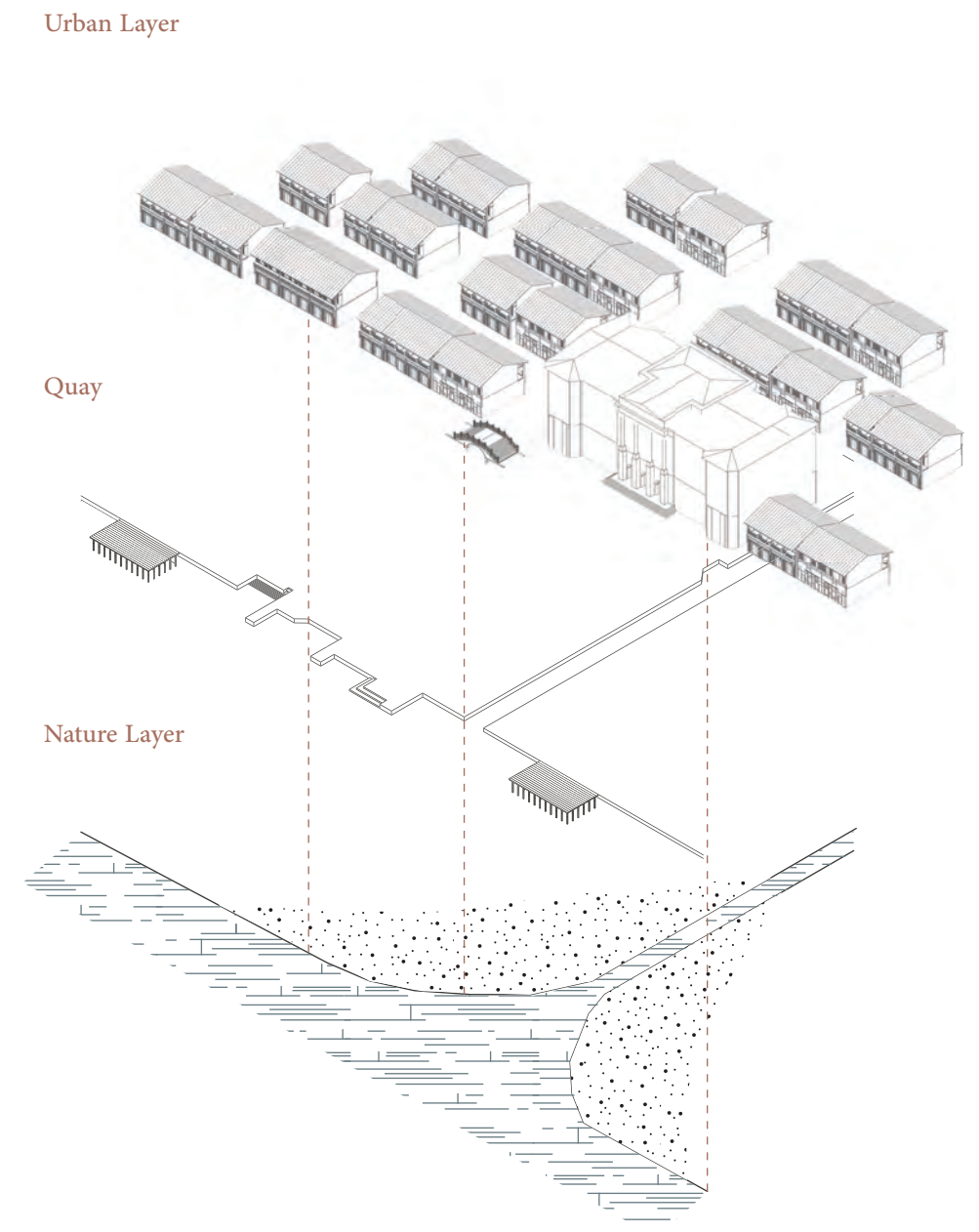


Figure 4-10 Waterfront Commercial Area, Drawn by Authur



The first type is the waterfront commercial area, transformed from the natural harbor with a drainage function. Diverse riverbank and the structural street pattern is it's characteristic.

The water system of the ancient city of Guangzhou is like a network, so water transportation is the mainstay. The city water system supports the city's production and trade functions, which is the lifeblood of Guangzhou's commercial survival. Many strip-shaped waterfront commercial spaces are formed inside and outside the ancient city of Guangzhou, basically relying on the development of ports along the river, along the Pearl River, or the main waterway of the city, which is a long commercial street extending east-west.



### 3. Waterfront Commercial Area

Places of trade activities and culture exchange

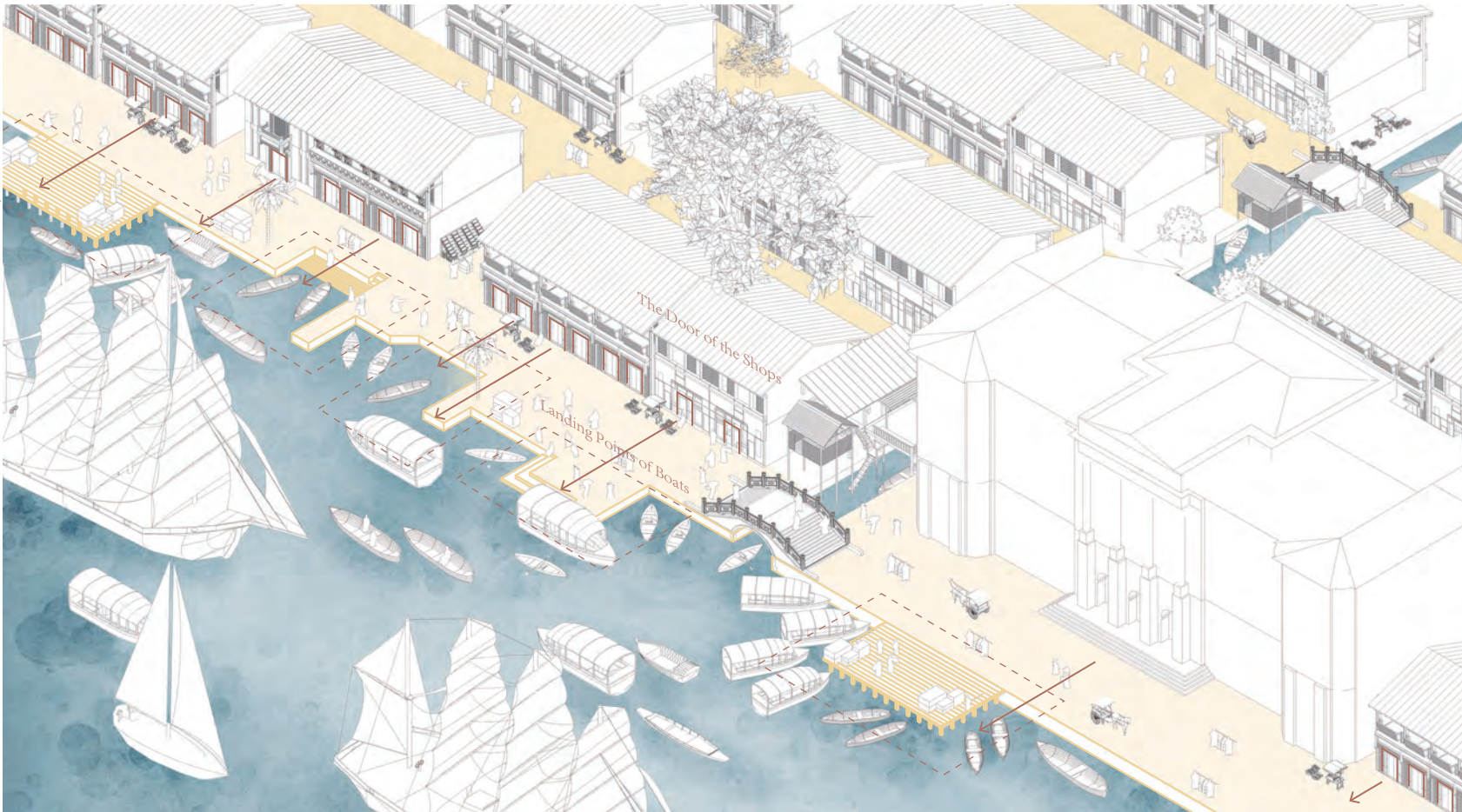
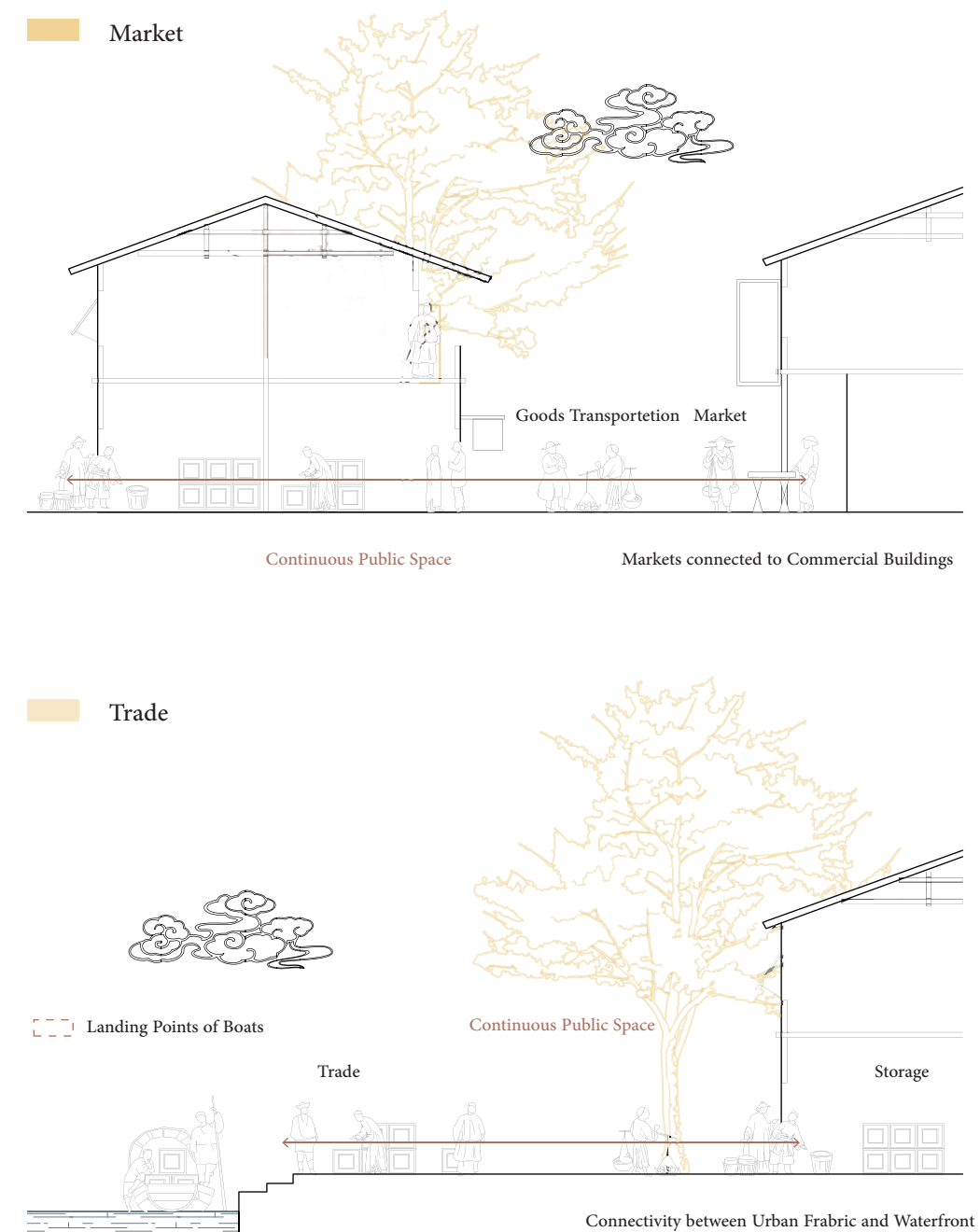


Figure 4-11 Waterfront Commercial Area, Drawn by Authur

It has a continuous public space, where various trade activities happen.

The ancient city of Guangzhou in the past dynasties will silt out beaches due to the southward shift of the coastline of the Pearl River. The construction of docks along the river prospered, and there will be a gathering of shops and shops. First, east-west streets that develop parallel to the river are formed. A few north-south streets perpendicular to the river are used as connections, and the city continues to expand south to form a new commercial water street.





## Various interaction and multiple layers of connectivity between canal and built-environment

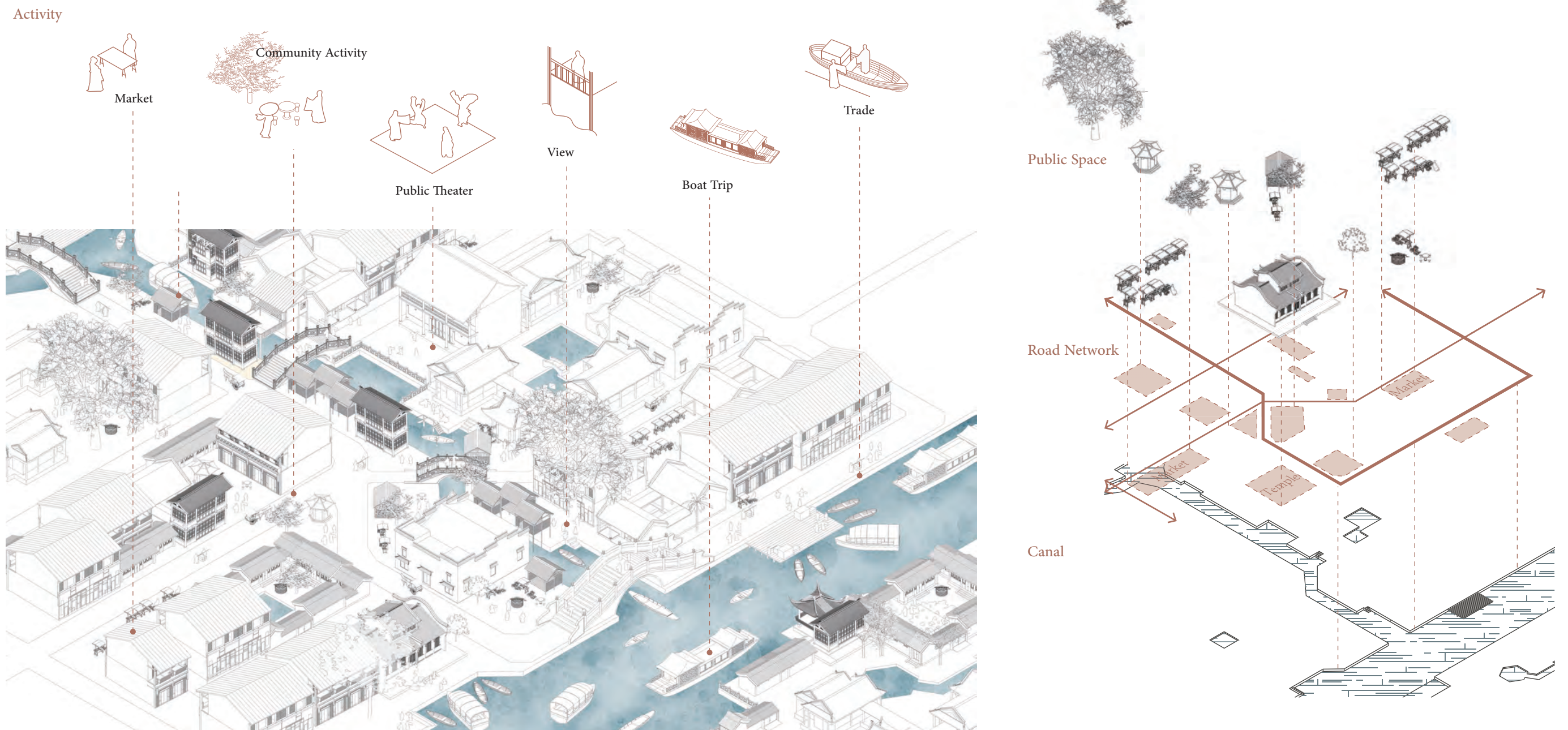


Figure 4-12 Waterfront Residential Area, Drawn by Authur

The second type is the waterfront residential area. Compared with the commercial area, it has a more intense street pattern and public space. The canal is the backbone, the transportation network connects layers of public space. The narrow canal also makes the relationship between people, between built-environment and water more closely.

Waterfront residential area generally refers to the living and residential area near the waterfront. The scope is wider than the water street. It mainly extends along the streets of the inland water system and extends to the inside of the block to form a flaky multifunctional area. It was formed under the development of the water street. The migration of the Pearl River coastline caused the commercial center to gradually move to the southwest. The commerciality of the original water street gradually diminished, and it merged with the surrounding residential areas to form a market-oriented lifestyle. Neighbors and water workshops are full of life.



## 4. Waterfront Residential Area

A part of the water storage and drainage system

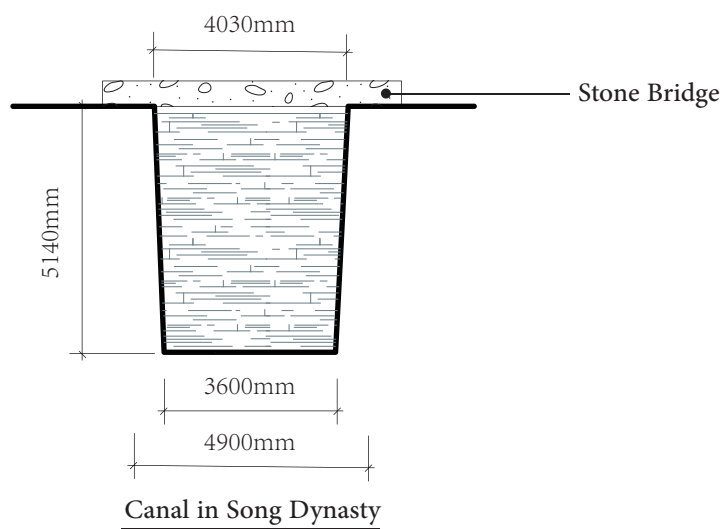
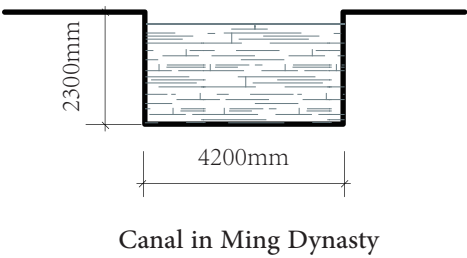
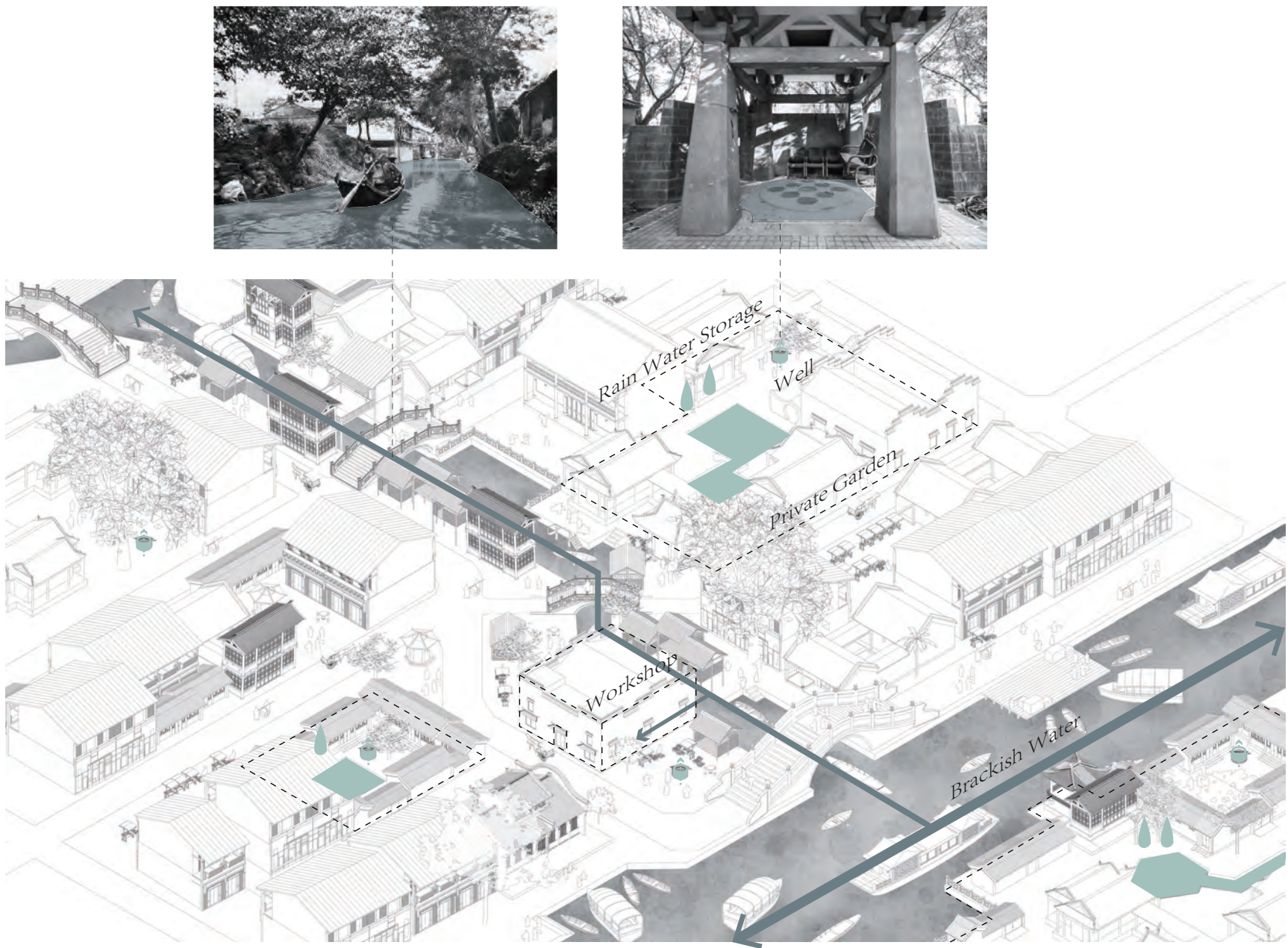


Figure 4-13 Waterfront Residential Area, Drawn by Authur

Connected with the pearl river, the water in canals is mainly brackish. People built wells and retention ponds to get and store the fresh water.

Residential areas in the ancient city of Guangzhou are basically formed along the water system, located between Wenxi and Dongao, relying on the water source of Ganxi for survival.



Various interaction and multiple layers of connectivity between canal and built-environment

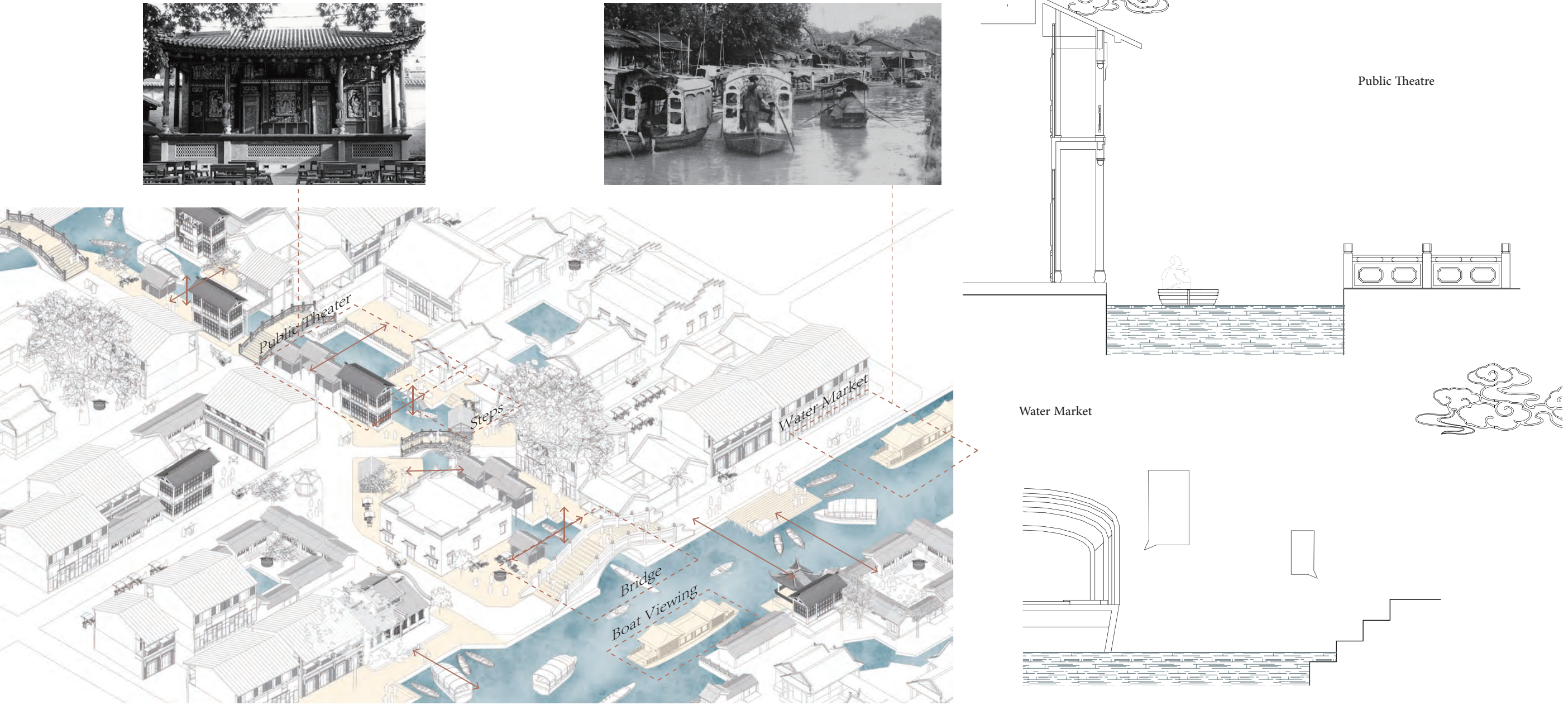


Figure 4-14 Waterfront Residential Area, Drawn by Authur

The built environment with the canal together forms the different lively scene of activities.

The waterfront residential area in the ancient city of Guangzhou are generally first concentrated at the inner harbor-wharf in the middle of the city’ s inner river. Various types of building spaces such as posts, temples, business, and residence centers are formed along the river. There are both streets parallel to the watercourse and perpendicular to the river course. The roadway in the city is an orthogonal water-shop network texture, which expands to form a residential area.



## 4. Waterfront Residential Area

Various interaction and multiple layers of connectivity between canal and built-environment

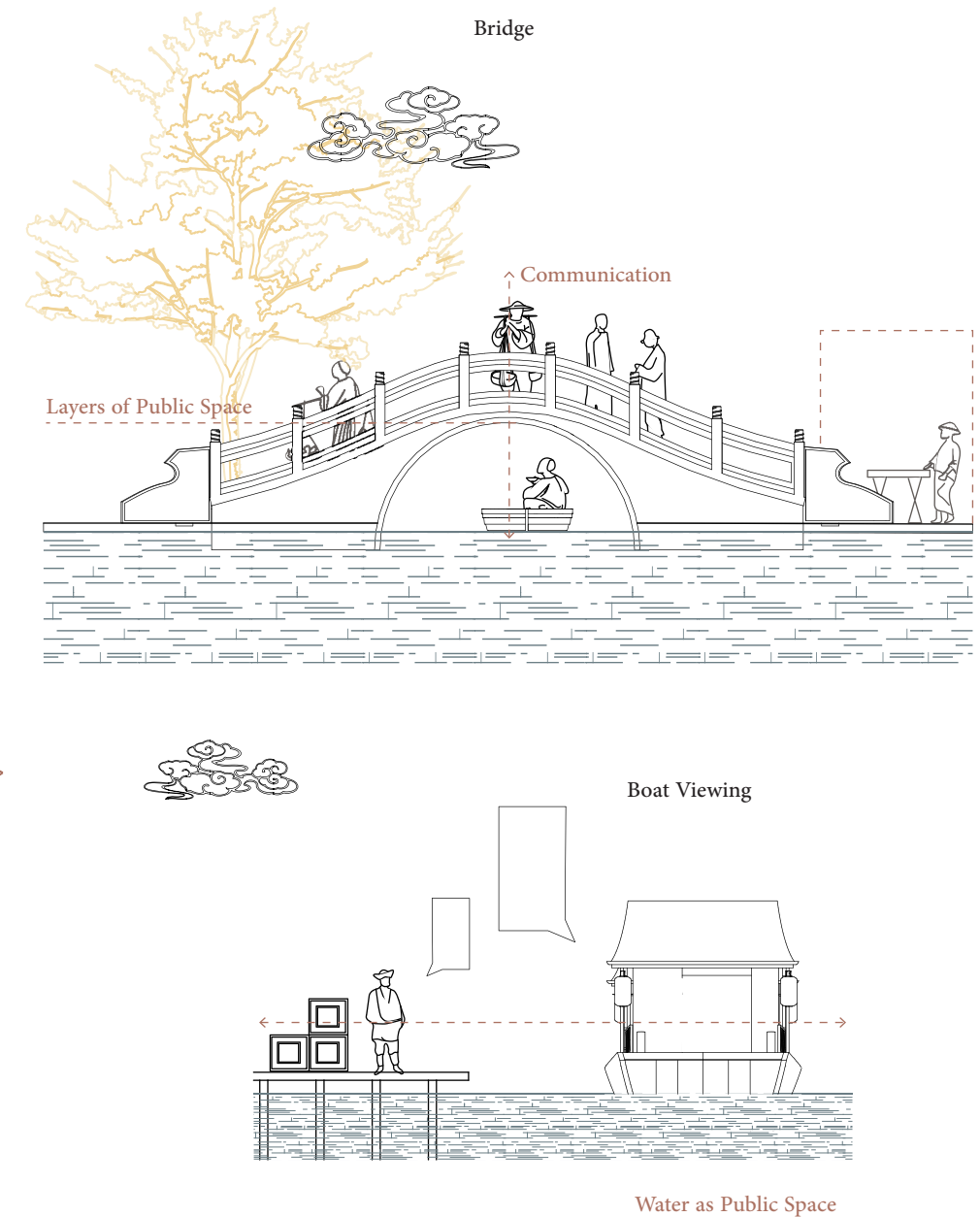
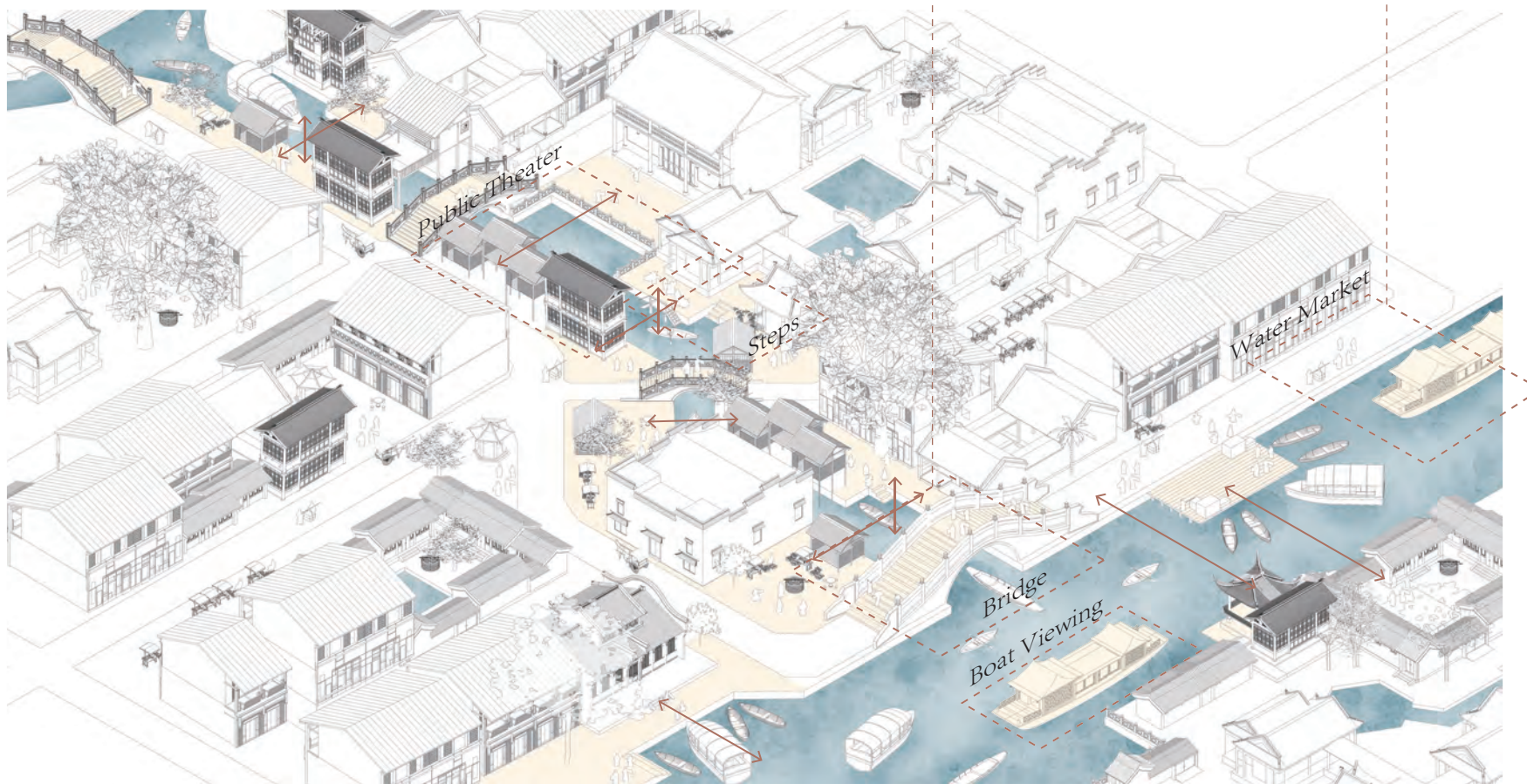


Figure 4-15 Waterfront Residential Area, Drawn by Authur

Different from the restored scene in the Lychee Bay Canal Project I have mentioned. In history, these activities are people's daily life. The public space in the project does not work because it does not involve the residents now when design.

Waterfront residential area is more abundant. Not only are there many buildings standing next to the water, but there are also public node spaces such as small piers, stage, banyan trees, temples, etc. at the bridgehead. These bridges, piers, and temples are what people live in public at that time. communication Center.



Harmony of built-environment and nature

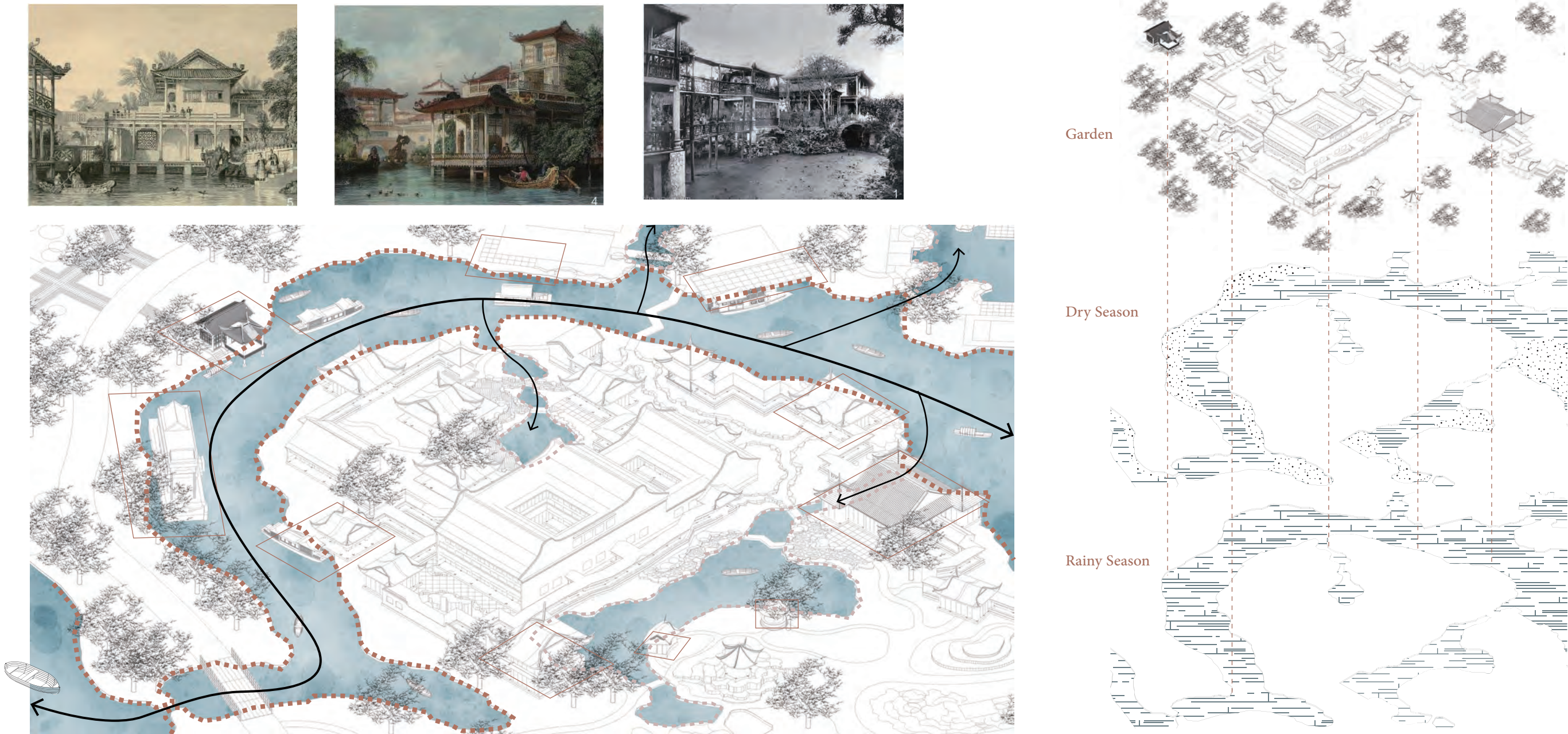


Figure 4-16 Waterfront Garden, Drawn by Authur

The last type is the waterfront garden. There was harmony between the built environment and nature. People can enjoy the view and store or drain the water with this dynamic waterscape.

The ancient city of Guangzhou has the tradition of building gardens due to water since ancient times. Waterfront gardens are the most abundant water system landscape space in the ancient time, mostly distributed around waters. The urban water system of the ancient city of Guangzhou, due to its different distribution topography and water sources, will form different regional water system forms, each with its natural characteristics of the water system, which have the same diachronic and sustainable ecological characteristics.



Harmony of built-environment and nature

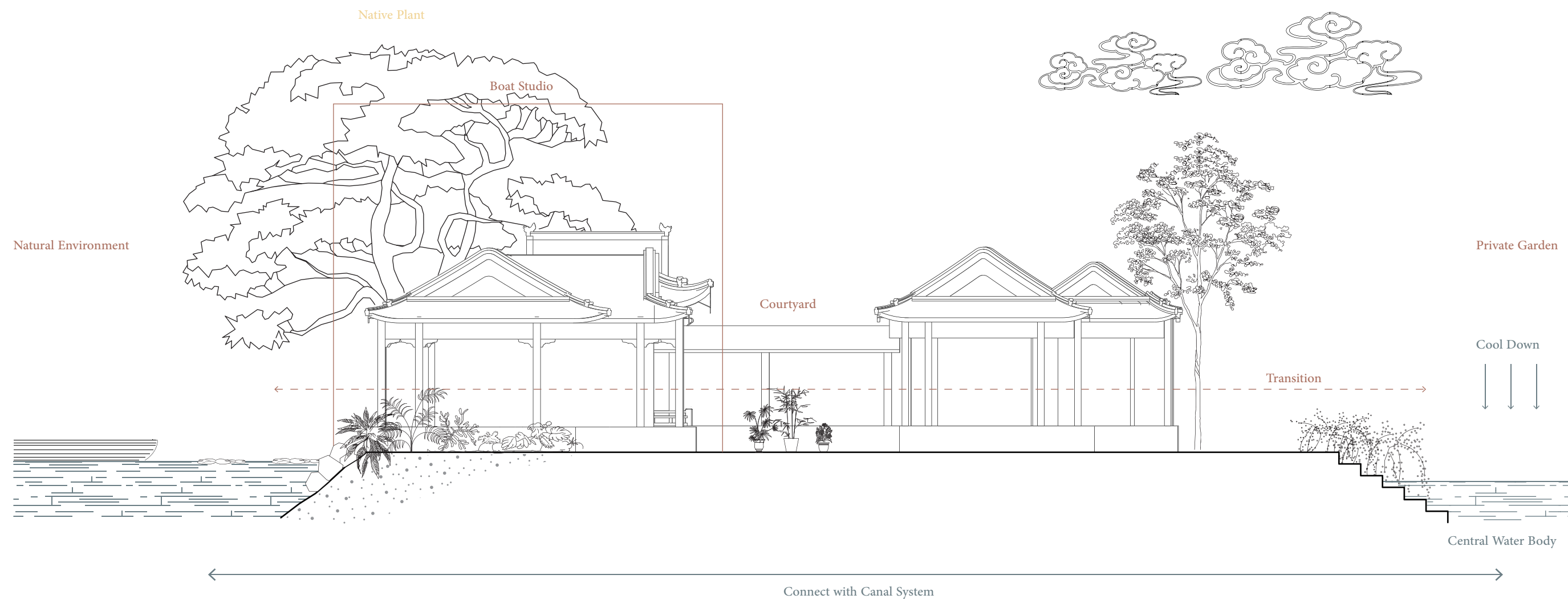
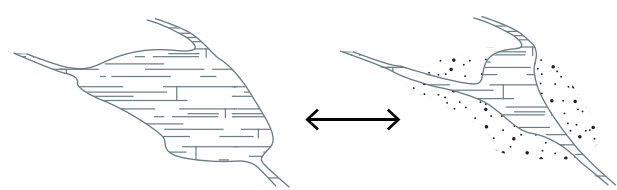


Figure 4-17 Waterfront Garden, Drawn by Authur

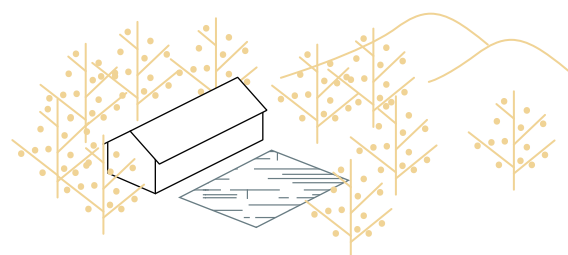
The highlight of this landscape is the transformation between the public garden and the private garden. People make use of the native plants, the central waterbody, and form of construction to create a pleasant micro-climate.

There are dense river networks in the suburbs of the ancient city of Guangzhou, so the owners often use the original water system resources to excavate ponds to build gardens. Lingnan gardens are mostly a combination of living space and courtyard space. Therefore, the setting of the water garden can adapt to the needs of the Lingnan regional climate. At the same time, Lingnan regional flowers and trees will be planted around the water garden. The water yard is connected to the urban water system, which not only prevents the living water from drying up, does not easily breed mosquitoes, but also plays a role in reducing temperature and drought during the intense heat, and more importantly, it can drain waterlogging in time during the rainy season. The combination with trees is beneficial to the microclimate in the garden. The adjustment enhances the practicability and convenience of the water court.

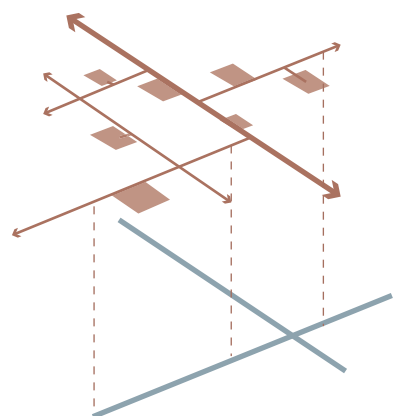
## Landscape



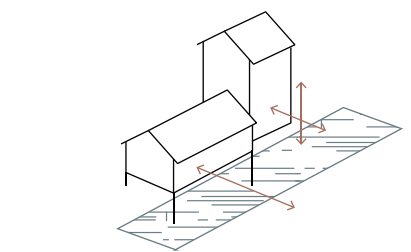
Dynamic Waterscape



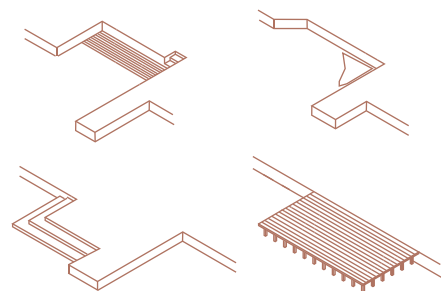
Harmony with Natural Environment



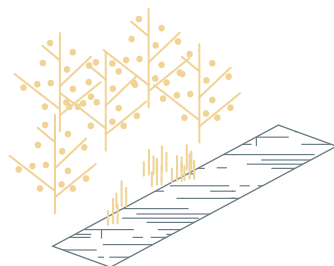
Connectivity of Public Space



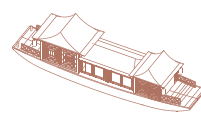
Interaction with Built-environment



Diverse Interface



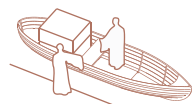
Use of Native Plants



Boat Trip



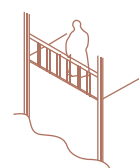
Play



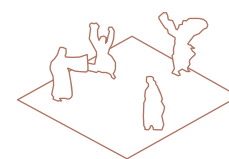
Trade



Community Activity



View



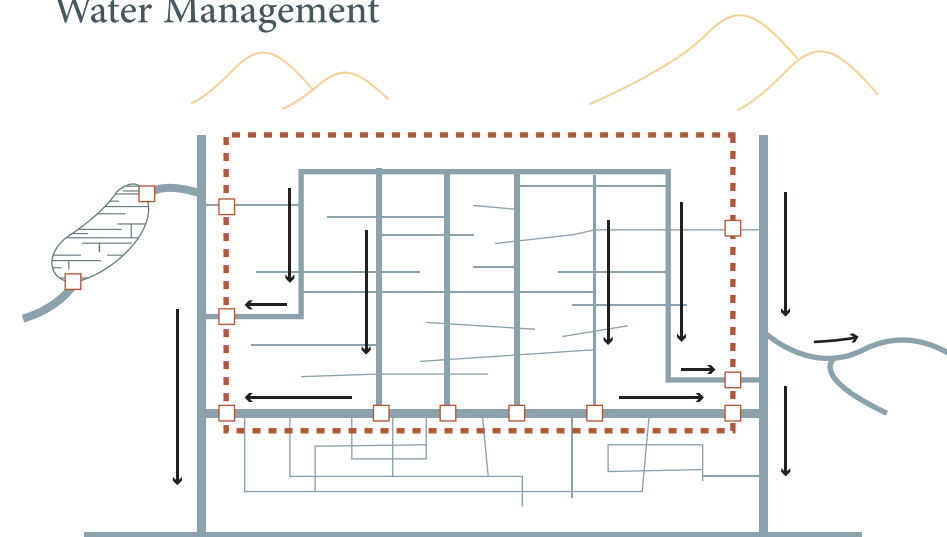
Public Theater



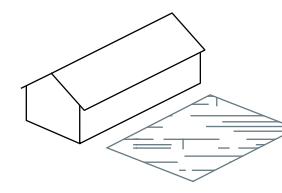
Market

Water as Public Space

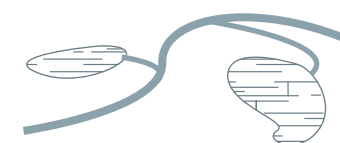
## Water Management



Sysmetic Water Network



Artificial Pond

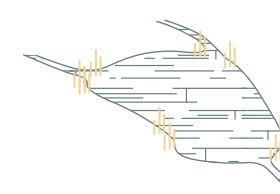


Wetland

Retention Pond



Combined with Garden



Aquatic Plants

Water Purification System

Figure 4-18 Design Principles in History, Drawn by Authur

Therefore, to conclude the design principles learn from history. I divide them into two aspects, the landscape aspect, and the water management.

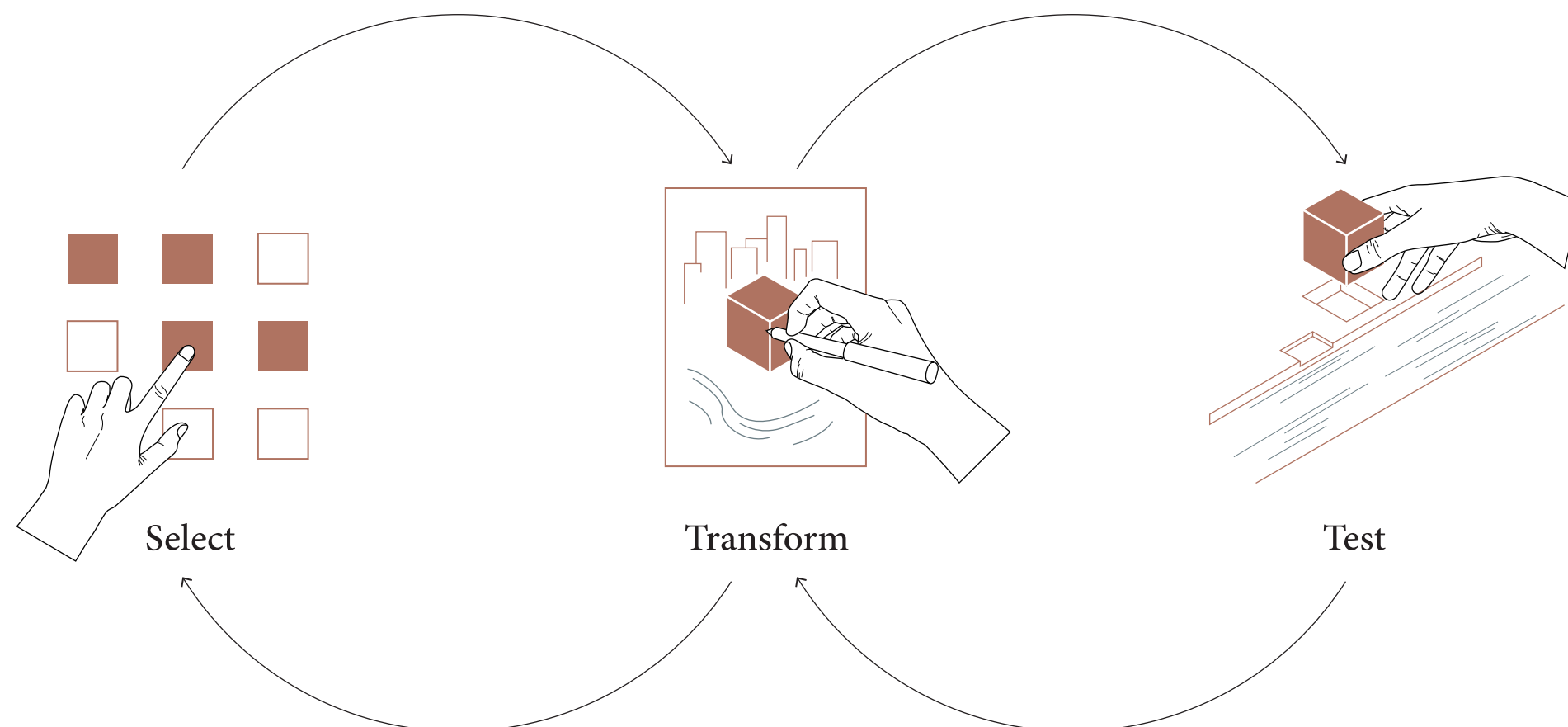
The design principles come from historical analysis. I analyzed the environmental characteristics of different types, how these environments promote the communication between people and water, and this interaction, in turn, affects the formation of the built environment. The main characteristics of landscape aspects are the connectivity of publicspace, and water as public space. As for water aspect, the canal system is the base of the canal landscape.



### How to apply?

There are three steps of application. Firstly, select the suitable principles according to the specific site, and transform them base on the specific condition. Then I can test it in the detailed design. In this back and forward process, the design principles would be developed, and the toolkit for today's situation would be completed.

Figure 4-19 Design Process, Drawn by Authur



# 5

## DESIGN EXPLORATION

### NEW WATER LANDSCAPE INFRASTRUCTURE

In the design exploration part, East Moat was first selected as the typical design of the historical river system in Guangzhou. As a historical moat that has been preserved intact, it has a huge social-cultural value. But at the same time, it also has typical problems faced by historical rivers. The river is isolated by the surrounding urban areas. Even if the river is repaired, it has not established a connection with the surrounding area. The water problem has not been solved. The public space along the river. It is also not well used by surrounding residents. Therefore, the design concept of the East Moat is to make it a zone again. The East Moat works as an urban landscape infrastructure, it has interaction with the surrounding area. The design part focuses on the connection between the city and the river. This design experience will be extended to other historical rivers in Guangzhou, forming a reborn historical river system.







Strategies

- To redefine the historical canal as landscape infrastructure

City Scale

Canal System

- Water System: Flooding/ Circulation/ Purification
- Public Space: Renovation of historic inner-city

District Scale

Lychee Bay Canal

- Canal: Flooding
- Canal Area: Rebirth of heritage/ Tourists & Locals

Yudai Moat

- Canal: Underground Canal
- Canal Area: Lost of local identity

East Moat

- Canal: Water purification/ Circulation/ Flooding
- Canal Area: Accessibiliity/ Heritage/ Public Space

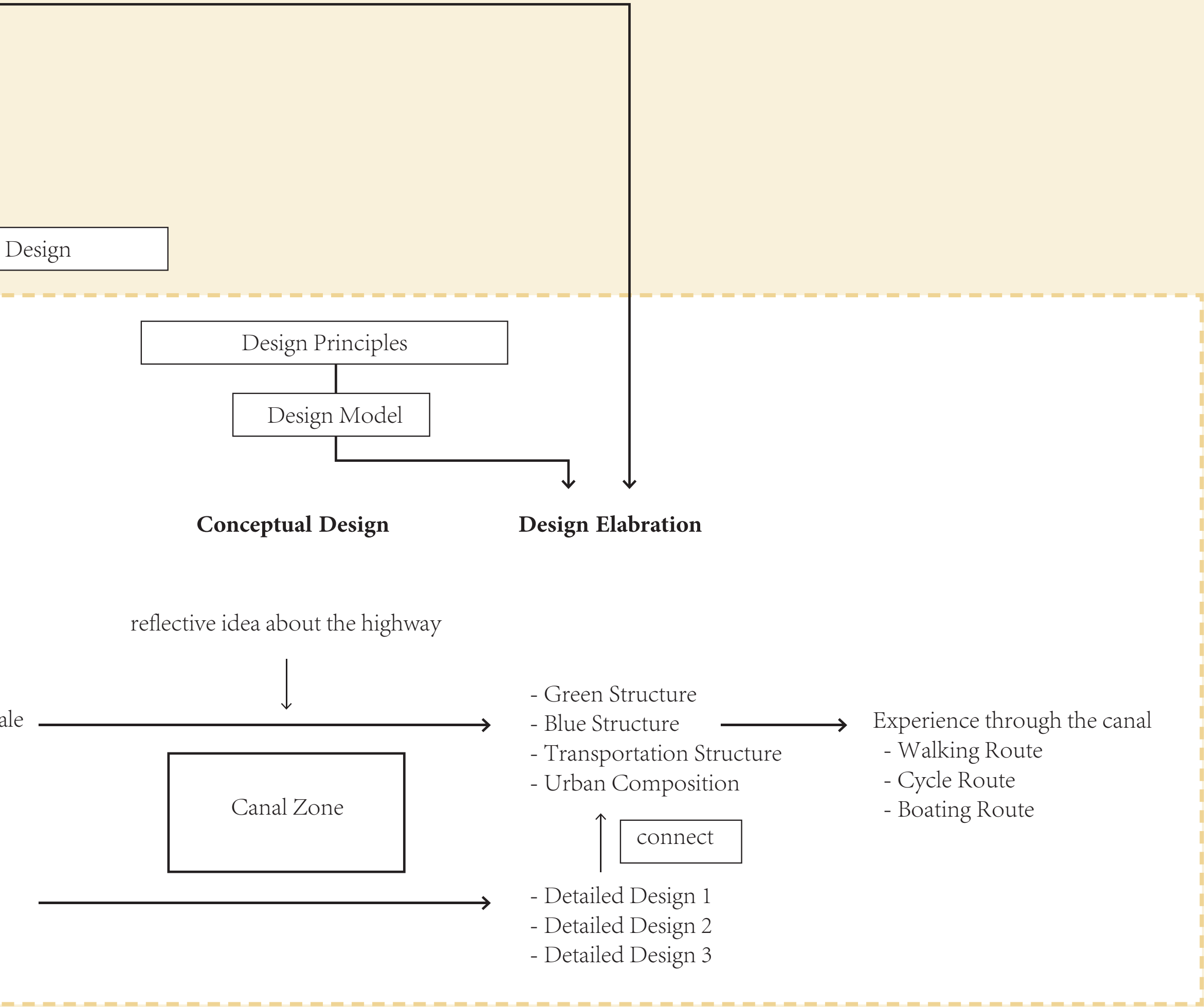
Landscape

Analysis

Regional Scale

Local Scale





# 1. Design Strategy

## Relevant Case Study and Theories Exploration

Landscape Infrastructure

Flowscapes explores infrastructure as a type of landscape and landscape as a type of infrastructure. The hybridisation of the two concepts seeks to redefine infrastructure beyond its strictly utilitarian definition, while allowing spatial design to gain operative force in territorial transformation processes. (Nijhuis et al., 2015)

The potential these infrastructure systems have for performing the additional function of shaping architectural and urban form is largely unrealized. [...] They can be designed with a formal clarity that expresses their importance to society, at the same time creating new layers of urban landmarks, spaces, and connections. (Strang, 1996)

Resilient Landscape

In popular terms, resilience is having the capacity to persist in the face of change, to continue to develop with ever changing environments. Resilience thinking is about how periods of gradual changes interact with abrupt changes, and the capacity of people, communities, societies, cultures to adapt or even transform into new development pathways in the face of dynamic change. (Folke, C., 2016)

It has developed into an approach for understanding complex adaptive systems and serves as a platform for interdisciplinary and transdisciplinary research with an emphasis on social-ecological systems. (e.g., Levin et al., 2013)

Learning from History

Landscape architecture is one of the few arts in which history can be created. "Landscape doesn't have to honor history." Pillaging an "endless bank of history," landscape architects play the role of "critical historians." That being said, these artists of the built environment should "always study history. If they are good, they can then invent their own." (John Dixon Hunt, 2011)

## Design Principles in History

Landscape

Dynamic Waterscape

Harmony with Natural Environment

Connectivity of Public Space

Interaction with Built-environment

Diverse Interface

Use of Native Plants

Boat Trip

Trade

Community Activity

Public Theater

View

Market

Water as Public Space

Water Management

Systemic Water Network

Artificial Pond

Retention Pond

Wetland

Combined with Garden

Aquatic Plants

Water Purification System

New Element

Traditional Element

Adapt

East Moat

To apply the design principles from the historical study, the design principles are combined with the knowledge learned from the relevant case study and other theory exploration. The tool kit is enriched and developed in this process, and the design principles are adapted in this specific site, East Moat.





East Moat is located at the east boundary of the historic district of Guangzhou, connected with Pearl River in the south side and Baiyun mountain in the north side. With long history, it is one of the typical examples of the historic canals in Guangzhou. It can be divided into three parts, the river mouth part, the main canal, and the water source part with Lukwu lake.



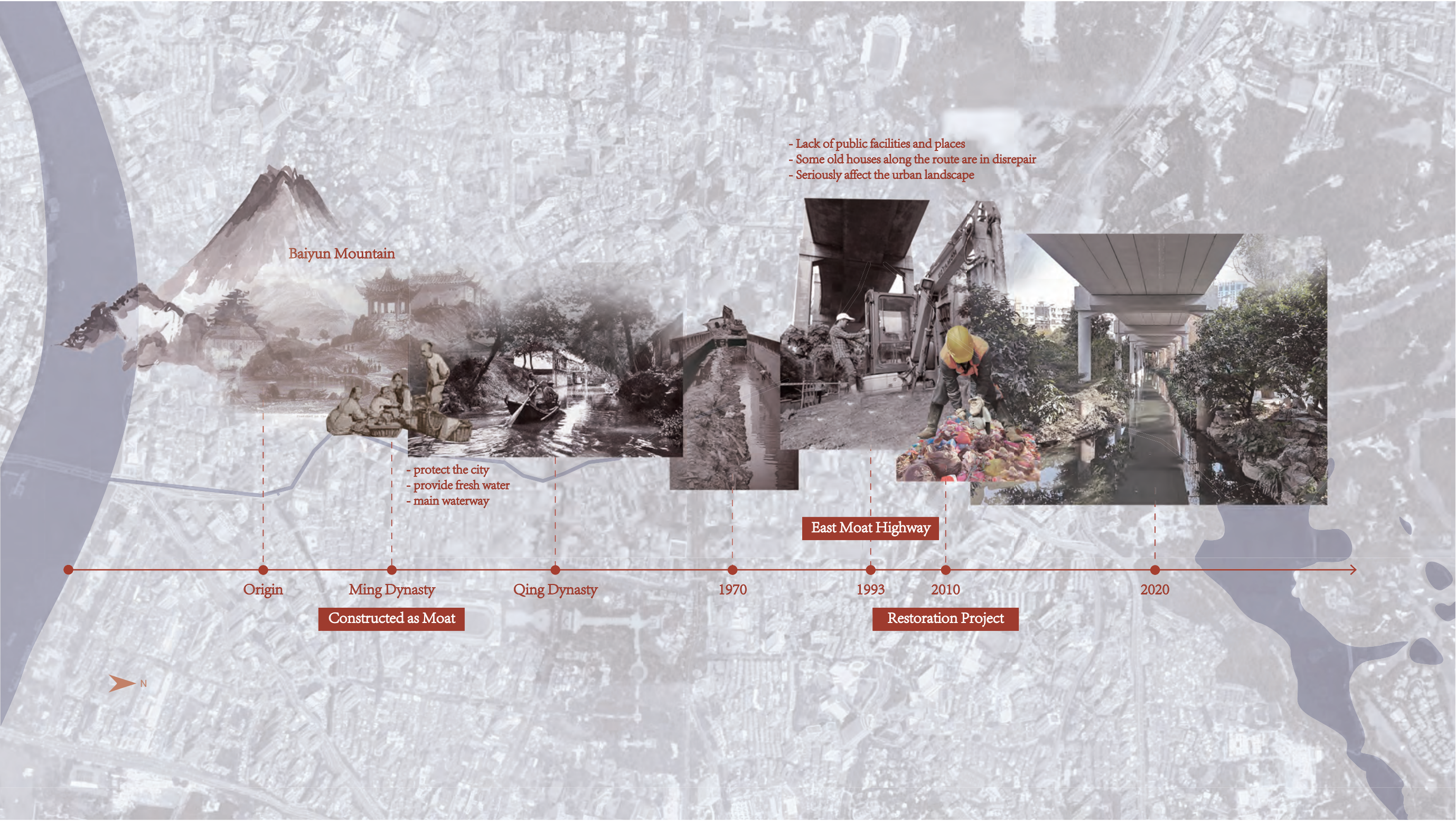


Figure 5-4 History of East Moat, Drawn by Author

It was constructed in the Ming dynasty as a moat to protect the city, provide fresh water, and worked as the main waterway. While, because of the decline of the canal system, water was polluted, the surrounding area was lack of management. In 1993, the East moat highway was constructed above the canal, and it made the condition even worse. In 2010, people began to attempts to renovate the canal.



In ancient times, Guangzhou was a water city with river courses like lanes and water systems forming a network. Historically, East Moat was once a natural tributary of the Pearl River. It originated from the bank of the Luk Lake at the foot of Baiyun Mountain, bordered by Baiyun Mountain in the north, and connected with the water of the Pearl River in the south. During the Chinghua period of the Ming Dynasty, it was excavated as a moat, which has a history of more than 600 years. The original East Moat not only has a wide water depth but also can pass ships. In ancient times, East Moat was 4510m long and 7-11m wide. It was among the best among the many moats in Guangzhou. It was responsible for the functions of defending the city pool, providing water for residents, and serving as the main waterway. To effectively solve the congestion problem in Guangzhou 's old city reconstruction.

East Moat double-deck elevated road was built in 1993. East Moat was buried underground and became a culvert with sewage function. In the ten years since the construction of the East Moat Highway, the entire river course has become increasingly dilapidated. There is a lack of routine maintenance systems on both sides of the river embankment, a lack of public facilities and places, and the lighting and environmental sanitation infrastructure on both sides of the river is imperfect. Some old houses along the route are in disrepair for a long time, and some buildings are in dilapidated condition, which seriously affects the urban landscape.



## 2. Site Analysis

### 2.3 Water System



Figure 5-5 Water System of East Moat, Drawn by Author

In that project, the downstream part has been renovated. The sewage interceptor pipe has been constructed to stop the sewage water drained into the canal. But the waterlogging problem still exists in the surrounding residential area. The upper stream is still suffering from the pollution of garbage and sewage water.

In modern times, due to the reduction of the forest area of Baiyun Mountain, the artificial lake Lulu Lake was built in 1958 to store water, and the water flow of East Moat was greatly reduced. In 2001, to prevent sewage from polluting the water quality of Luhu Lake, the Guangzhou Municipal Government implemented the Luhu Lake Sewage Interception Project. The sewage from entertainment venues, restaurants, and residents around the lake area was changed from being discharged into Luhu Lake District to being drained into East Moat via a sewage pipe. Since then, East Moat has changed from its original function of flood prevention and drainage and water transportation to mainly receiving pollution. Due to the long-term acceptance of untreated sewage directly discharged from the surrounding residential areas, the gushing body causes siltation at the gushing bottom, the water body stinks, and some river channels are even dry due to blockage, and the overall environment is harsh. Increased by 25% in 2003. Facing the increasingly serious problem of river water pollution, the Guangzhou Municipal Government has continuously invested manpower and material resources in remediation since the 1990s. River water pollution has also been controlled to a certain extent, but the remediation effect has not been good.



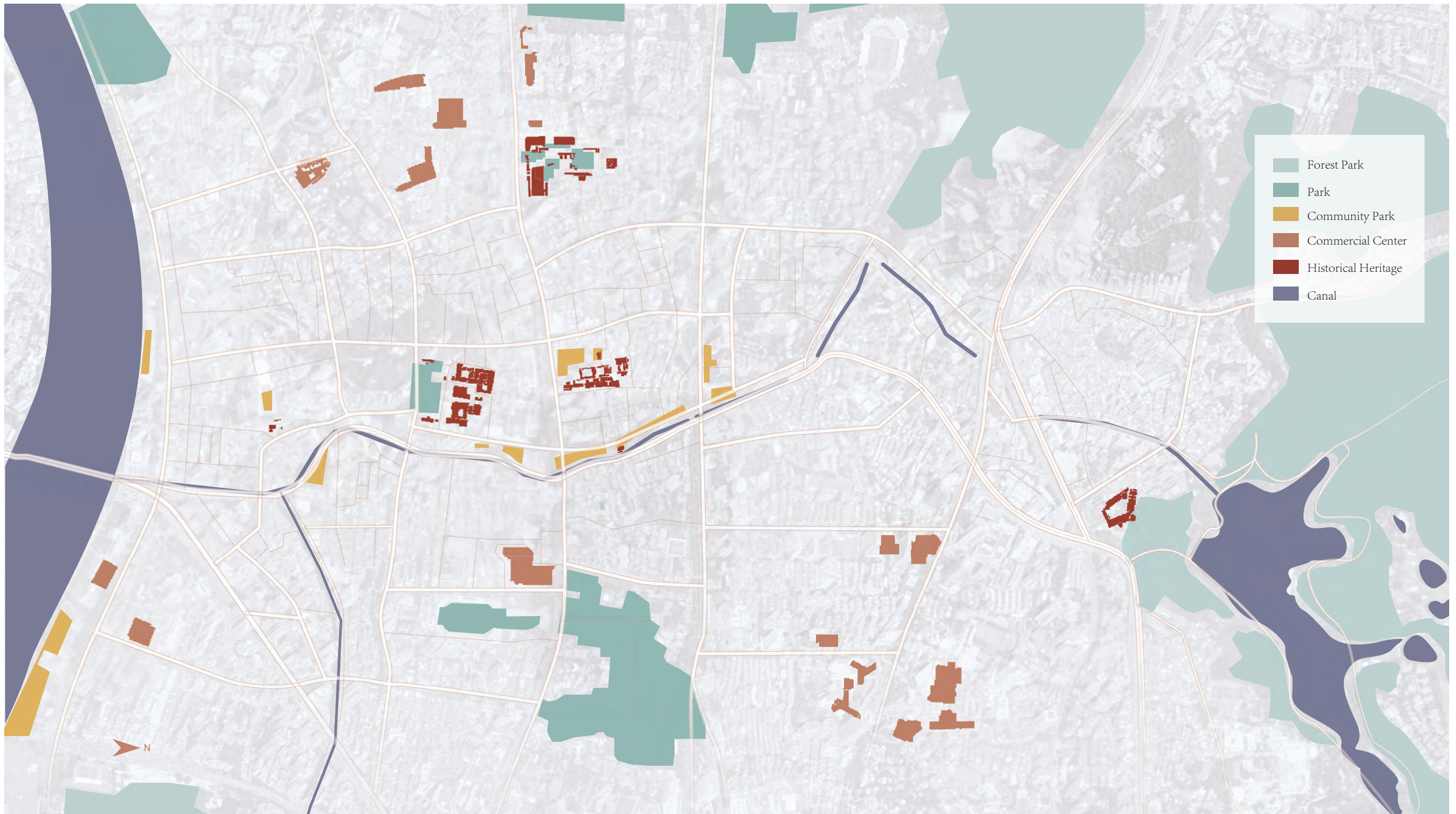


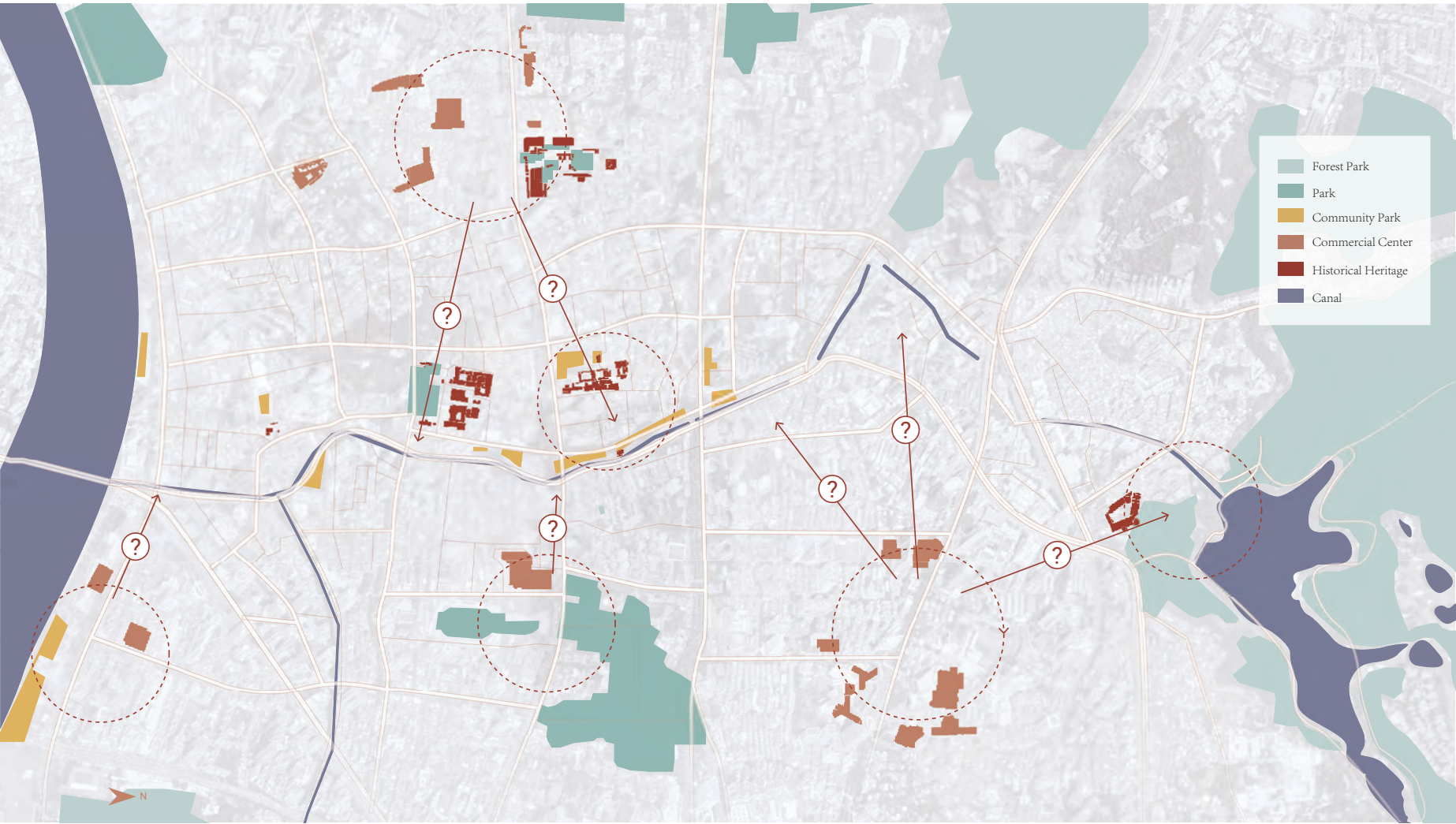
Figure 5-6 Land Use of East Moat, Drawn by Author

As for the land use, the surrounding area of the canal is mainly a residential area, with various fragmented green spaces scattered in it, there is not a continuous green corridor. In the east-west direction, the hotspot of the city, for instance, the commercial center and the center of cultural heritage, are disconnected from the canal, and also there is a lack of green space in the residential area.



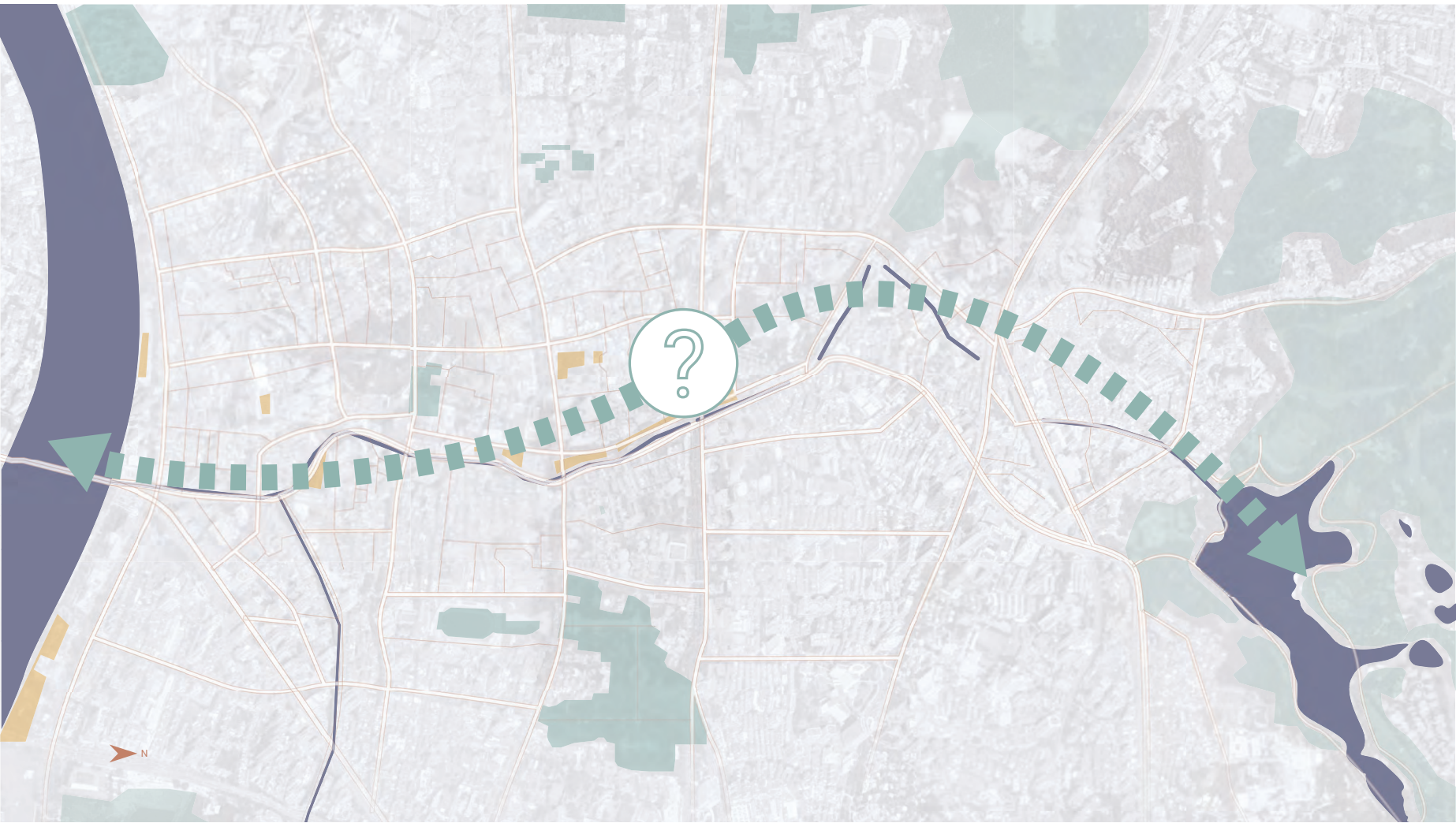
2. Site Analysis  
2.4 Land Use

Figure 5-7 Challenges in Urban Tissue, Drawn by Author



In the north-south direction, East Moat has the potential to reconstruct a green structure that connects the two core green spaces in Guangzhou, Baiyun Mountain in the north and the Pearl River in the south.

Figure 5-8 Challenges in Green Structure, Drawn by Author



The East Moat is located in the middle of two important green spaces in Guangzhou. It is between the Baiyun Mountain, an important mountain green space in Guangzhou, and the Pearl River. It can connect the broken green space around it and establish an ecological green corridor for the communication between the mountains and rivers between the north and the south. In the east-west direction, the green space extends into the residential area, establishing a dialogue between the residential area and the river. Connecting the originally broken green space into a piece, continuous blocks can increase the ecological diversity in it, provide a channel for the migration of animals in the city, and allow ecological exchanges between different green spaces. The current situation is that the surrounding green space is isolated and fragmented. As a historical city center, the area of hard pavement is very high, and there is no communication between different green spaces.

In the first river restoration plan in 2010, a lot of water platforms and green spaces along the river were set up along the river in Dong Hao Chung. However, because these public spaces are not really connected with the surrounding residential areas, they will still be blocked by various roads, fences, parking lots, etc., resulting in these public spaces not being well used by surrounding residents.



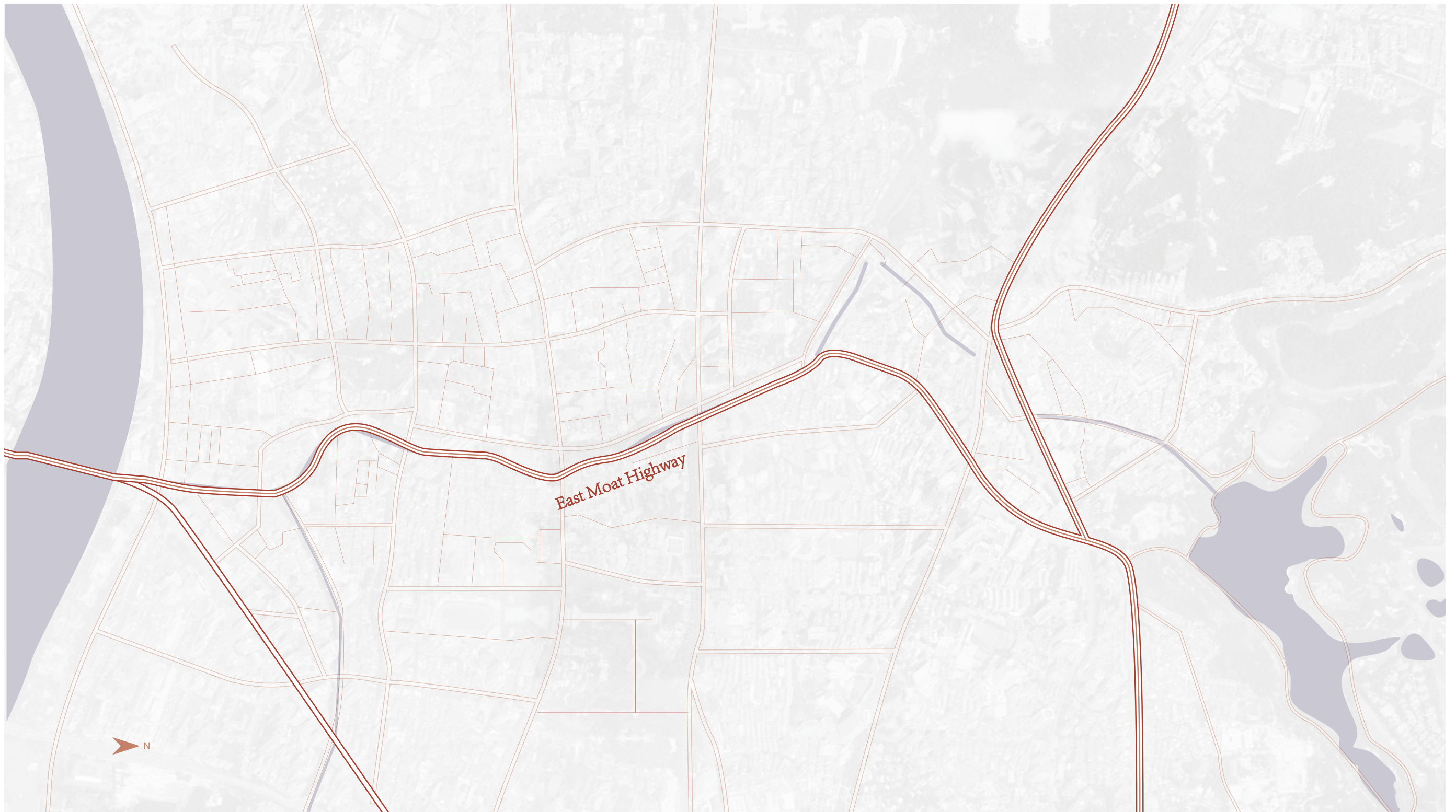


Figure 5-8 East Moat Highway, Drawn by Author

Another important element in this canal area is the East Moat highway, which goes through most of the canal. It makes the canal invisible in the city and also damages the integrity of this canal.



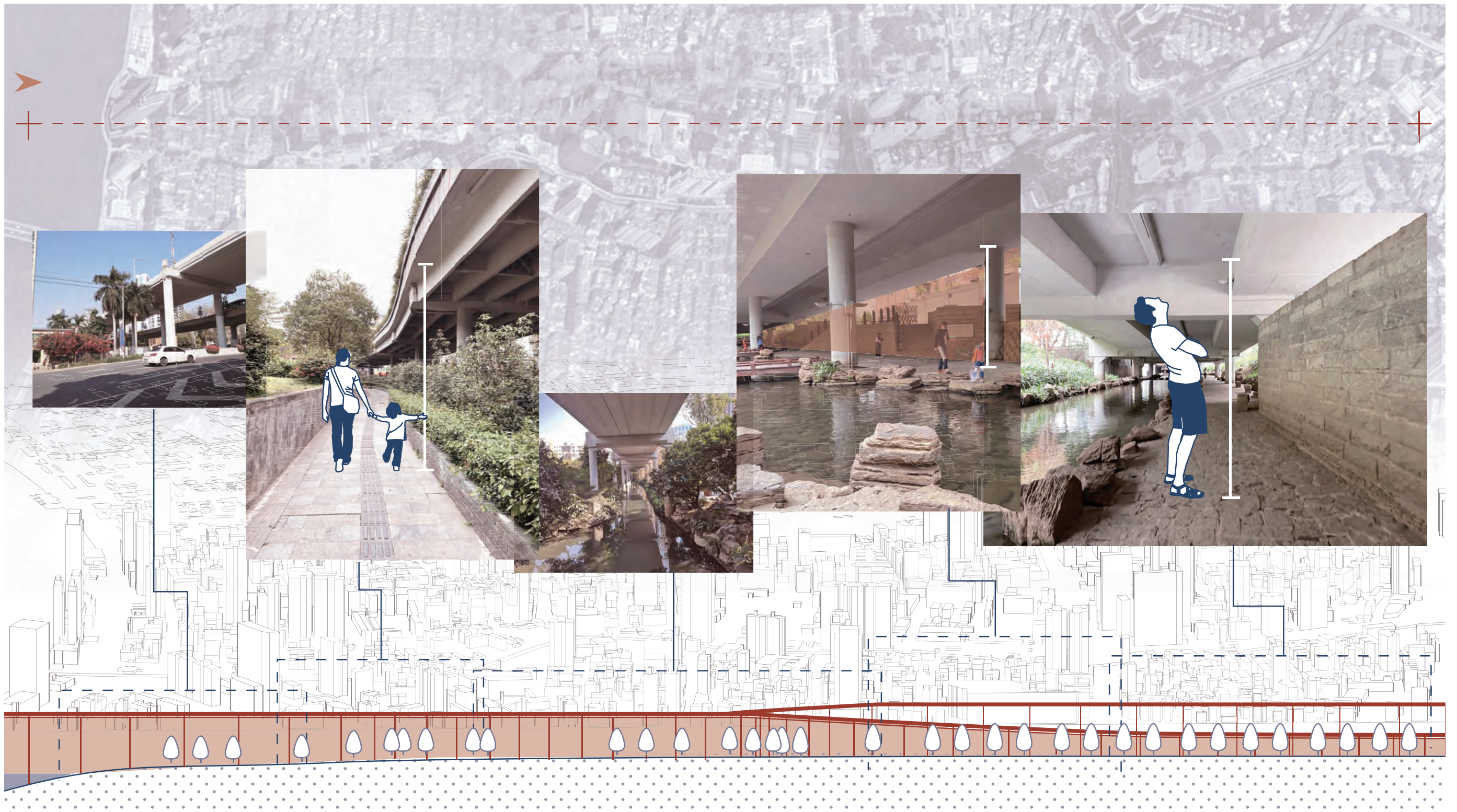


Figure 5-9 Height Changes of East Moat Highway, Drawn by Author

In the vertical direction, the cover of this highway makes the space of the canal always dark and limited. With the highway going into the canal from the Pearl River, the highway becomes lower. Therefore, at the end of the main canal part, the public space there underneath the highway hardly function, giving people a sense of oppression.

The East Moat Highway was constructed in 1993. Since then, most of East Moat Highway has been covered by this highway. The completion of this viaduct has caused the river to be even more neglected by the city and aggravated its status as a stinking ditch for drainage. After the first river restoration plan, the public space along the river was transformed, and many water platforms and open squares were set up on the river bank. However, due to the influence of this viaduct, the space under the viaduct lacks sunlight all year round. In the part where the viaduct is too close to the river channel, people can even reach the viaduct as soon as they reach out their hands. Such a dark and narrow space lead to the public space there being rarely used by people.



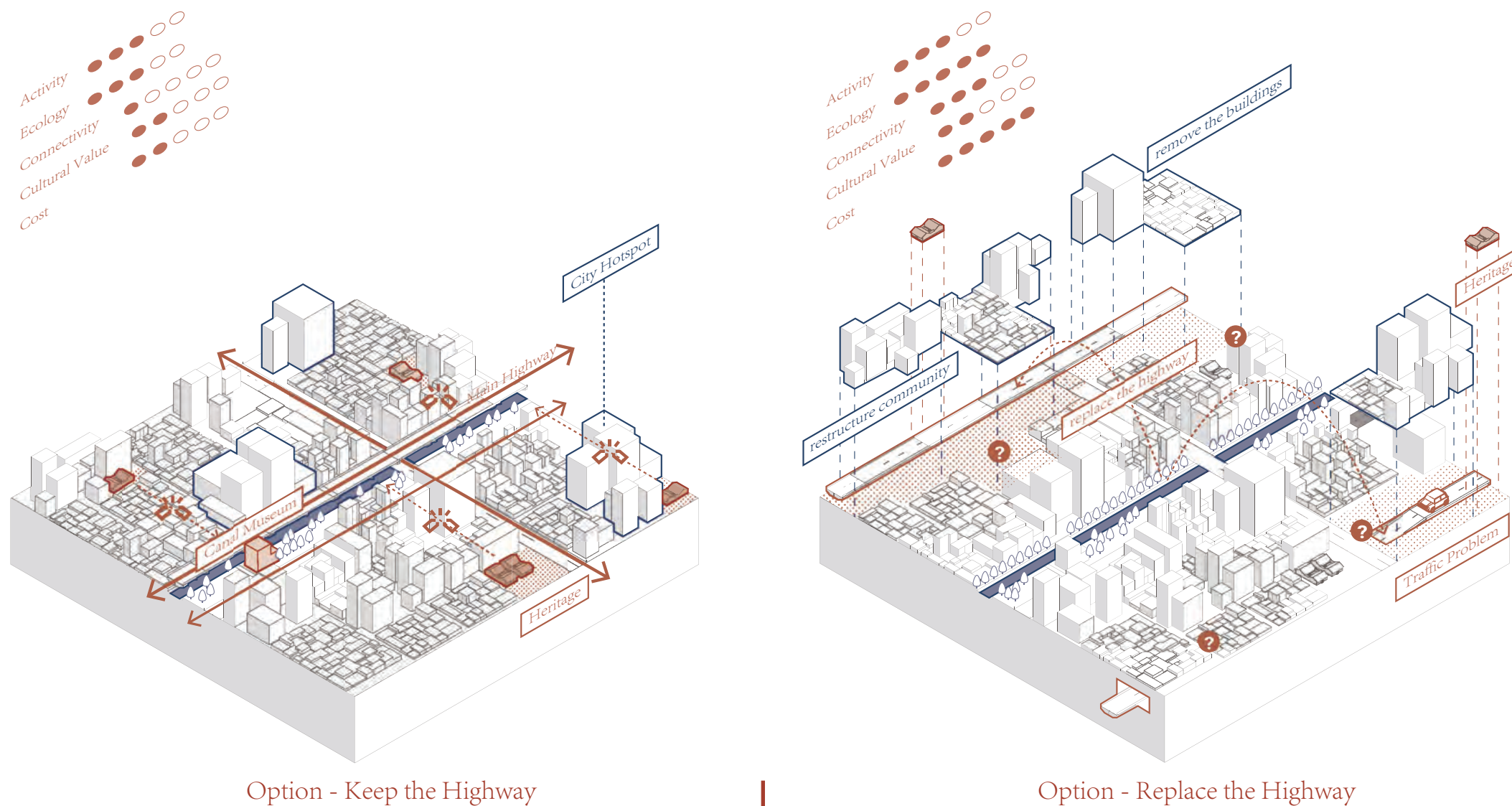


Figure 5-10 Possible Choices for East Moat Highway, Drawn by Author

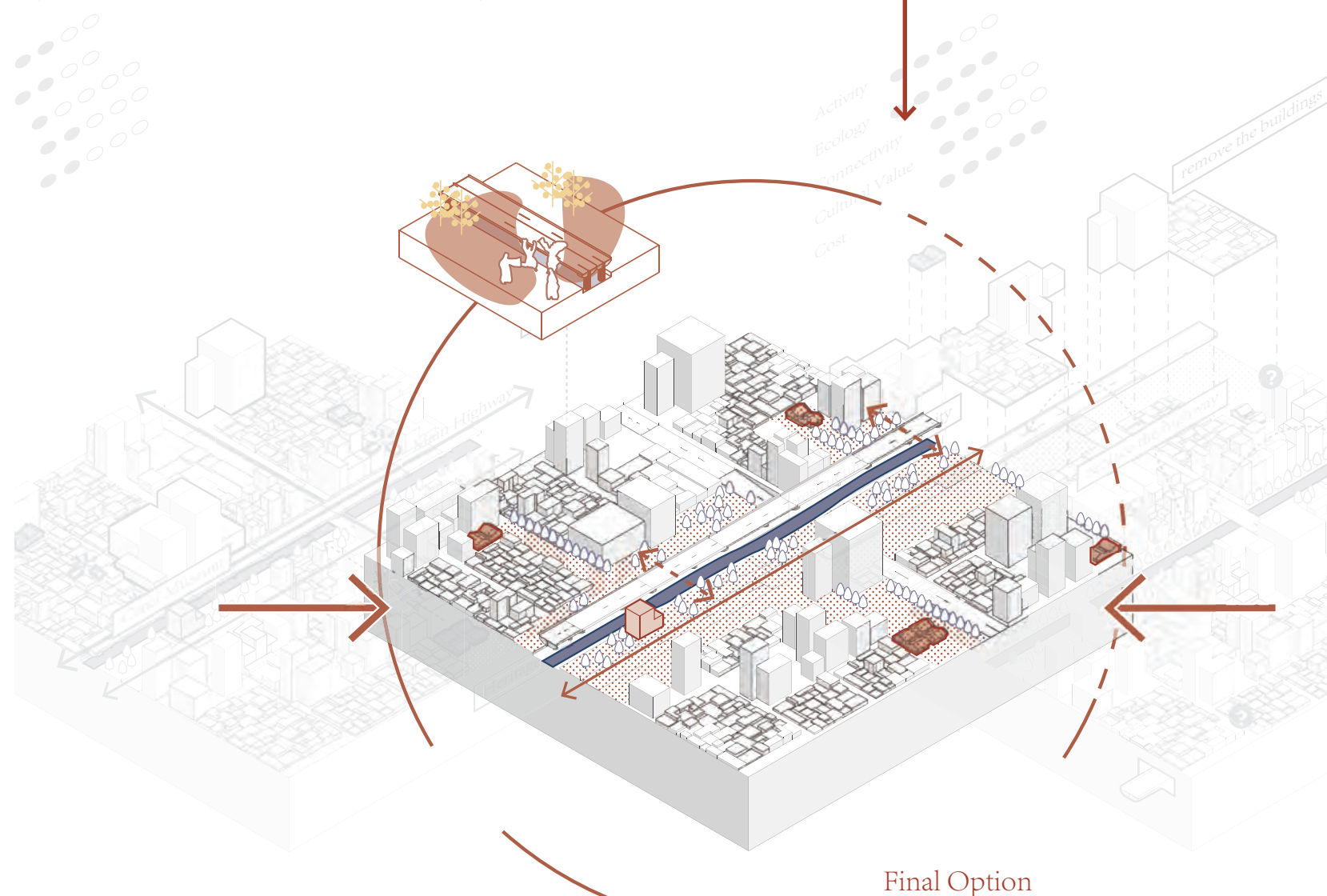


Figure 5-11 Final Choice for East Moat Highway, Drawn by Author

There are two options on how to dealing with the highway. Firstly, the highway could stay as it is, and the spatial quality of the surrounding area still suffers from it. Secondly, choose to remove it directly, re-diverting traffic to new surrounding roads, or bury it underground as an underground tunnel. But this approach may cause other problems in other places, such as new traffic problems, and we also need to remove some of the buildings and build a new community.

Therefore, in the project, the design chooses to focus on how to work on the surrounding area to reduce the effect of the highway. For instance, widen the open area along with the canal, or replace the disfunction public space with a natural green area.



Water Issue

Seasonal flooding caused by rainstorm, poor construction of water system and city development

Lack of a circular water system (rain-water collection, water purification and disposal)

Public Space Issue

Public Space

A main high-rise road was constructed above the canal

Inadequate public facilities around. (green area, visiting route and open space)

The corssing main roads and highway make the experience through the canal discontinuous

Connectivity

Physically and visually disconnected with surrounding residential area

Social-cultural Value

Loss of local identity as a waterfront area

Some historical residential area along the canal are in disrepair, and its cultural value is unrealized

In conclusion, there are two aspects of the issue of this canal, like I have mentioned before, the water issue and the issue for public space. Except for the common challenges in the historic canals in Guangzhou, East Moat is especially challenged by the highway above.

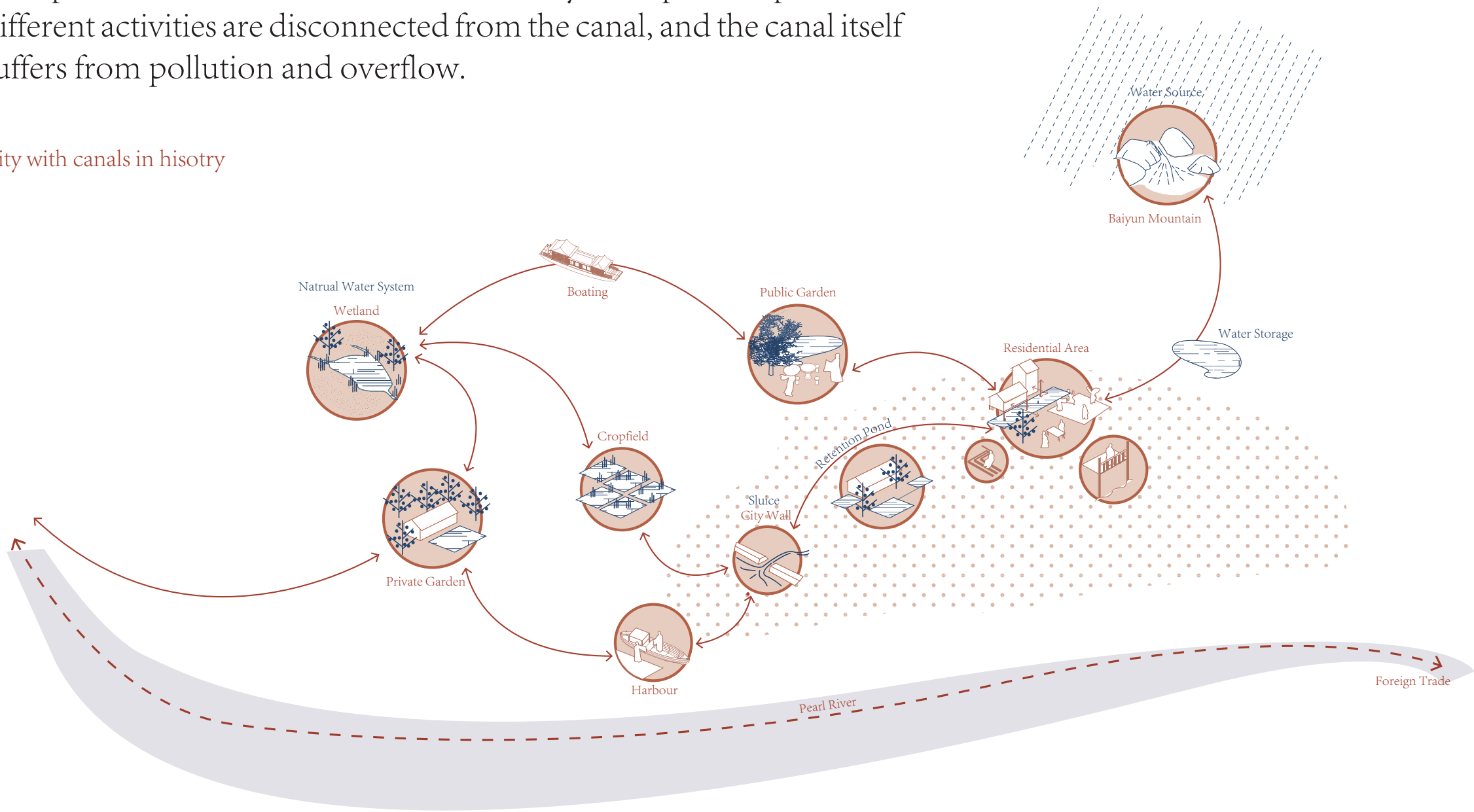
The challenges East Moat is faced with can be divided into two perspectives as above. The water issue and the public space issue. The water issue including the seasonal flooding caused by the rainstorm, poor construction of water system and city development, and lack of a circular water system (rainwater collection, water purification, and disposal). As for the public space aspect, there are three parts to it. Firstly, the main high-rise road was constructed above the canal, inadequate public facilities around (green area, visiting route, and open space), and the crossing main roads and highway make the experience through the canal discontinuous are in the public space part. The second part is about connectivity, the physical and virtual disconnection between the surrounding residential area and the canal. The last part is the social-cultural value, the loss of local identity as a waterfront area, and Some historical residential along the canal in disrepair.



3. Diagnosis and Potential  
3.1 Diagnosis

Compared with the water town in history, the public space and different activities are disconnected from the canal, and the canal itself suffers from pollution and overflow.

City with canals in history



City with canals now

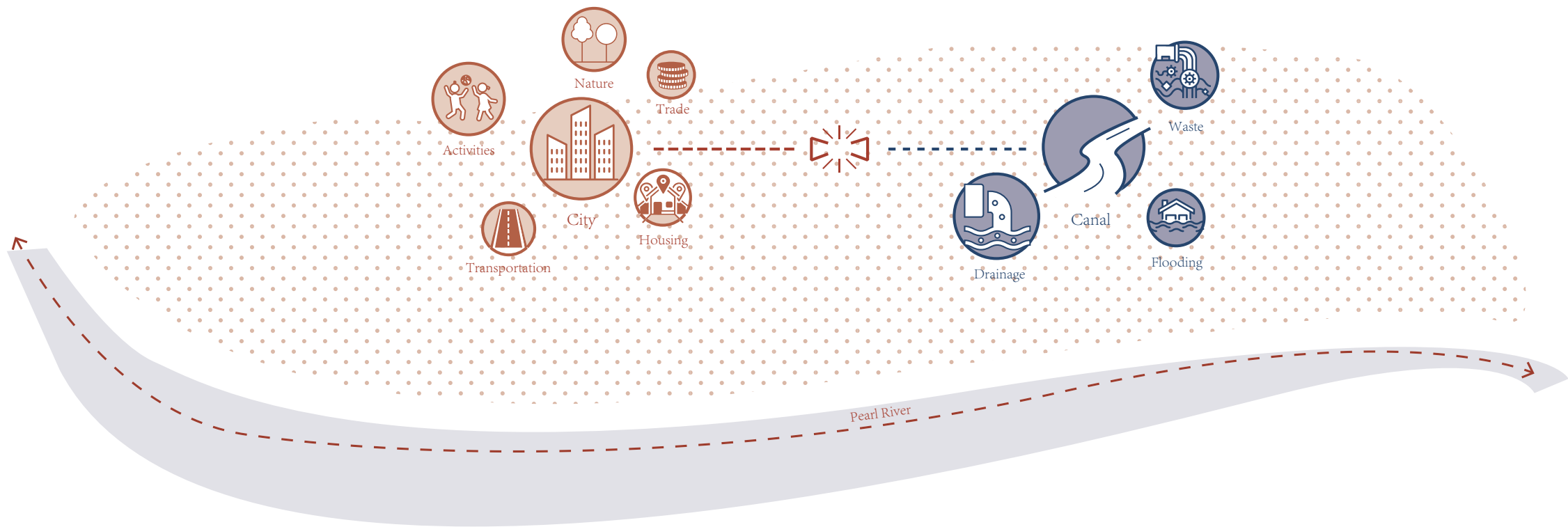


Figure 5-12 Comparison of Historical and Current Situation, Drawn by Author



POTENTIAL

- East Moat is the last existing historical moat in Guangzhou.
- East Moat is an important part of the water system in Guangzhou historic inner-city.
- East Moat connects the core green area of Guangzhou and Pearl River in north-south direction.
- Reorient the city towards the canals again, and revitalize the canal area.

ASSIGNMENTS





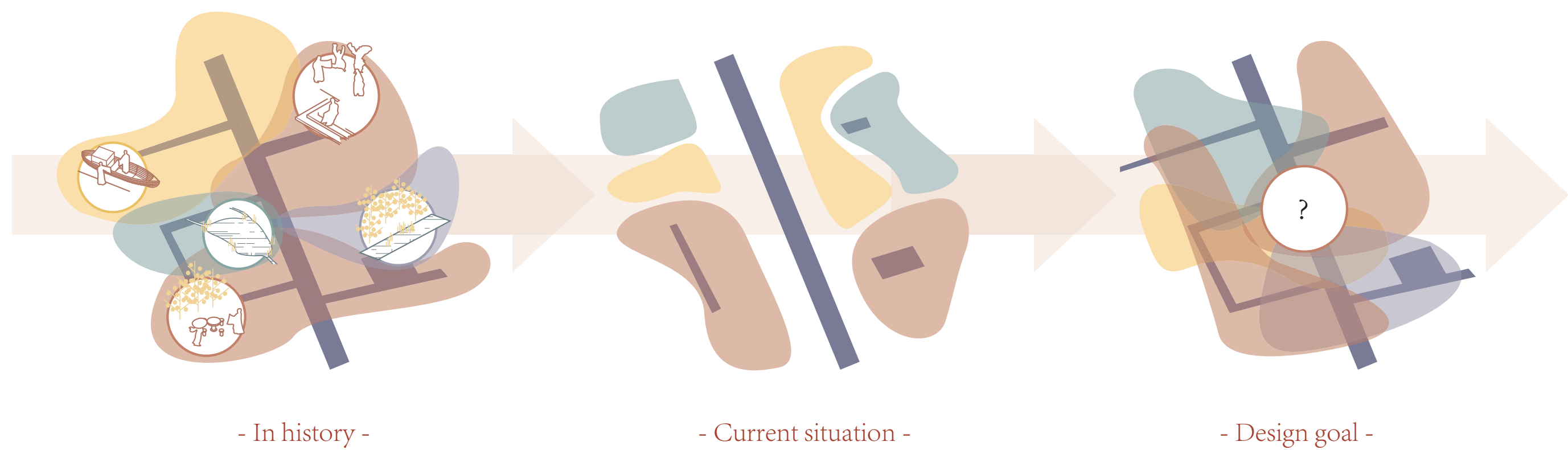
But the canal also has the great potential to be designed as an urban landscape infrastructure again. It is the only existing historic moat in Guangzhou, it is an important part of the water system for the whole city, and also it could connect the fragmented green structure in the district.

The East Moat affects the ecosystem of streets, communities and parks in the entire area by affecting the natural environment and biological types in the water system area system. The construction of greenways avoids the fragmentation of the regional ecosystem and passes through East Moat. The construction of greenways can increase the total number of people in the area, and also make the biological species in the area develop in a diversified direction, aiming to build a more reasonable ecological balance system.

As a corridor, East Moat connects the originally divided green space system to demonstrate the uniqueness of its composite landscape; it can also integrate the patches in the system to reduce damage to some local landscapes. The existence of East Moat is conducive to re-continuing the Baiyun Mountain water system, improving sewage diversion, water purification, and replenishment, and landscape modification, effectively improving the living conditions of residents on both sides of the strait, and reshaping Guangzhou's six veins all lead to the sea. The landscape pattern of green hills and the half city. On the other hand, East Moat Greenway, like a corridor in the patches-corridor-substrate system, will help build a safer ecosystem pattern. Development plays an indispensable role. At the same time, the corridor-like spatial feature of East Moat Greenway is an important element in constructing the landscape rhythm of the whole system. As a linear rhythm element, it can be curved or straight to drive the vibrancy of the entire Yuexiu North area, and in the future, A variety of greenway grids such as squares, diamonds, polygons, and circles will be constructed with other greenways in the Guangzhou greenway system to create a patches-corridor-matrix system with great landscape ecological benefits.



Figure 5-13 Design Concept, Drawn by Author



Based on the historical study, the goal is to design an urban landscape infrastructure and solve water and public space issues.



## Create a new green-blue structure

East Moat is an important part of the greenway system in Guangzhou. The first is to repair the natural ecological environment of East Moat area, especially for some important ecological nodes and corridors. During the construction, emphasis was placed on the organic maintenance of the water purification process in the East Moat area, and the greenway system played a role in cleaning water sources and purifying the air; the third is the effective enhancement and improvement of the connectivity of the ecological space in the East Moat area. The ecological network structure of the entire Guangzhou greenway system.

## Improve spatial quality

The East Moat is adhering to the principle of improving the comfort of the landscape in the East Moat area. The original closed greenway construction will be treated openly, and rest spots, water-friendly platforms, stools, signs, and other services will be constructed. Facilities to enhance the functionality and openness of the greenway. The original single-function moat water body was restored and built into an ecological corridor with leisure and hydrophilic services, providing leisure and ecological natural oxygen bar for surrounding residents, and effectively improving the landscape comfort of East Moat.

## Rediscover the social-cultural value

East Moat Greenway, as the first water control achievement in the Guangzhou greenway system, adheres to the principle of protecting Guangzhou 's historical and cultural resources in its construction, and strives to build a landscape carrier that shows the history and culture of Guangzhou 's Yuexiu District. East Moat Greenway serves as a key link to connect the important cultural and historical lines in the greenway system of Guangzhou. The restoration of some historical, natural, and cultural landscapes, such as the East Moat Museum and the Xiaodongmen Bridge, will restore the civilization that once declined in Guangzhou. This is a kind of culture, but also a result of the development of the city to a higher level. This move perfectly reflects the regional characteristic culture of Guangzhou 's greenway system in the East Moat Greenway space.





LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE



## 4. Masterplan

This is my master plan for this canal, by changes in its shape and form, would drive a series of new programmatic connections to the river. With new connections, they enrich and diversify life along the river







Downstream

Due to the deep water level and poor water quality, choose aquatic plants with a longer growth period and strong dephosphorization and deoxidation functions



Hymenocallis Spciosa



Thalia geniculata



Pistia stratiotes



Nymphaea alba

Upstream

To reduce the remaining issues



Kandelia carya

Build permeable filtration facilities near the river to further treat the sewage after aerobic treatment, so that the water quality can reach the standard

Porous area to increase the c...



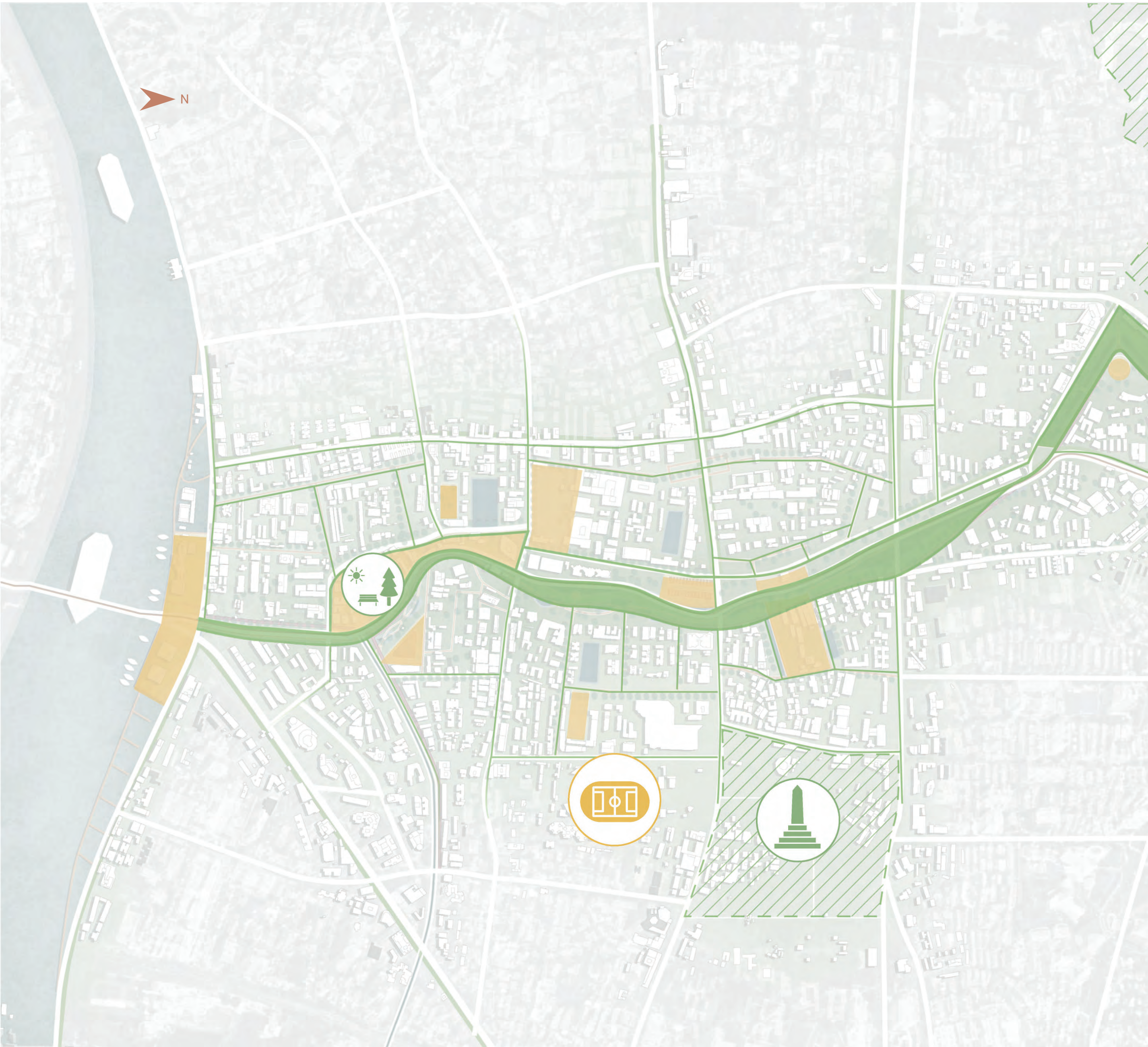
## 4. Masterplan

### 4.1 Water System

For the water issue, I choose to use the aquatic plantation to help in the purification part, and there are different plantations for downstream and upper stream according to the problems, and there are additional permeable filtration facilities to do the further purification. Besides, there is more sponge space along the canal to increase the ability to hold the water.

Figure 5-15 Water Layer of Master Plan, Drawn by Author





LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE



## 4. Masterplan

### 4.2 Green Structure

For the public space issue, the connectivity of the green structure will be enhanced in the East Moat area by creating a continuous green corridor in the south-north direction. To open the enclosed space, and there would be rest spots, waterfront platforms, a community park, an open square, and other services constructed along with the canal. The single-function moat is restored and built into a green corridor with diverse public space, improving the spatial quality of East Moat.

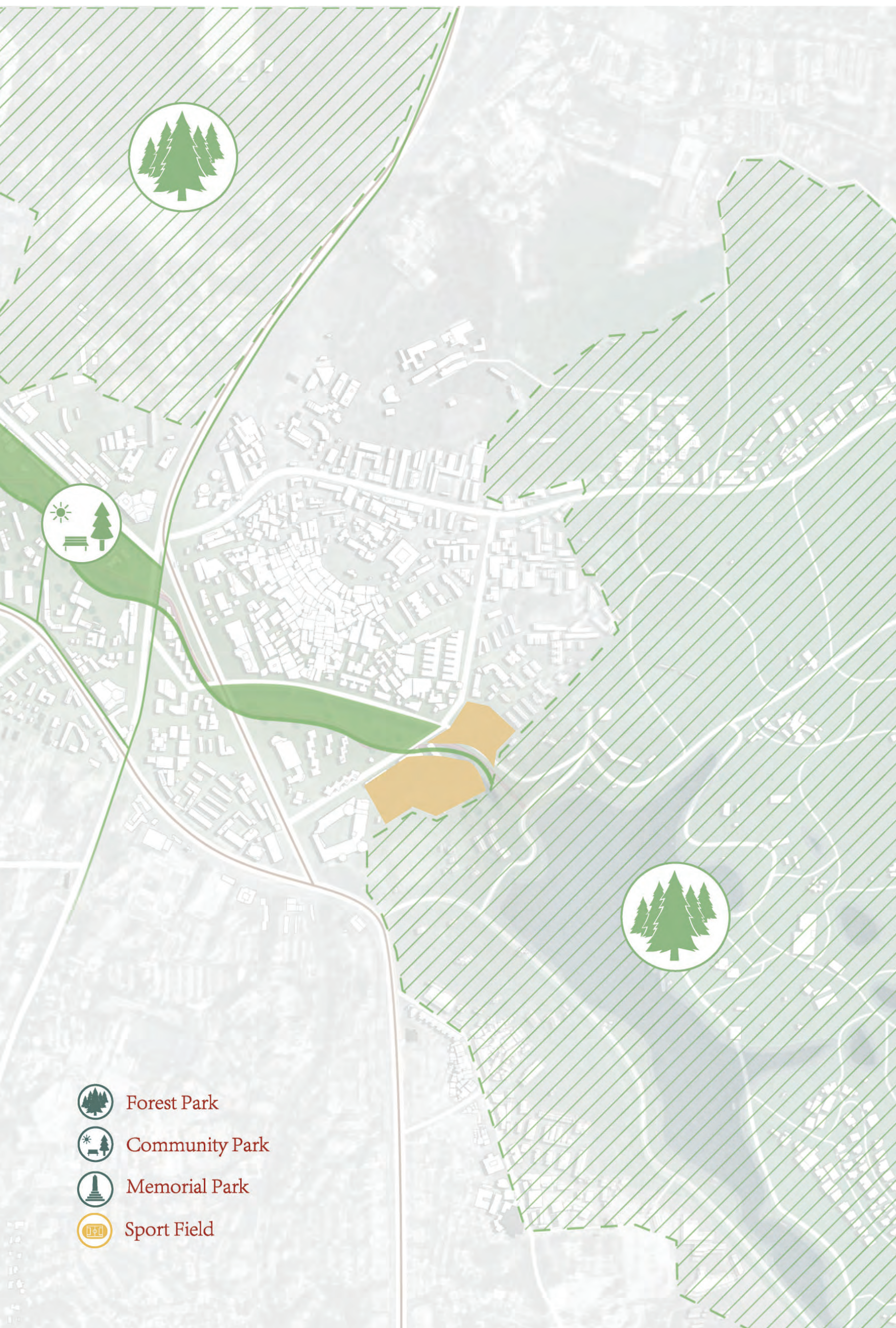




Figure 5-17 Main Canal Part, Drawn by Author

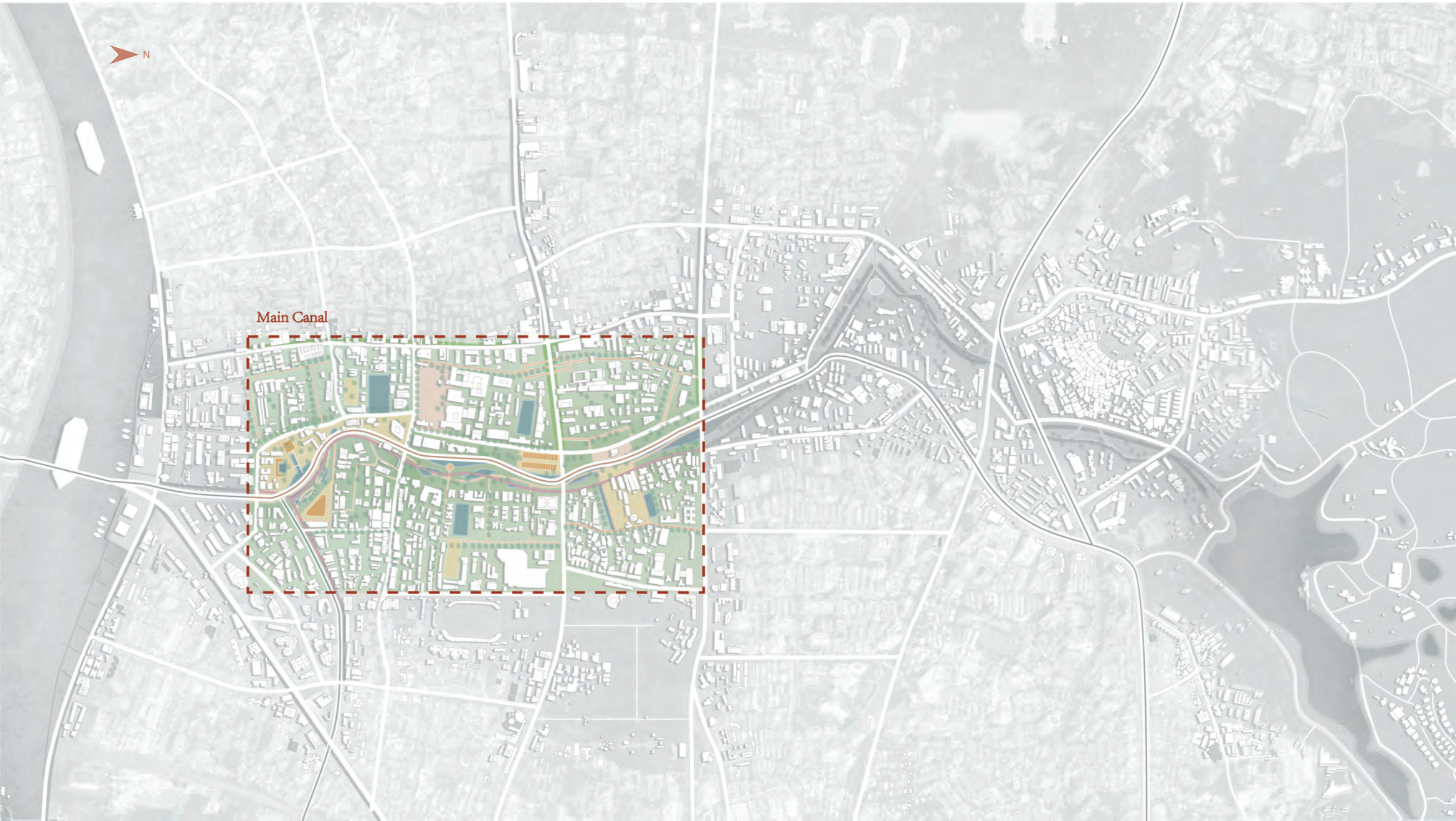


Figure 5-18, 5-19 Current Situation of Main Canal Part, Photo by Author



Figure 5-20 Current Situation of Main Canal Part, Source: <https://mapio.net/>





## 5. Design Exploration

### 5.1 Main Canal - Site Analysis



Figure 5-21 Analysis of Main Canal, Drawn by Author

The main canal part is what my design focuses on. Because the whole part of it is underneath the highway. It has all the typical challenges the East Moat faced with. This part is all surrounded by a residential area, it is an active neighborhood with great social-cultural value, for instance, there are several memorial halls and a crowded shopping hall located in it.



## 5. Design Exploration

### 5.1 Main Canal - Site Analysis



Figure 5-22 Interface Analysis of Main Canal, Drawn by Author

However, when I look closer to the canal, I found that the canal is isolated in this neighborhood, because of the hard interface between them. The canal is located at the back side of the neighborhood. Different elements like the parking lot, temporary housing in bad condition, and the car road create the hard boundary between them.



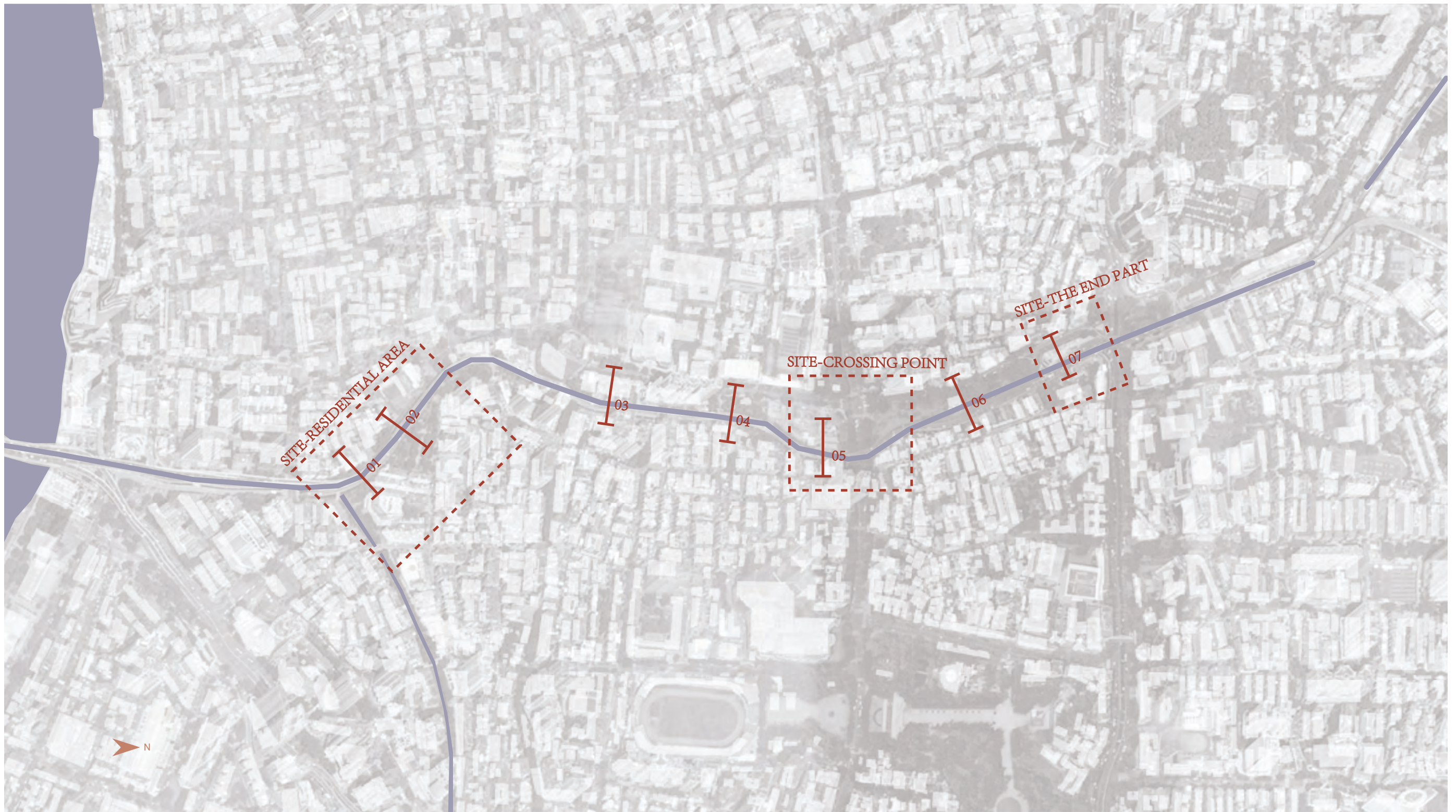


Figure 5-23 Sites and Sections of Main Canal, Drawn by Author

Because the interface condition is different according to these surrounding elements, so I have made these sections to analyze different types of interface and made intervention in them. Besides, I choose three sites with different typical issues around the sections.



## 5. Design Exploration

### 5.2 Design Process

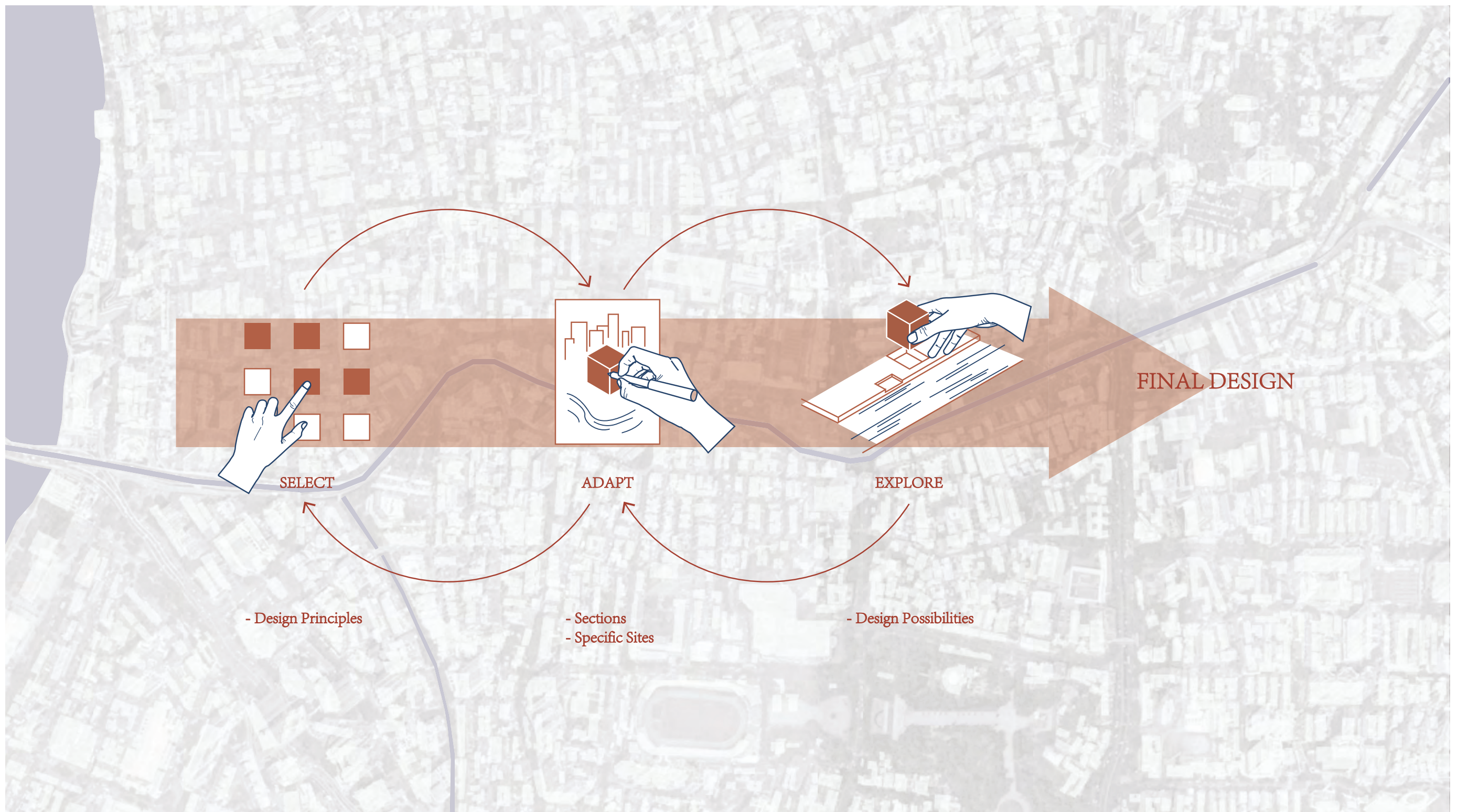


Figure 5-24 Design Process, Drawn by Author

Therefore, the process of my design exploration has three steps. First, select the suitable design principles in history, and adapt them in the sections and specific sites, to explore the possibilities of the sites and also the possibilities of the design principles in a different situation. This is a back and forward process, then it comes to my final design.

So first I would introduce the section 01 and 02 and site-residential area as an example to see how my design exploration leads to the design goal.



## 5. Design Exploration

### 5.3 Section 01

#### CURRENT SITUATION

- The entries of the old housing
- Bad condition of old buildings
- Lives in traditional neighborhood



Figure 5-25 Old Housing,  
Photo by Author

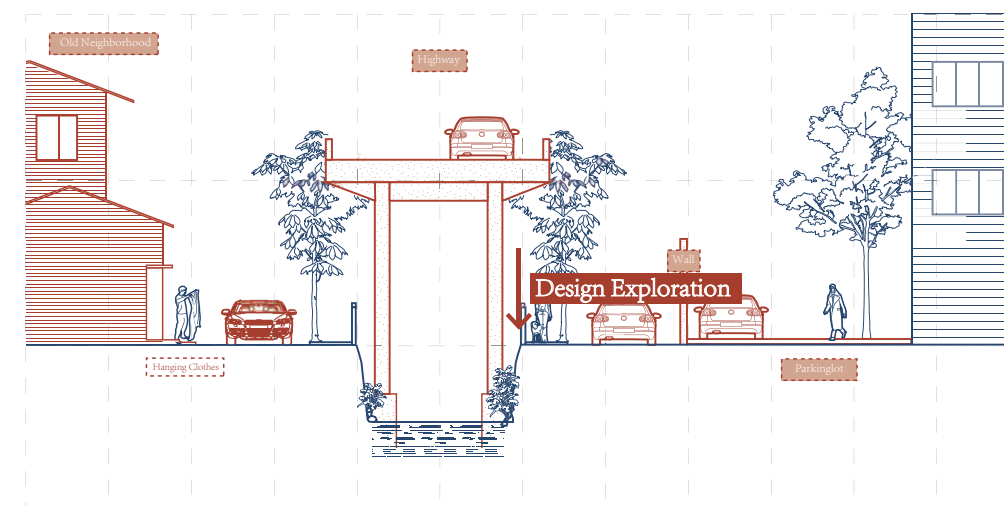
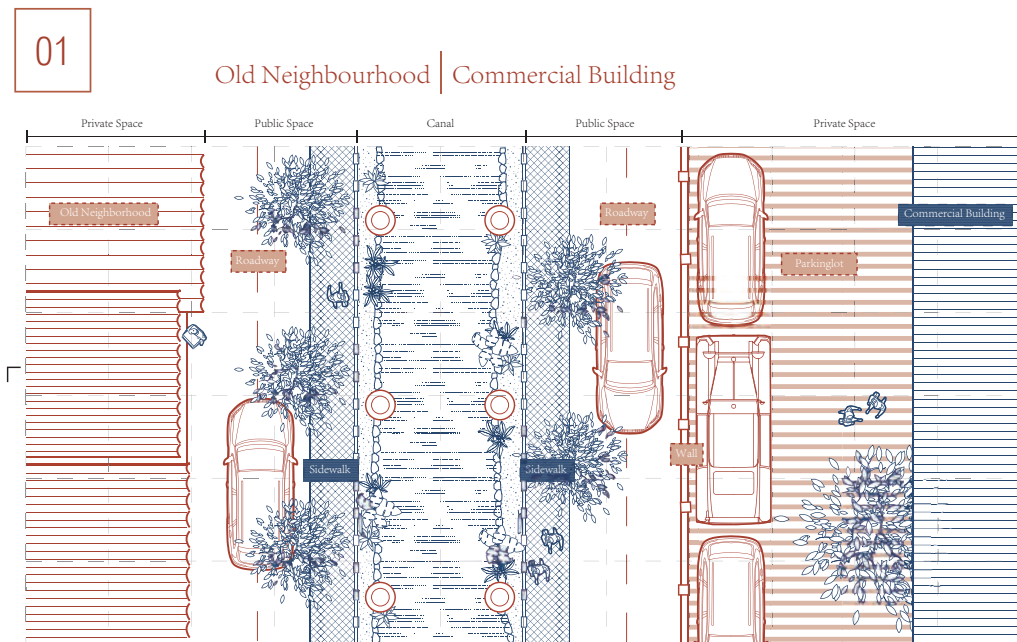


Figure 5-26 Current Situation of Section 01, Drawn by Author



- Backside of the office building
- Wall and parking lot

Figure 5-27 Parking Lot,  
Photo by Author

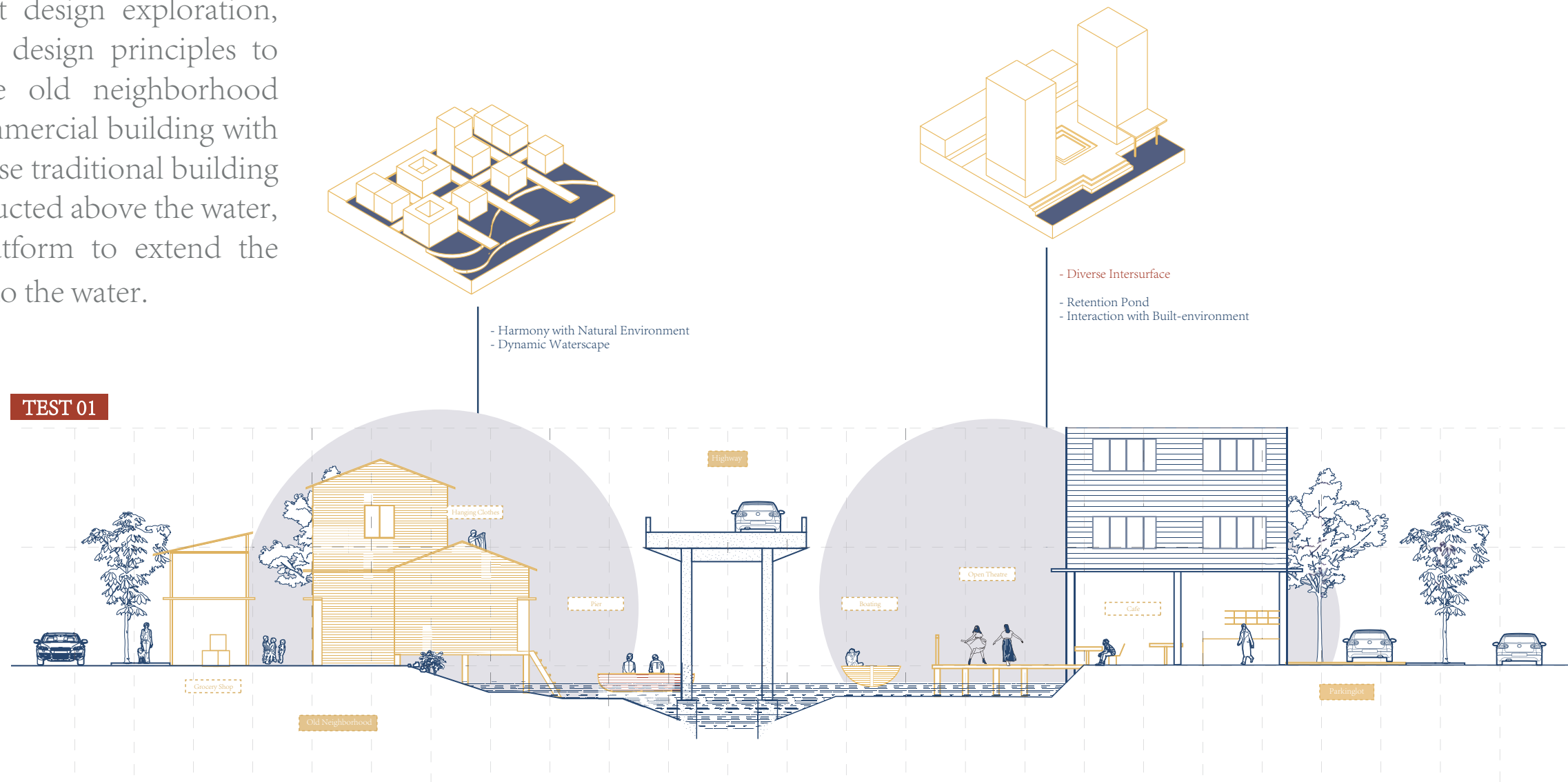
Section 01 is located in the old neighborhood in bad condition and the backside of the commercial building.



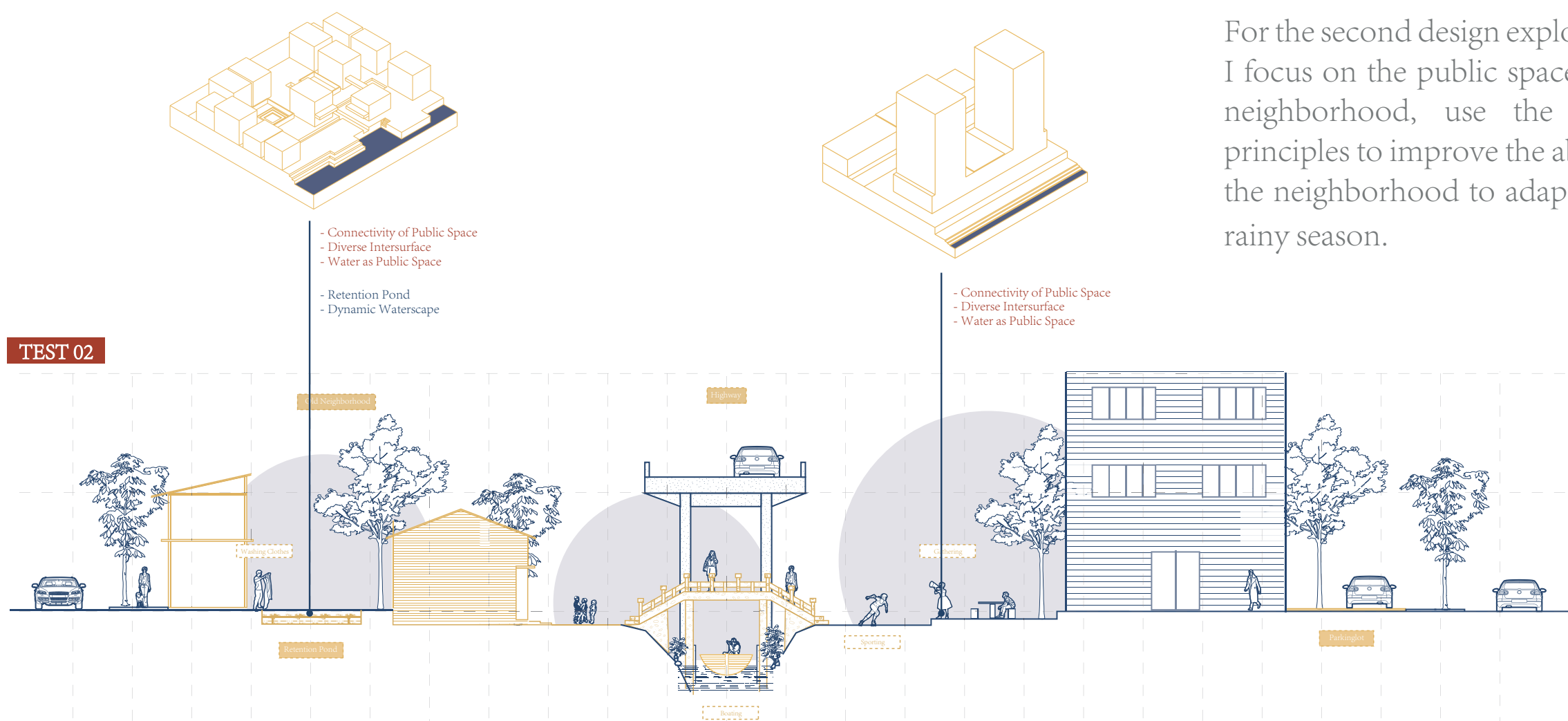
01

Old Neighbourhood | Commercial Building

For the first design exploration, I tested the design principles to connect the old neighborhood and the commercial building with the water. Use traditional building form constructed above the water, and the platform to extend the buildings into the water.



TEST 02



For the second design exploration, I focus on the public space in the neighborhood, use the design principles to improve the ability of the neighborhood to adapt to the rainy season.

Figure 5-28, 5-29 Design Exploration of Section 01, Drawn by Author



## 5. Design Exploration

### 5.4 Section 02

#### CURRENT SITUATION

- The path is well designed
- Sitting spots for people to stop and rest
- Still disconnected by the wall



Figure 5-30 Path,  
Photo by Author

02

#### Apartment Complex | Community Park

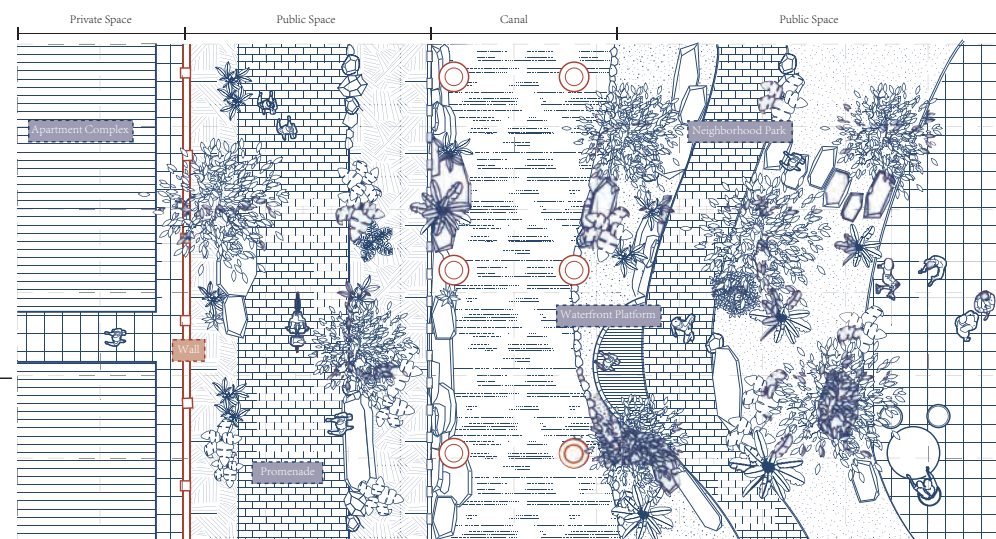
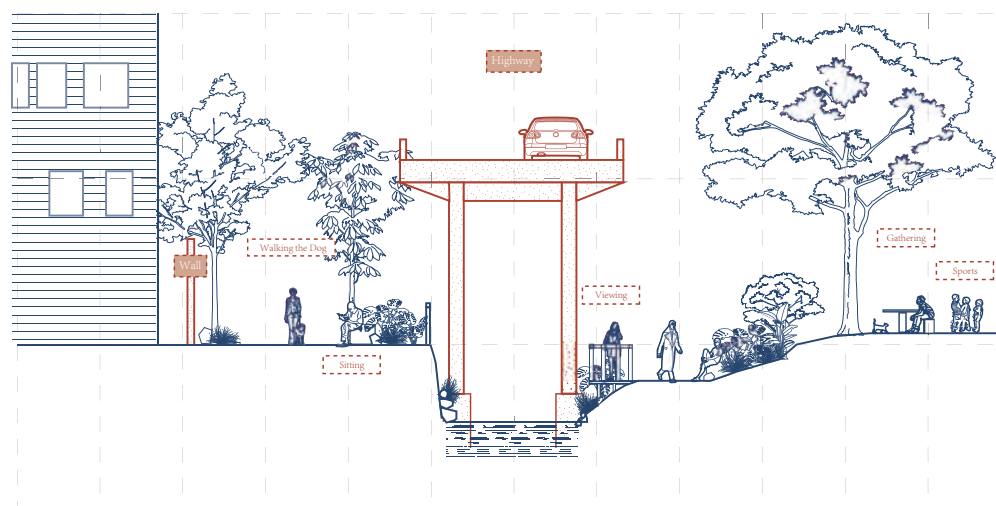


Figure 5-31 Current Situation of Section 02, Drawn by Author



- Nice transition area between the park and the canal
- There is multifunctional area and well used

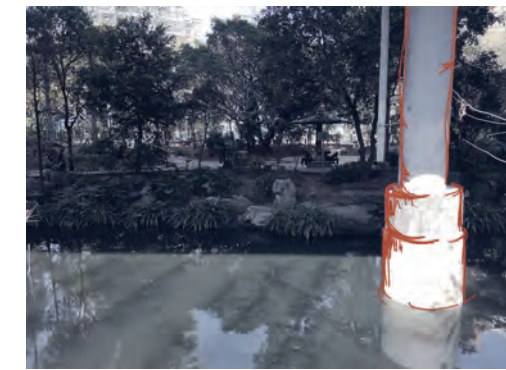
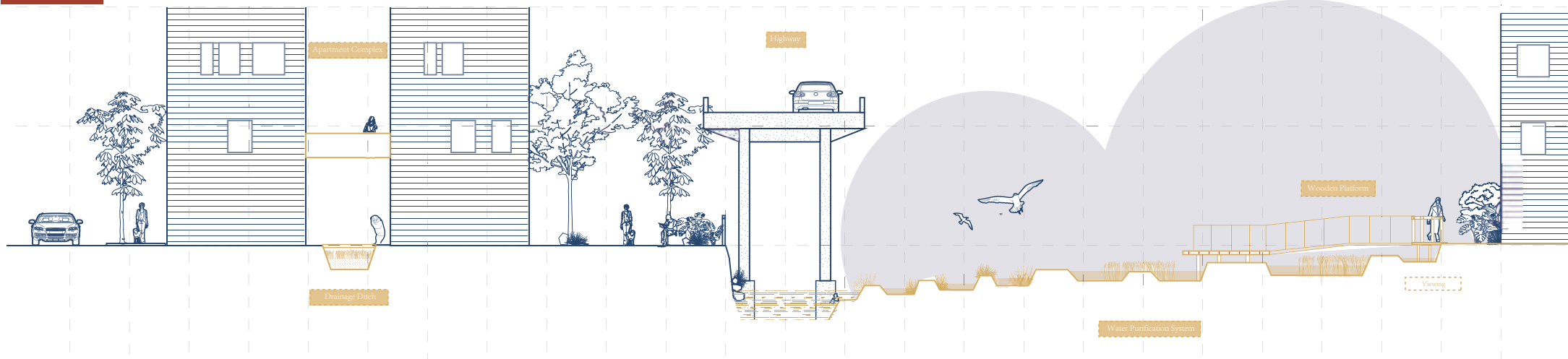


Figure 5-32 Community Park,  
Photo by Author

#### Design Exploration

#### TEST 01



#### TEST 02

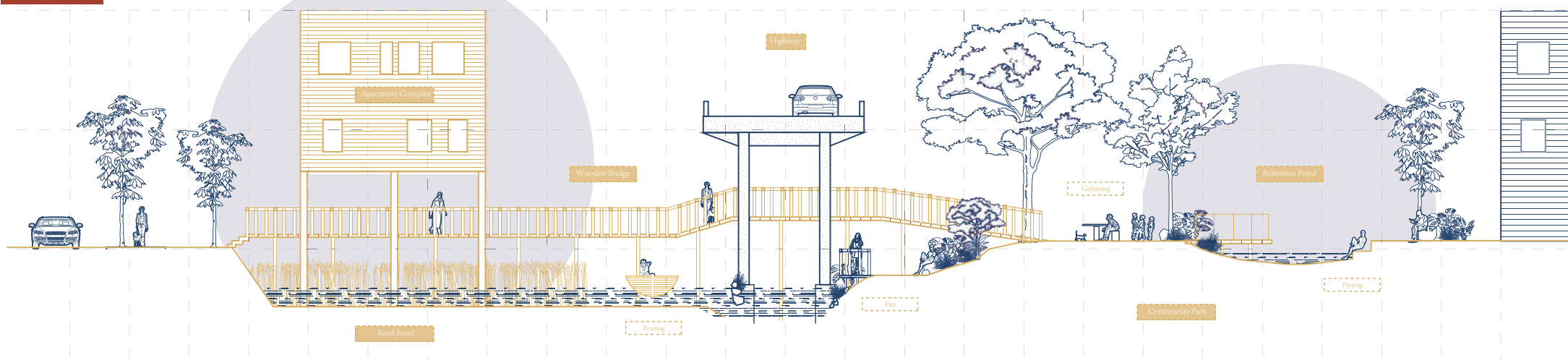


Figure 5-33 Design Exploration of Section 02, Drawn by Author



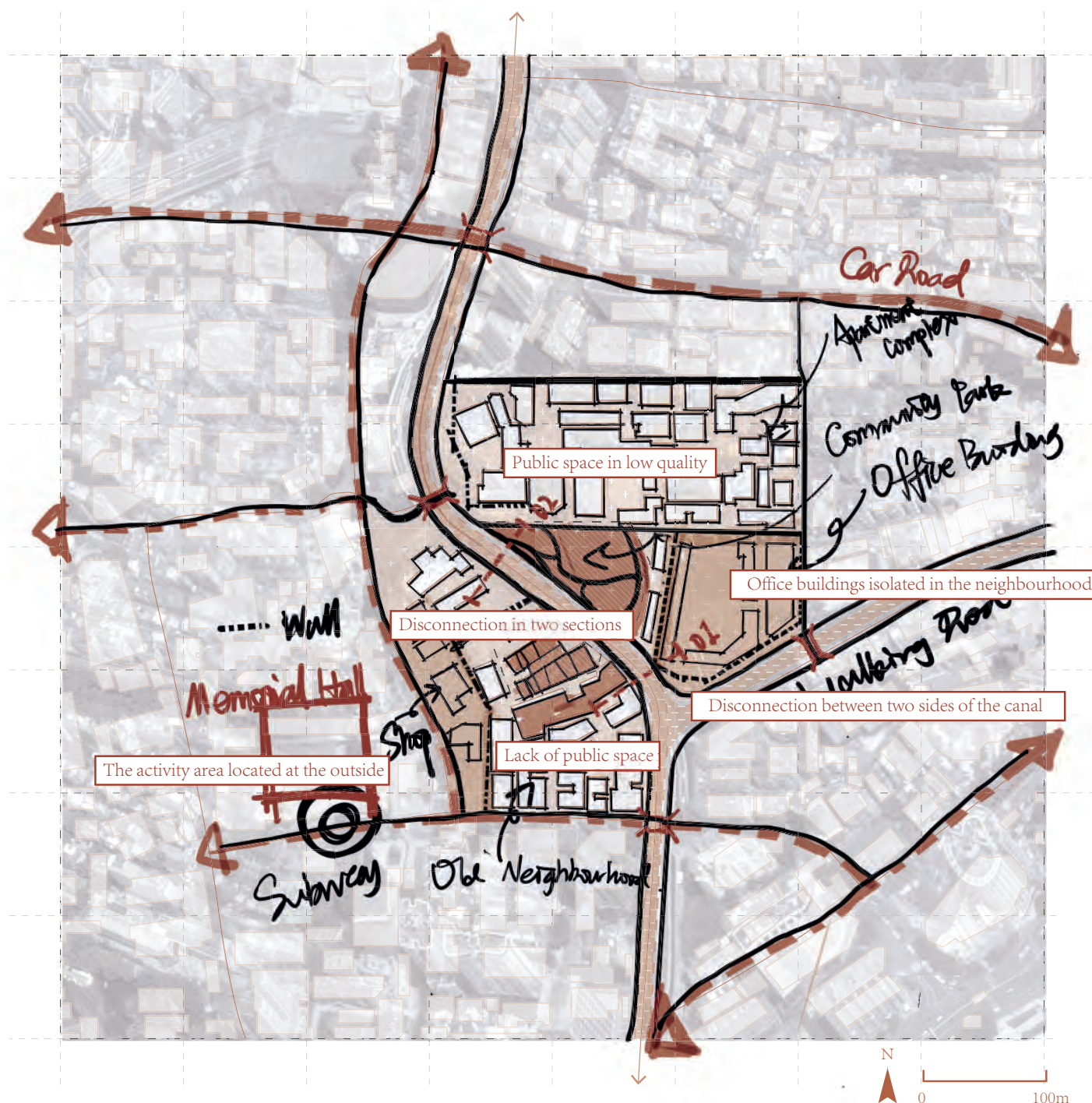


Figure 5-34 Analysis of Site-Residential Area, Drawn by Author

When I zoom out to see how these two sections connect, and how they work with the surrounding area, therefore I choose the site-residential area to do further design. Also, because the design here could also be applied in other residential areas along the canal, it has the characteristics of the main canal part.



5. Design Exploration  
5.6 Conceptual Design-Residential Area

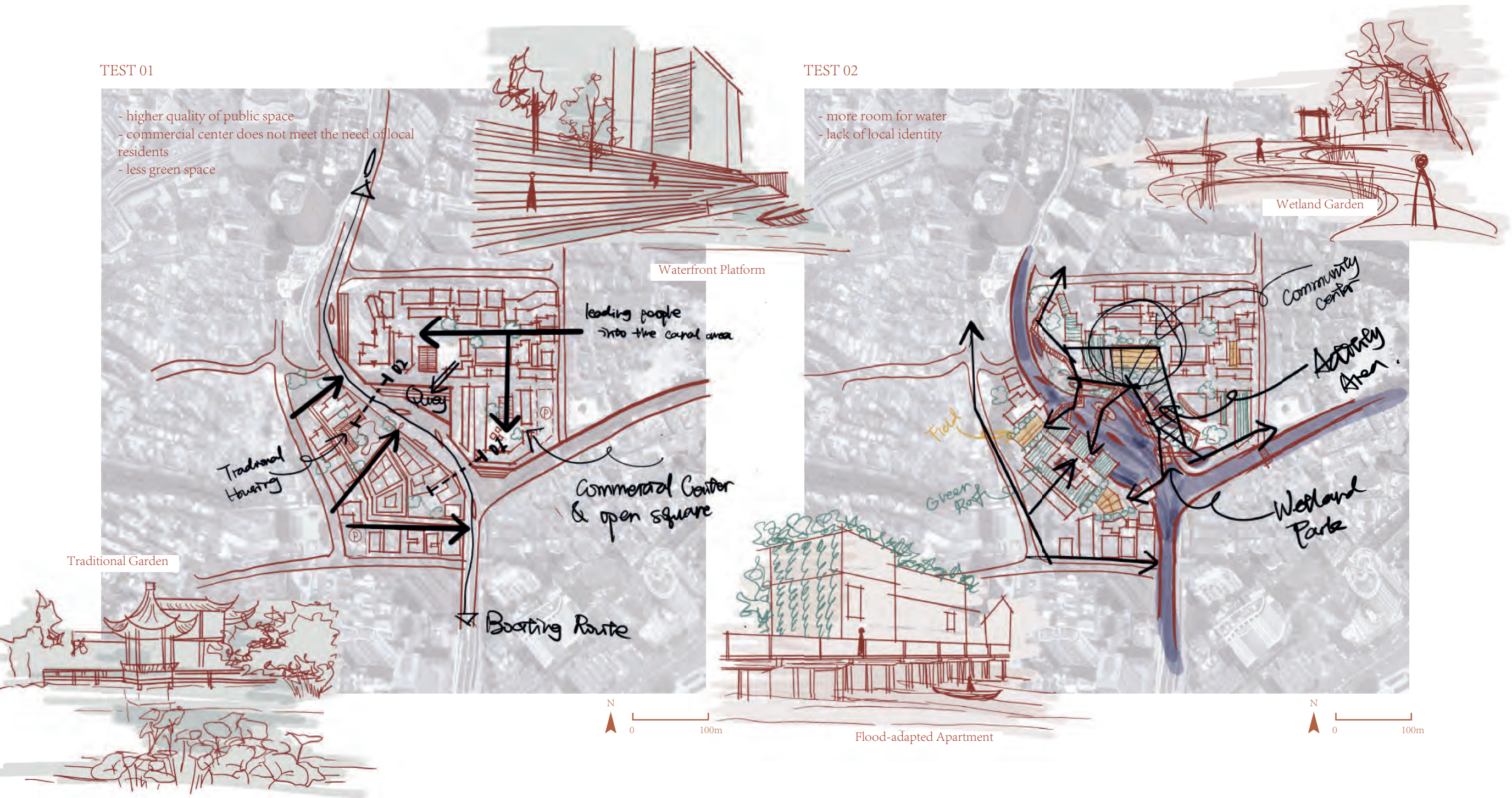


Figure 5-35 Sketches of Site-Residential Area, Drawn by Author

Based on the exploration of the two sections, I have sketched several possibilities of the site-residential area. In the sketches, I tried to explore the way of connecting the two sections and how they could affect the community as a whole. Having a traditional garden or flood-adapted apartment is one of my initial ideas for the new neighborhood. Each concept has its advantages for the neighborhood, and also its limitations.



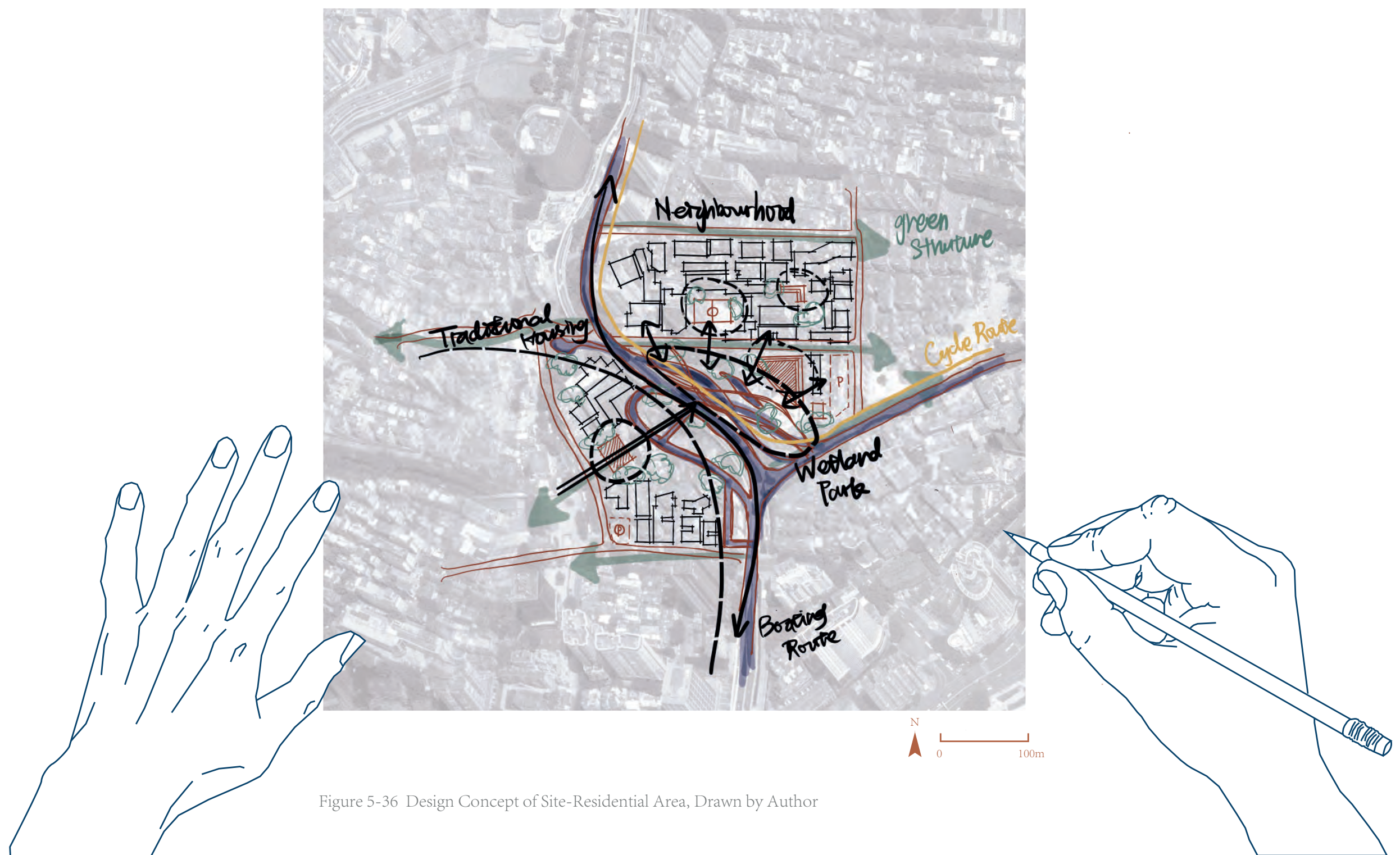


Figure 5-36 Design Concept of Site-Residential Area, Drawn by Author

After considering their different effect on the community and how they could relate to the concept, urban landscape infrastructure, I chose to combine the traditional neighborhood with wetland park as my final design for this site. The green structure would stretch into the neighborhood and connect the whole community, linking the residents to the water. For the boundary between the old neighborhood and the apartment complex, they would be connected through the water body in the design.



5. Design Exploration  
5.6 Conceptual Design-Residential Area

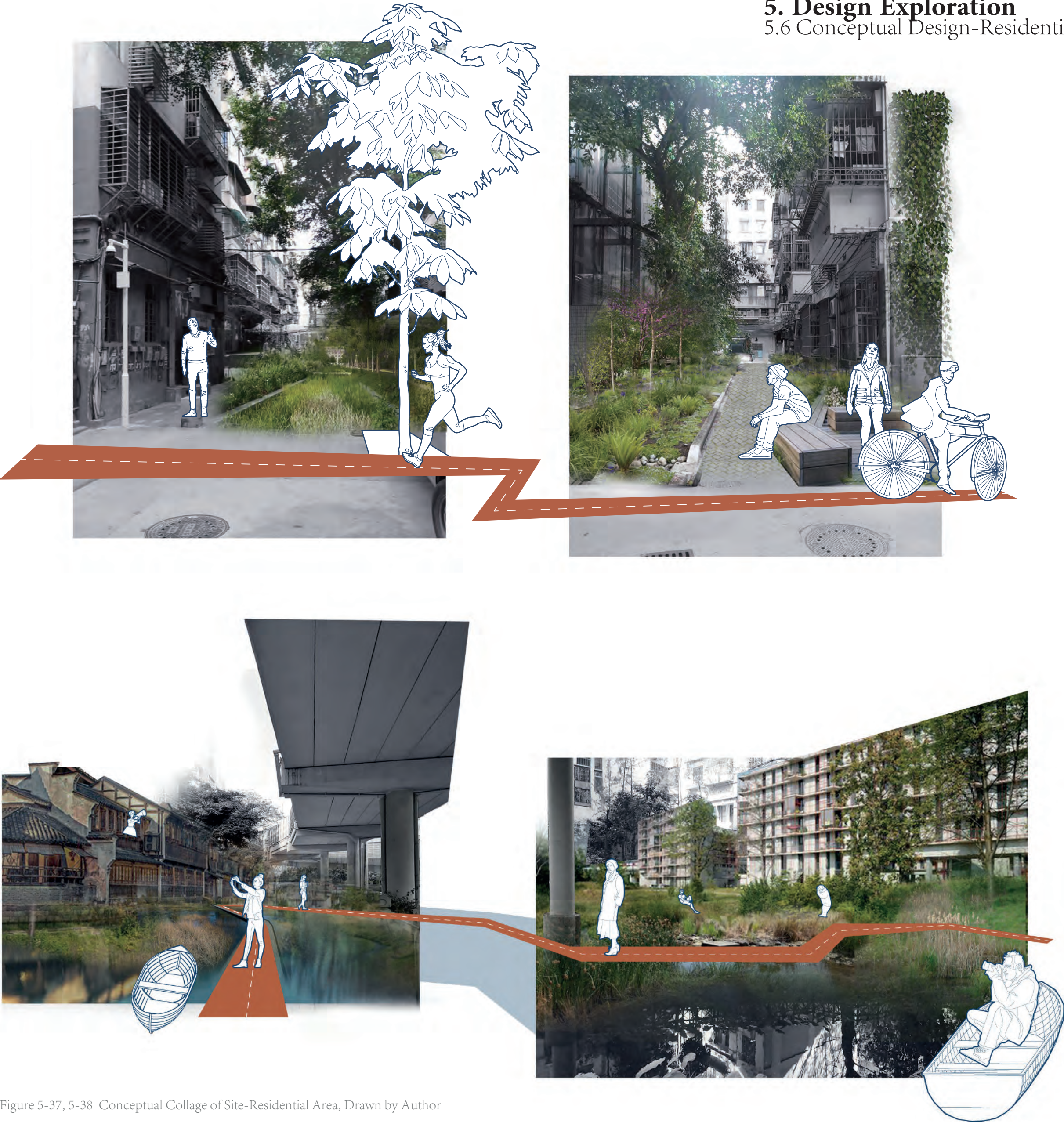


Figure 5-37, 5-38 Conceptual Collage of Site-Residential Area, Drawn by Author









Figure 5-39 Final Plan of Main Canal, Drawn by Author

Here is the master plan for the site-residential area, on one side, there is a wetland park that has high water storage capacity, on the other side is the restored traditional water town. The public space for activities is placed along the canal, and the things like the parking lot are placed on the outskirts of the side because I want to reorient the urban area back towards the canal.





Figure 5-40 Water Layer of Final Plan, Drawn by Author

This is the water layer of the design, learned from history, the water system here also have a different hierarchy, from the street drainage, then into the retention pond, finally into the canal.



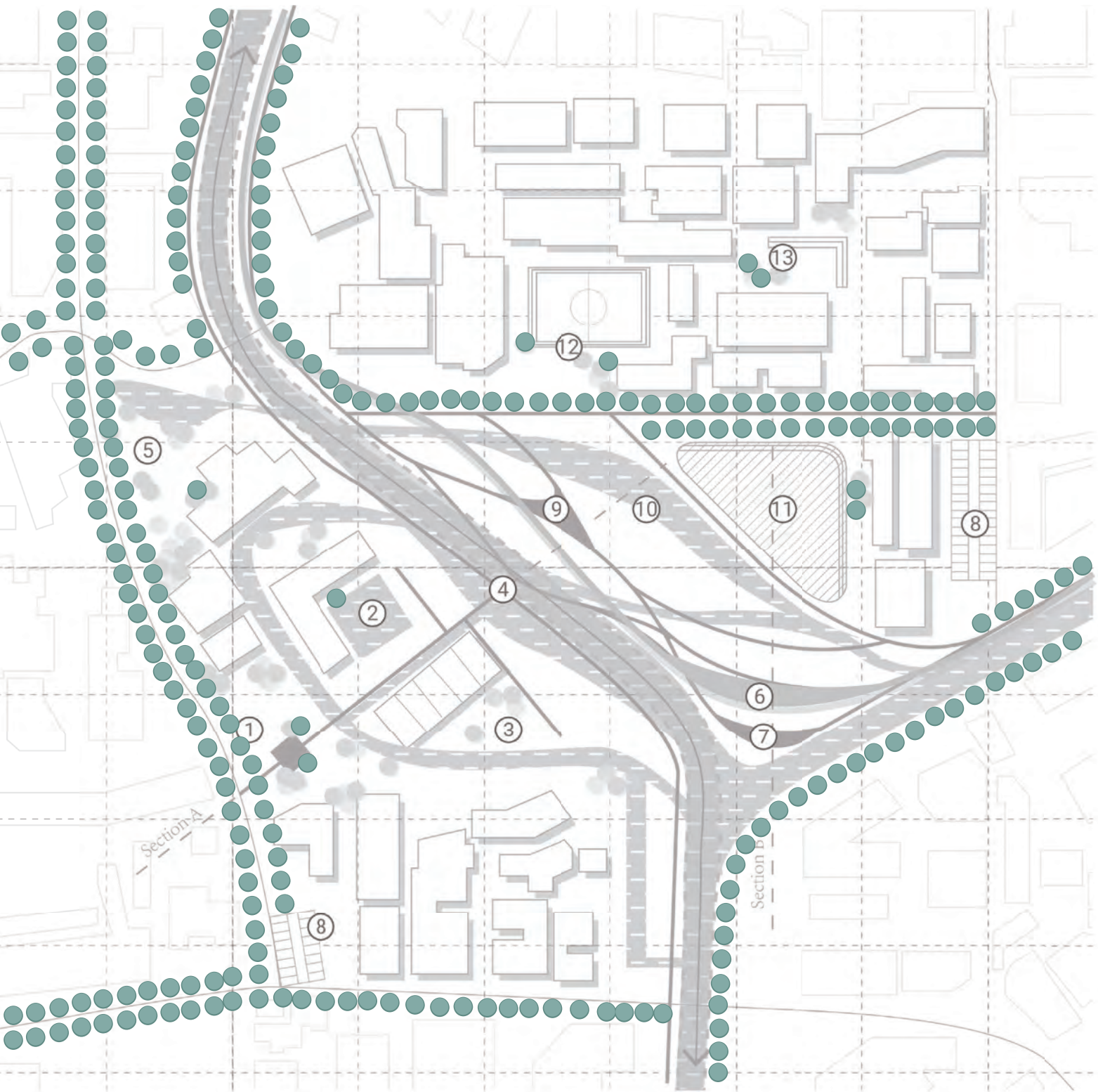


Figure 5-41 Street Trees in Planting Design, Drawn by Author

● Street Trees



Magnolia grandiflora  
Height: 20.00 - 30.00 m



Cinnanomum camphor a  
Height: 30.00 - 40.00 m



Bombax malabaricum  
Height: 10.00 - 25.00 m



Salix babylonica  
Height: 10.00 - 18.00 m



Cinnanomum camphor a  
Height: 8.00 - 20.00 m



Osmanthus fragrans  
Height: 15.00 - 25.00 m

As for the planting design, for the trees that are planted alongside the road and in the public space, I choose the local species that have the characteristics of the traditional water town and reserve the old tree with a long history in the site.

Planting street trees on both sides of the river can carry out photosynthesis, absorb carbon dioxide, and release oxygen. The leaves of forest trees can stick to and trap floating dust and can prevent deposited pollutants from being blown by the wind, so it has the effect of purifying the air. According to research, the maximum amount of floating dust deposited on the leaves of trees can reach 30-68t/hm2, which can reduce air pollution. There are many types of street trees in Guangzhou, such as stone chestnut, mango, kapok, banyan, and alpine banyan. But to restore the ancient river-style of East Moat, the green landscape embodying tropical scenery, Lingnan characteristics, durian style, and flowers blooming in all seasons, a variety of plants have been selected for riverside street trees.





● Woody Aquatic Plants



*Taxodium distichum*  
Height: 10.00 - 40.00 m



*Taxodium ascendens*  
Height: 10.00 - 25.00 m



*Bruguiera gym noihiza*  
Height: 5.00 - 10.00 m



*Kandelia candel*  
Height: 5.00 - 10.00 m



*Aegiceras corniculatum*  
Height: 1.50 - 4.00 m

Figure 5-42 Woody Aquatic Plants in Planting Design, Drawn by Author

Along the open water body, I choose the trees that can absorb the pollutants in the water and adapt to this moisture condition.

To restore the ecological features of the ancient rivers, many native tree species such as crape myrtle, kapok, mango, and banyan trees have been fully utilized on both banks of East Moat, Litchi, to reflect the quaint Lingnan style. Some ancient trees, such as camphor trees and banyan trees, that have grown over decades and long years are witnesses of weather-beaten, time, and history. They are closely related to the development of East Moat and the lives of people on both sides of the strait. Their planting background and deeds are closely related to Local characteristics are one of the most precious parts of local culture, so it is listed as an ancient tree and given priority protection. The weeping willow is often planted on both banks of ancient rivers and has a long history because of its light-loving, cold-resistant, water-tolerant, strong germination, well-developed root system, and fast growth. Canal is often planted on the bank of the embankment to decorate the landscape or as a solitary tree, and it is also used as a sidewalk berm tree (online information), etc. Therefore, in the restoration of the ecological river green landscape, the weeping willow as the embankment sidewalk tree is the main part of the ecological river landscape. (Juanyu, Yi, 2011)





Figure 5-43 Herbaceous Aquatic Plants in Planting Design, Drawn by Author

● Herbaceous Aquatic Plants



*Nelumbo nucifera*  
- Emergent Plants



*Nymphaea alba*  
- Floating Plants



*Ceratophyllum demersum*  
- Submersed Plants



*Thalia dealbata*  
- Emergent Plants



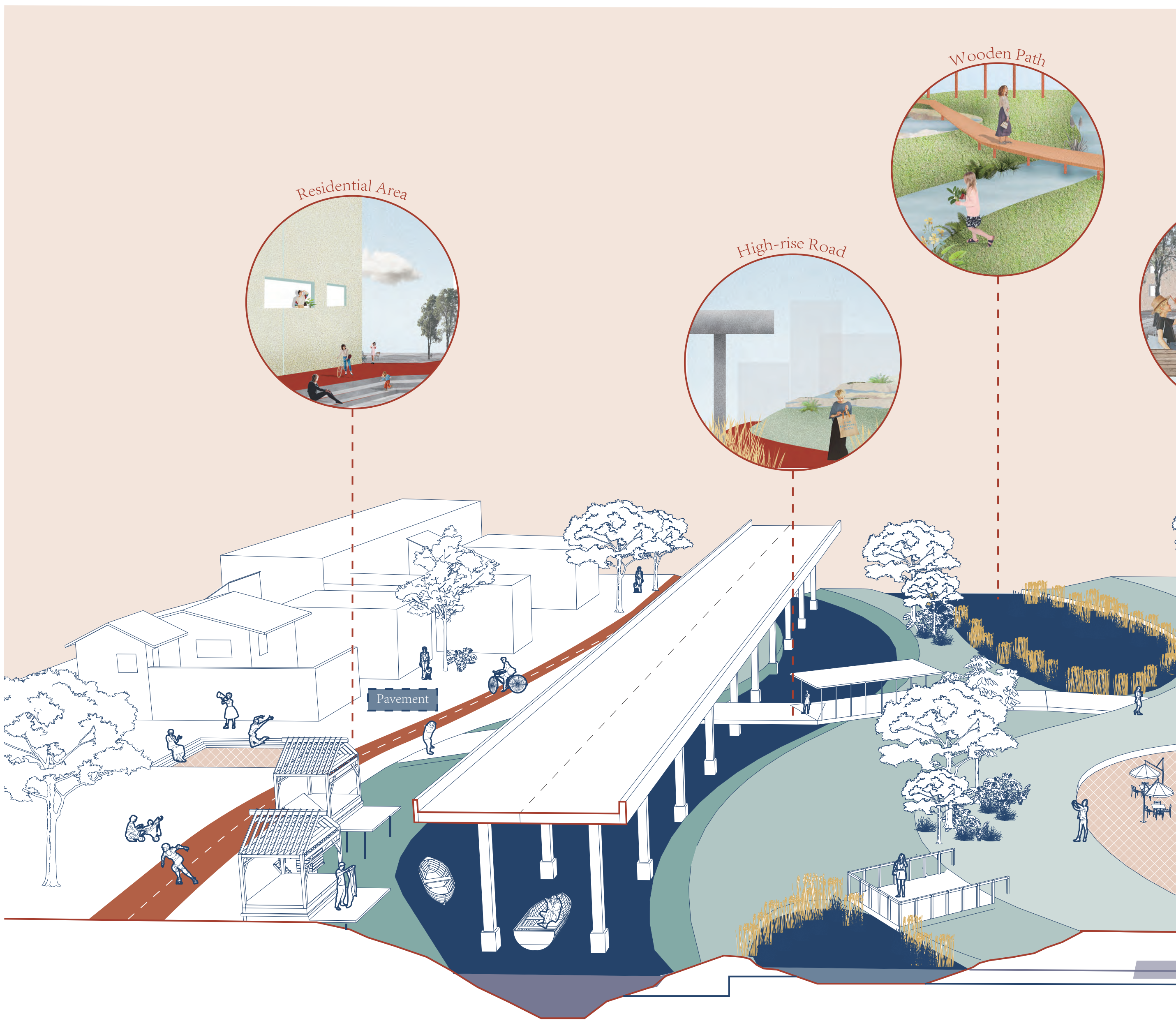
*Hymenocallis sp.*  
- Emergent Plants



*Pistia stratiotes*  
- Floating Plants

Herbaceous aquatic plants have the structure and characteristics suitable for survival under hypoxic conditions, including hypertrophy of the stem, large tissue in the center of the stem and root, hollow stem, and shallow root system. A large number of aquatic garden plants are planted in Dong Hao Chung, especially the water ghost banana, which has a special structure, which is conducive to the transmission of oxygen in its body and can be transmitted to the root zone. It can also promote the redox reaction in the root zone and the activities of aerobic microorganisms. (Juanyu, Yi, 2011)

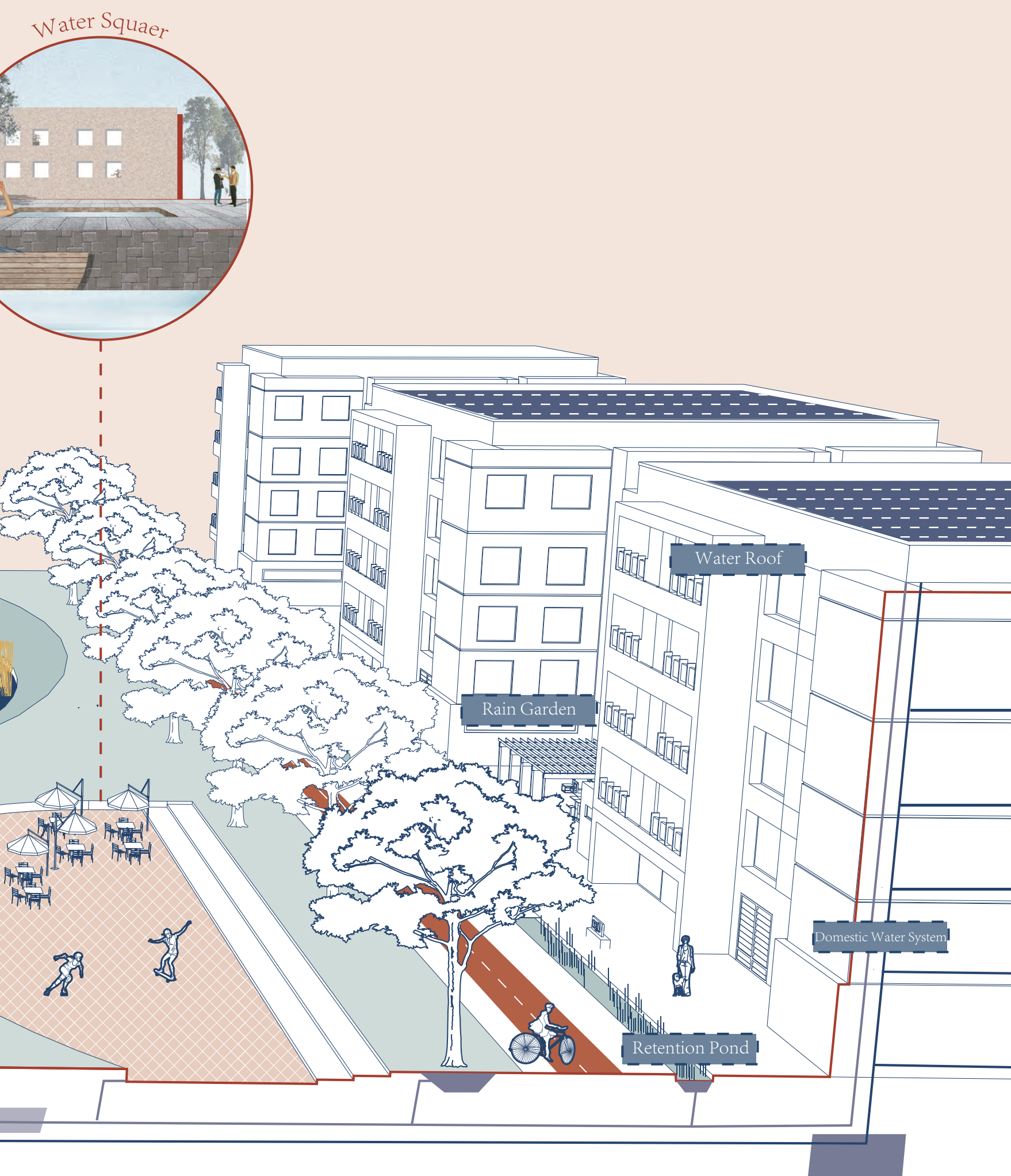






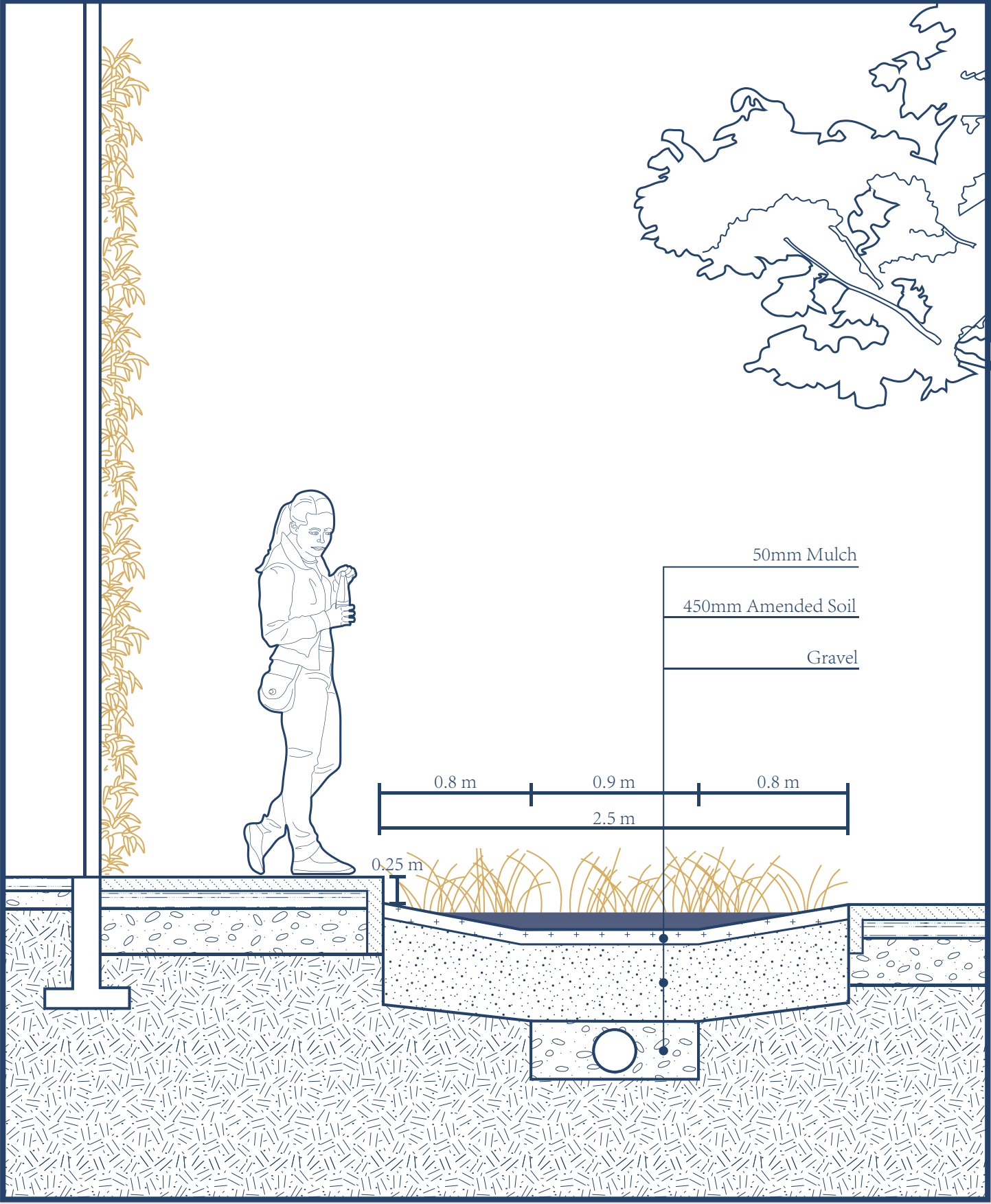
## 5. Design Exploration

### 5.7 Final Plan-Residential Area

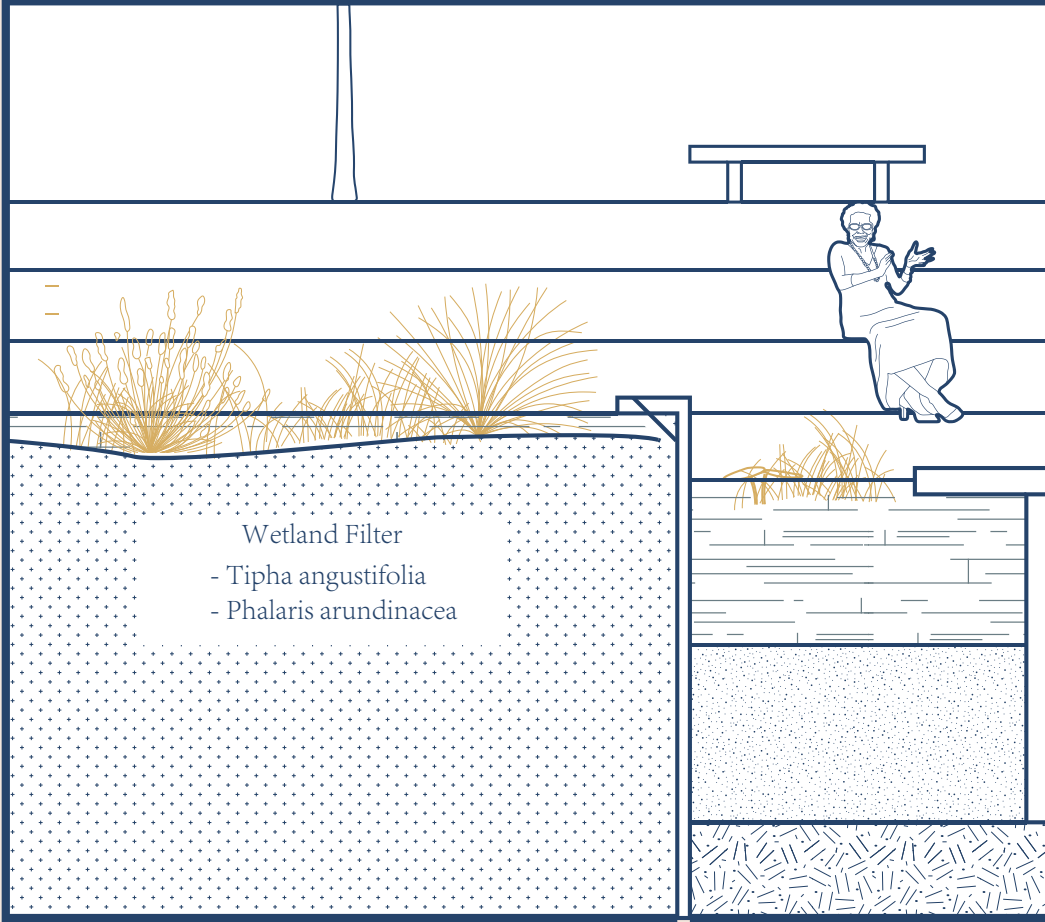


This is the overview of the design for this site, The residential area is connected with the canal in green structure, the public space, and also the water system. The retention pond with reeds can purify the water from the families. On the social aspect, the new water system also creates a different lively scene. In this new urban system, new social and ecological interactions would be facilitated, and the new process could shape the built environment into a better place.

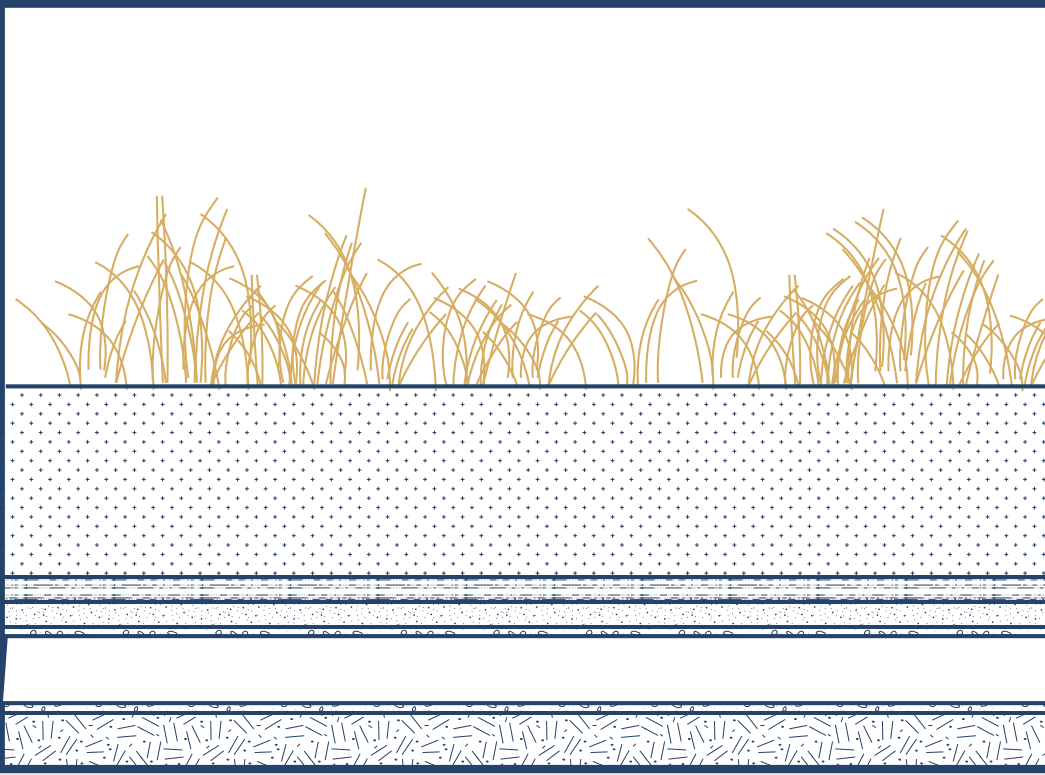




Retention Pond



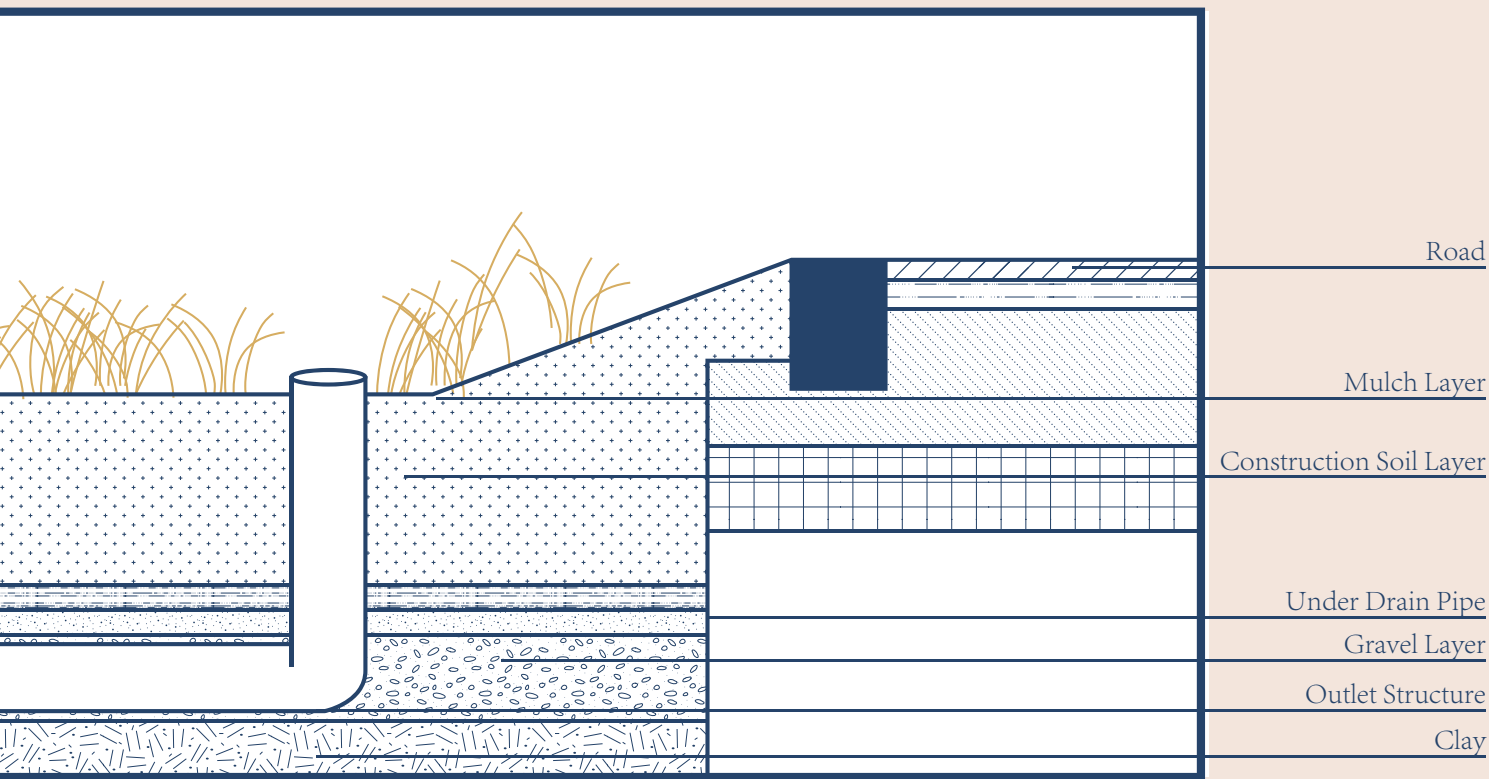
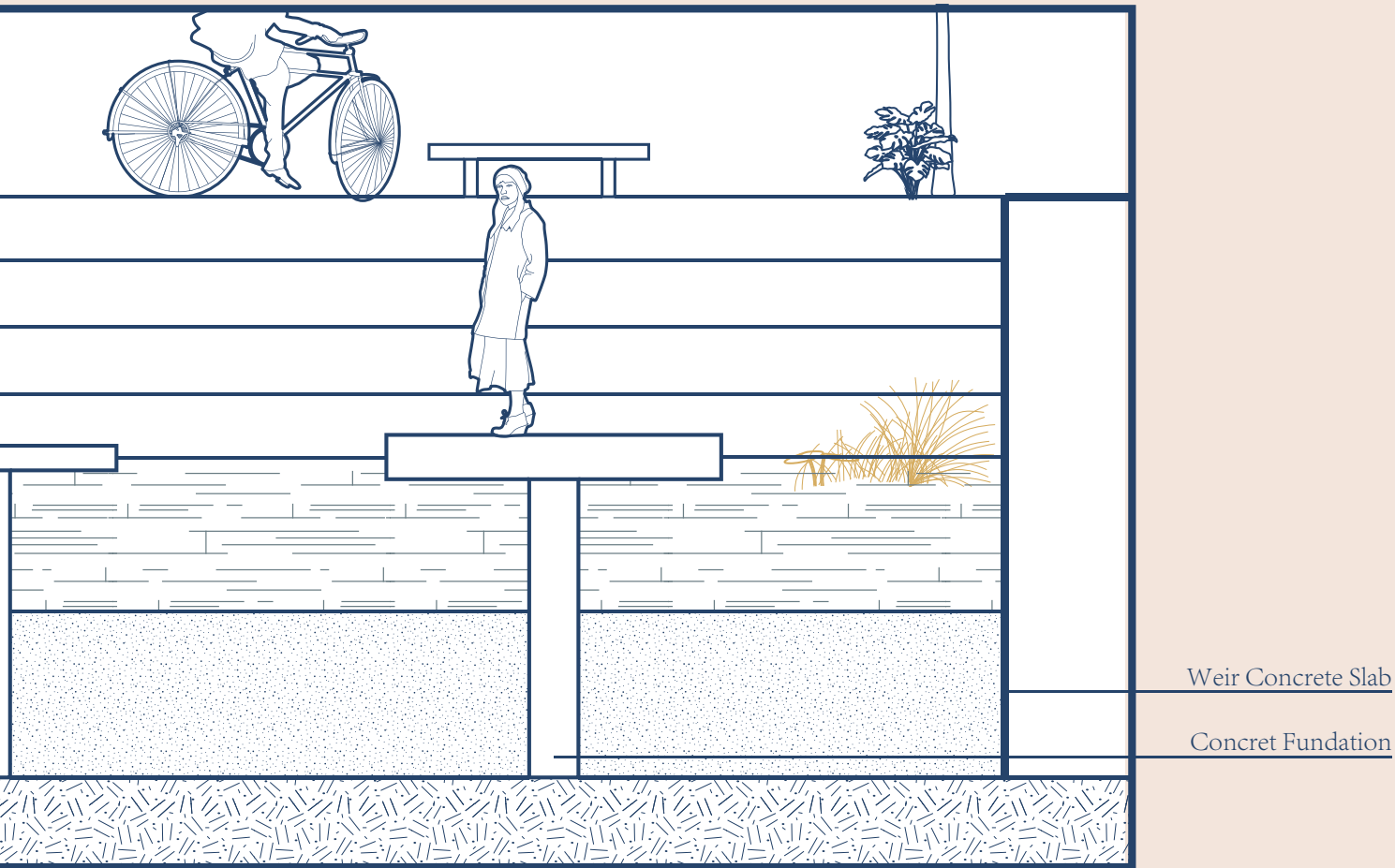
Wetland Filter



Gravel



er Square



ass Field

These are some technical details in it that are hidden underground with water storage or drainage capacity. Showing the design is trying to design the urban landscape infrastructure, trying to combine the ability of water treatment and improving the spatial quality.





LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE





Figure 5-46 Site Residential Area in Dry Season, Drawn by Author





LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE



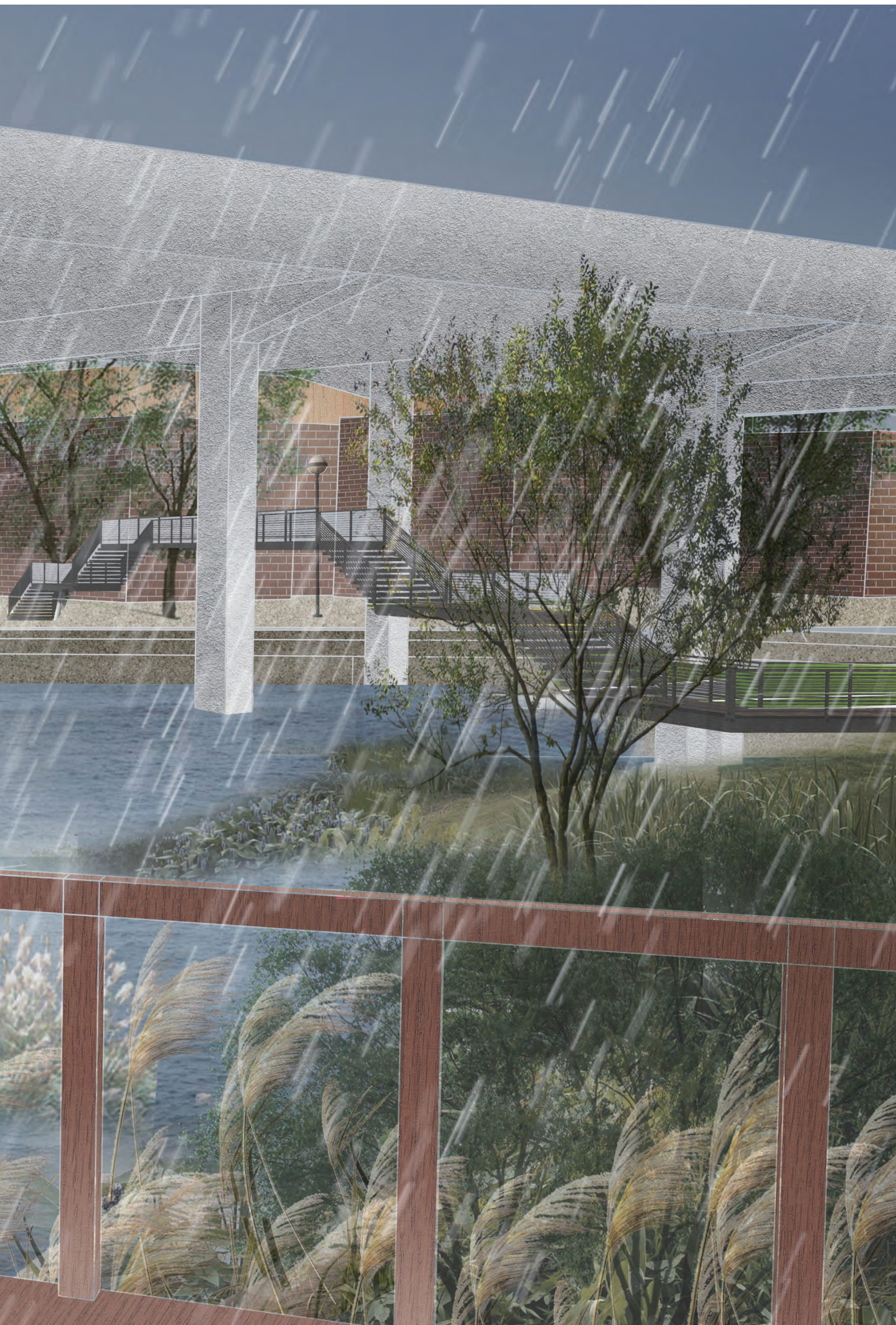


Figure 5-47 Site Residential Area in Rainy Season, Drawn by Author



## 5.8 Section 05

## CURRENT SITUATION

- A narrow and dark path, make people feel unsafe
- The facade of the temporary housing in bad condition, and block the sight into the canal



Figure 5-48 Path,  
Photo by Author

## 05

Temporary Housing | Residential Area

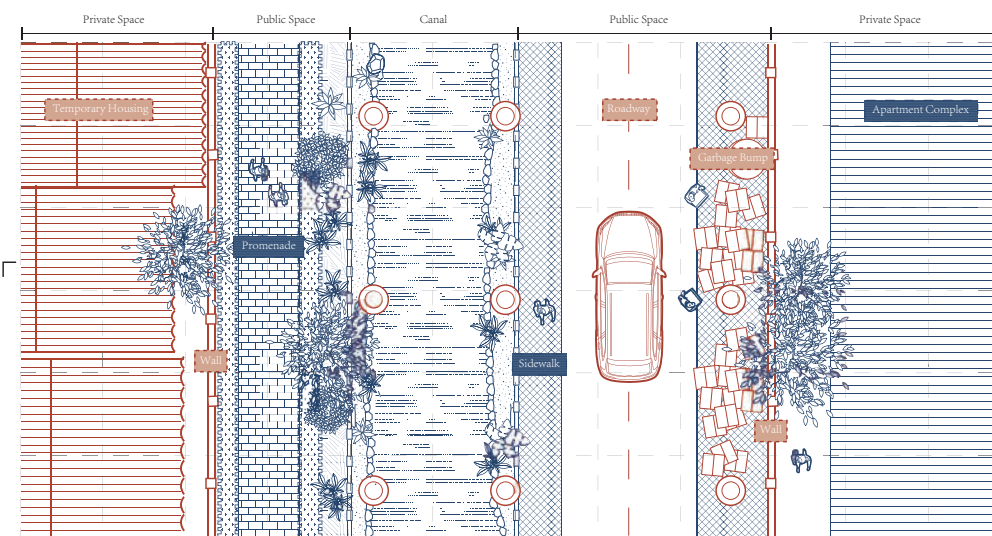
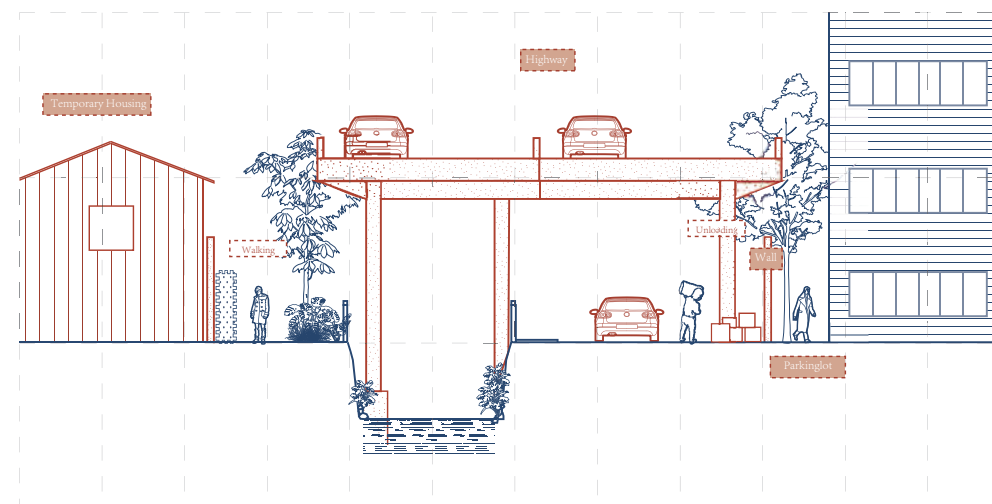


Figure 5-49 Current Situation of Section 05, Drawn by Author



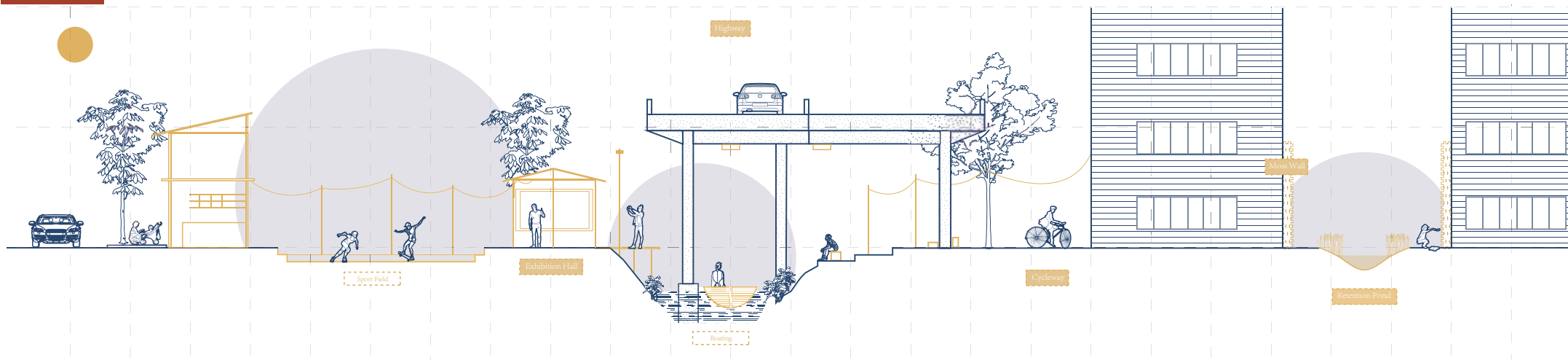
- Dark and messy area under the highway
- Garbage dump at the backside of the apartment complex



Figure 5-50 Messy Space,  
Photo by Author

## Design Exploration

# TEST 01



## TEST 02

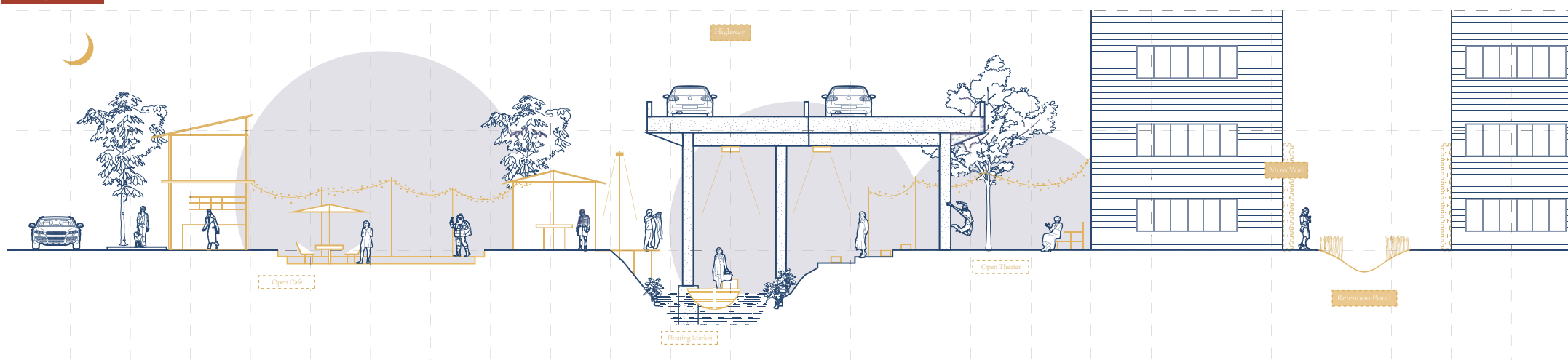


Figure 5-51 Design Exploration of Section 05, Drawn by Author

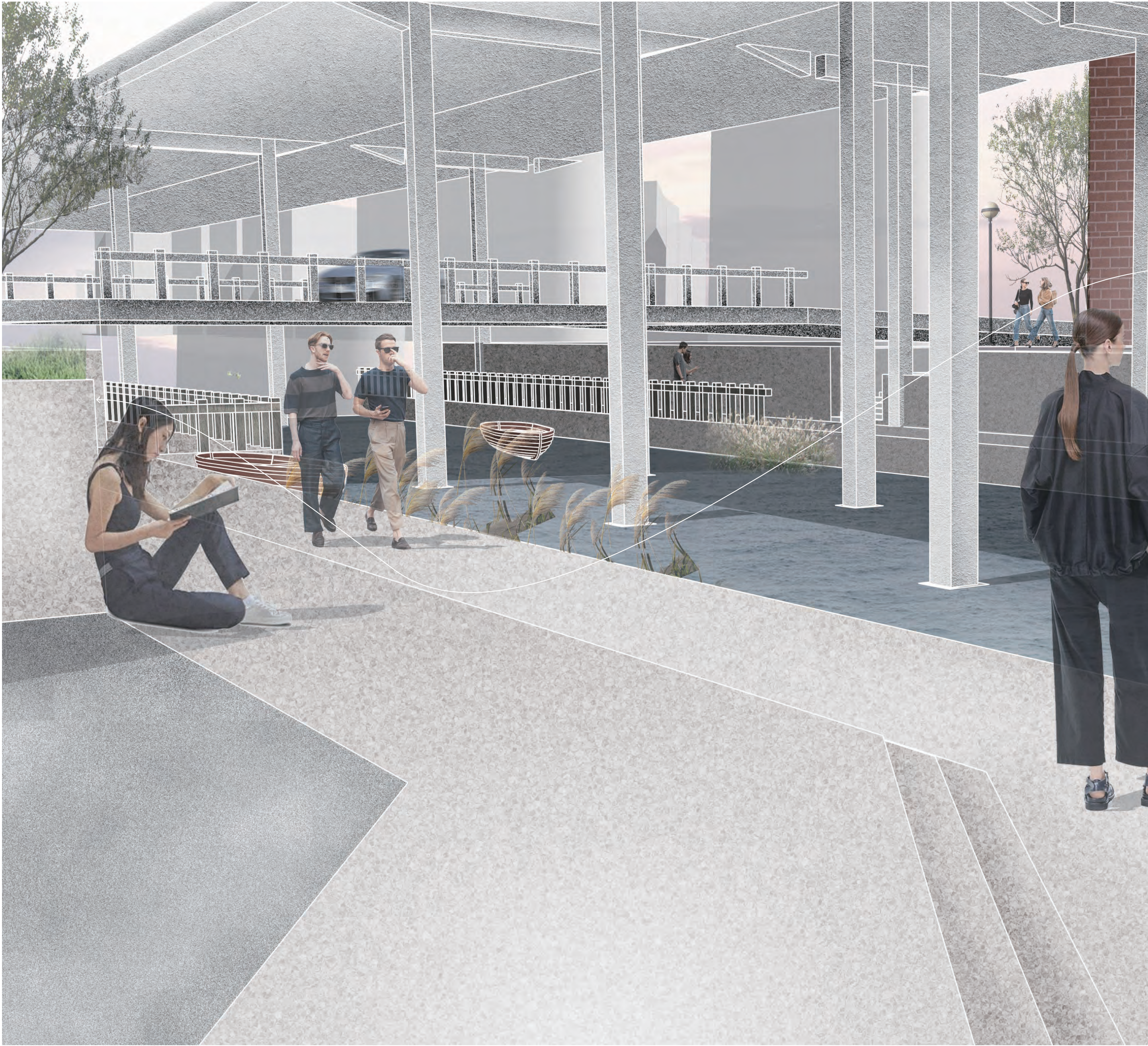




Figure 5-52 Site Crossing Point, Drawn by Author

The site is located at the intersection of the three transportation systems of highways, rivers, and main roads. The temporary building next to this intersection will be transformed into a square for opening up the market, echoing the residential area across the river. The multi-story plaza gradually decreases in height and is close to the river. There is a road for people to walk under the bridge, which is the intersection of the four transportation systems. The space under the viaduct can also be used, using lights to create different scenes during the day and night, and various activities can be carried out.





LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE



## 5. Design Exploration

### 5.9 Site-Crossing Point

This is the perspective from the water square looking into the neighborhood on the other side. There are water features, such as the platforms that offer an opportunity for children and families to engage with water at the canal's edge. The boating trip and the piers provide a physical connection to the water through recreation.

#### Crossing Point

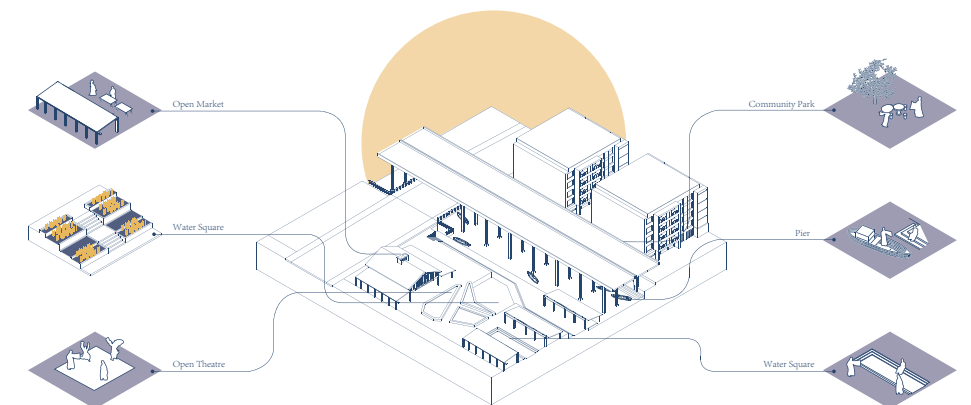


Figure 5-53 Programme, Drawn by Author

#### Transportation Layers

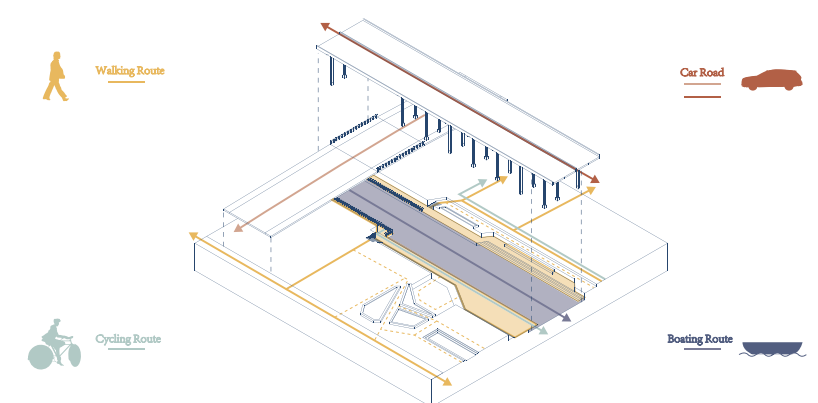


Figure 5-54 Transportation Layers, Drawn by Author

Figure 5-55 Water Square, Drawn by Author



# 5. Design Exploration

## 5.10 Section 07

### CURRENT SITUATION

- A side with concret wall, have no transition into the surrounding area.
- ugly facade
- no people use that walkway

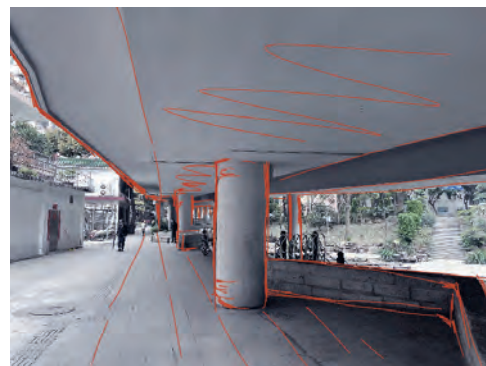


Figure 5-56 Path,  
Photo by Author

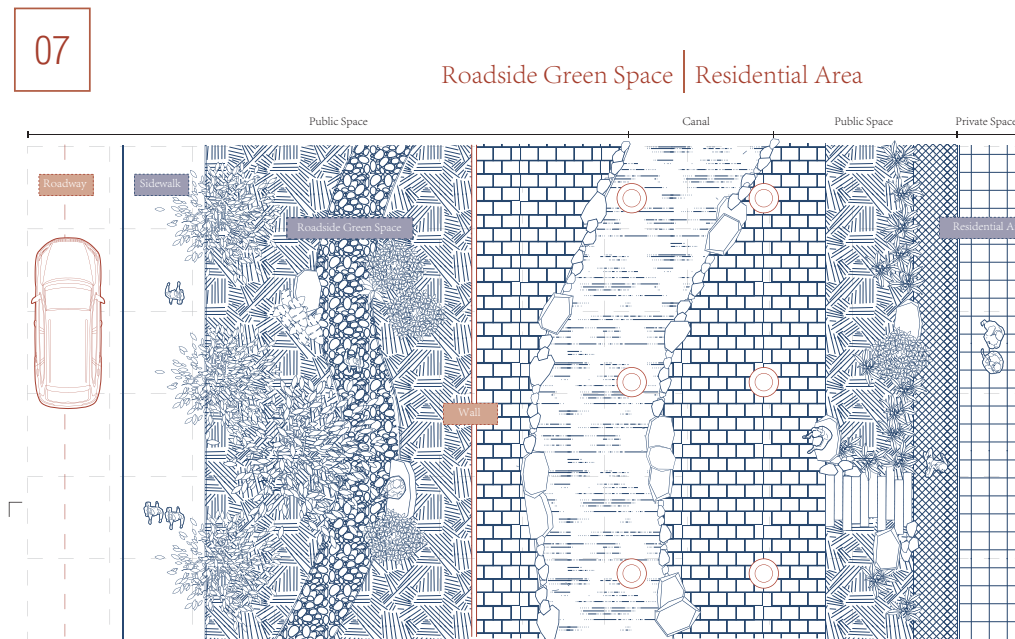


Figure 5-57 Current Situation of Section 07, Drawn by Author

- The waterfront area is barely used because of the height of the highway.
- dark and make people feel unsafe

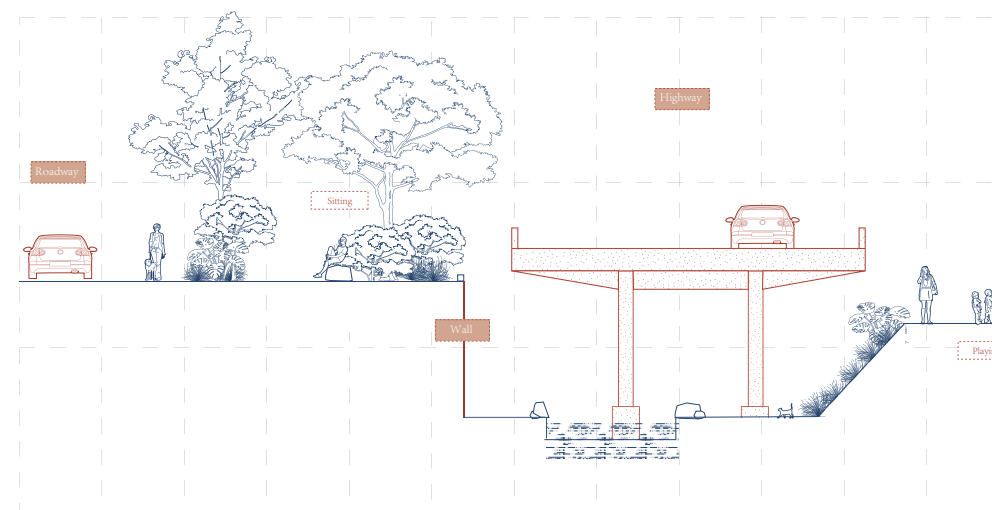
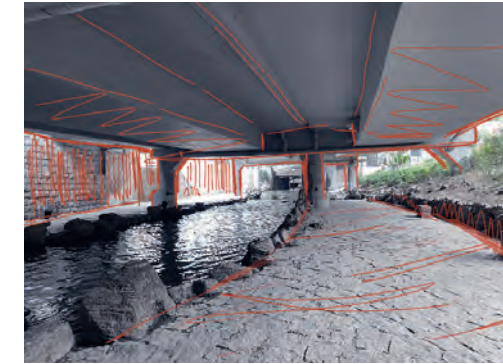
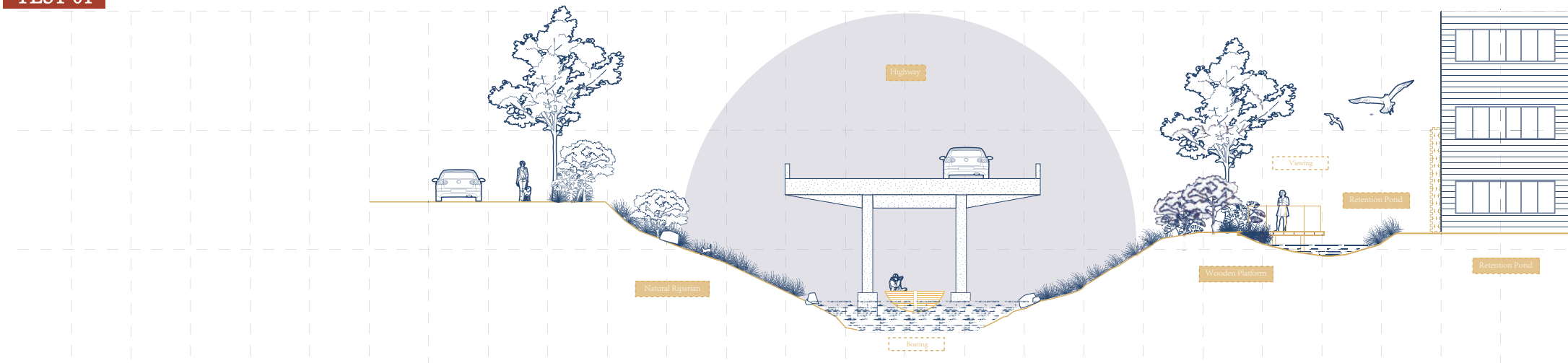


Figure 5-58 Narrow Space,  
Photo by Author

### Design Exploration

#### TEST 01



#### TEST 02

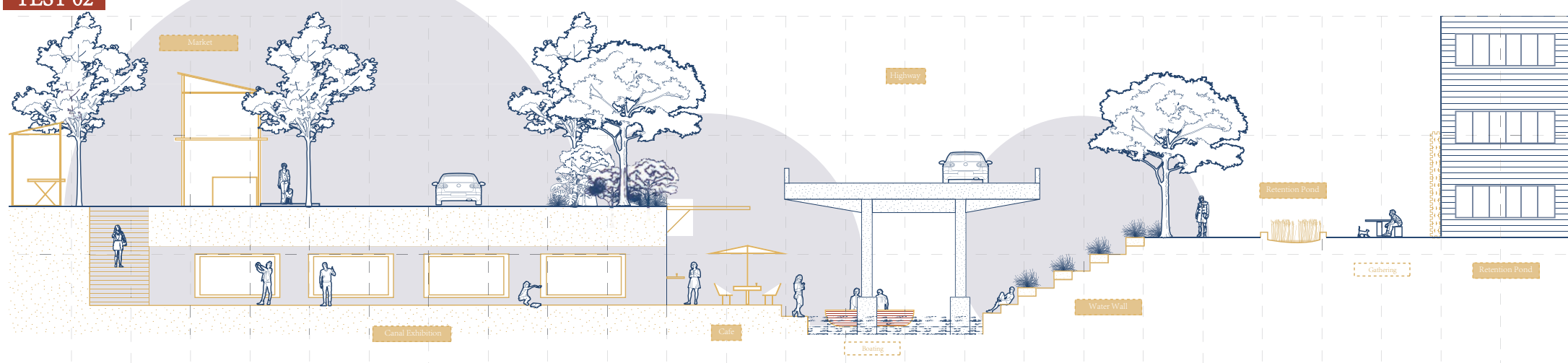


Figure 5-59 Design Exploration of Section 07, Drawn by Author





Figure 5-60 Site The End Part, Drawn by Author

The area is the north endpoint of the main canal area, and also the endpoint of the boating trip. Therefore, there would be a pier for the boating. However, because of the low height of the highway in this part, the area underneath is dark and limited, so this area would be given back to nature and a walkway underground connecting the residential area would be made. The space underground can be made for the exhibition of the story of this canal.





LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE



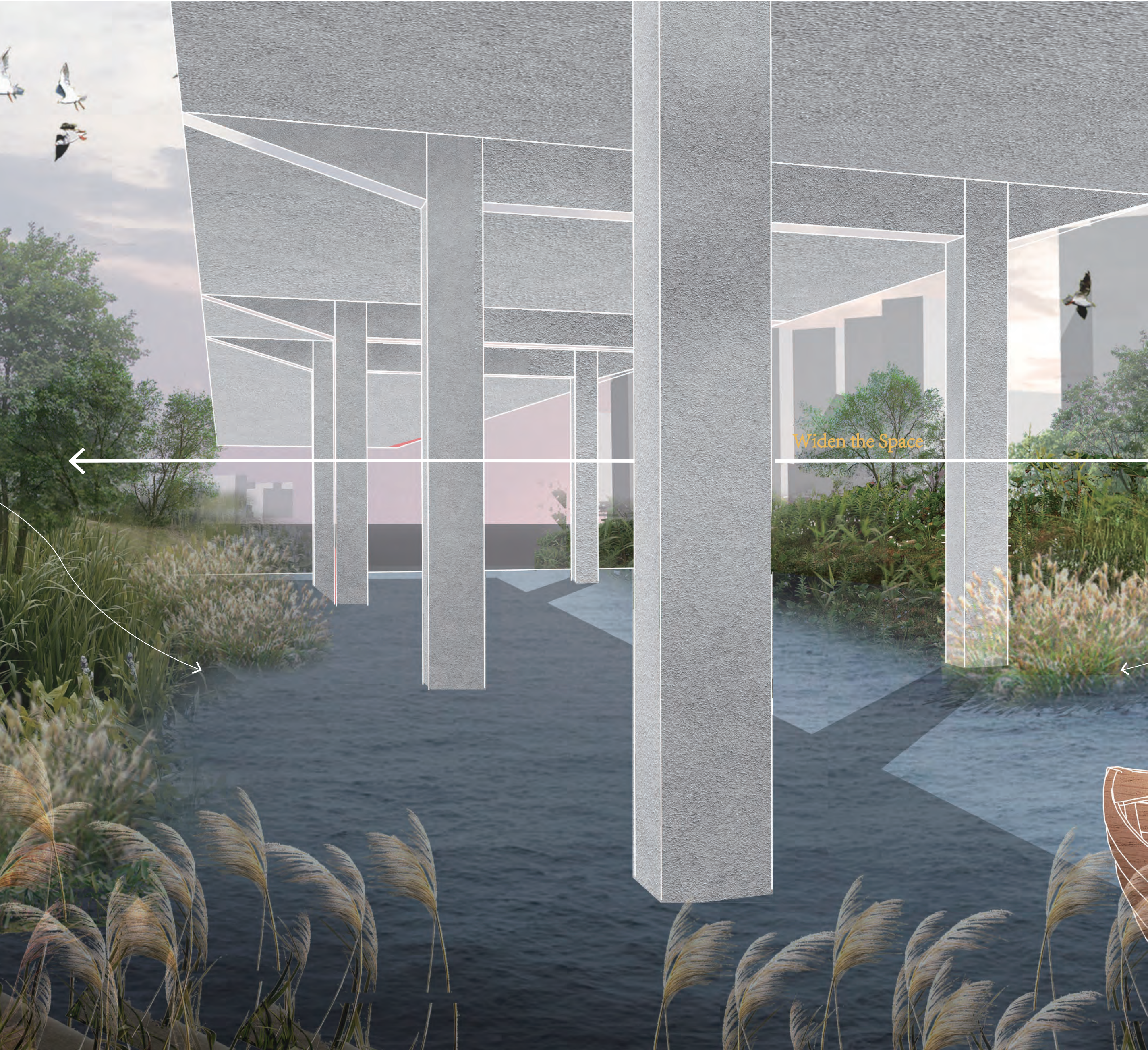
## 5. Design Exploration

### 5.11 Site-The End Part



Figure 5-61 Underground Exhibition Hall, Drawn by Author



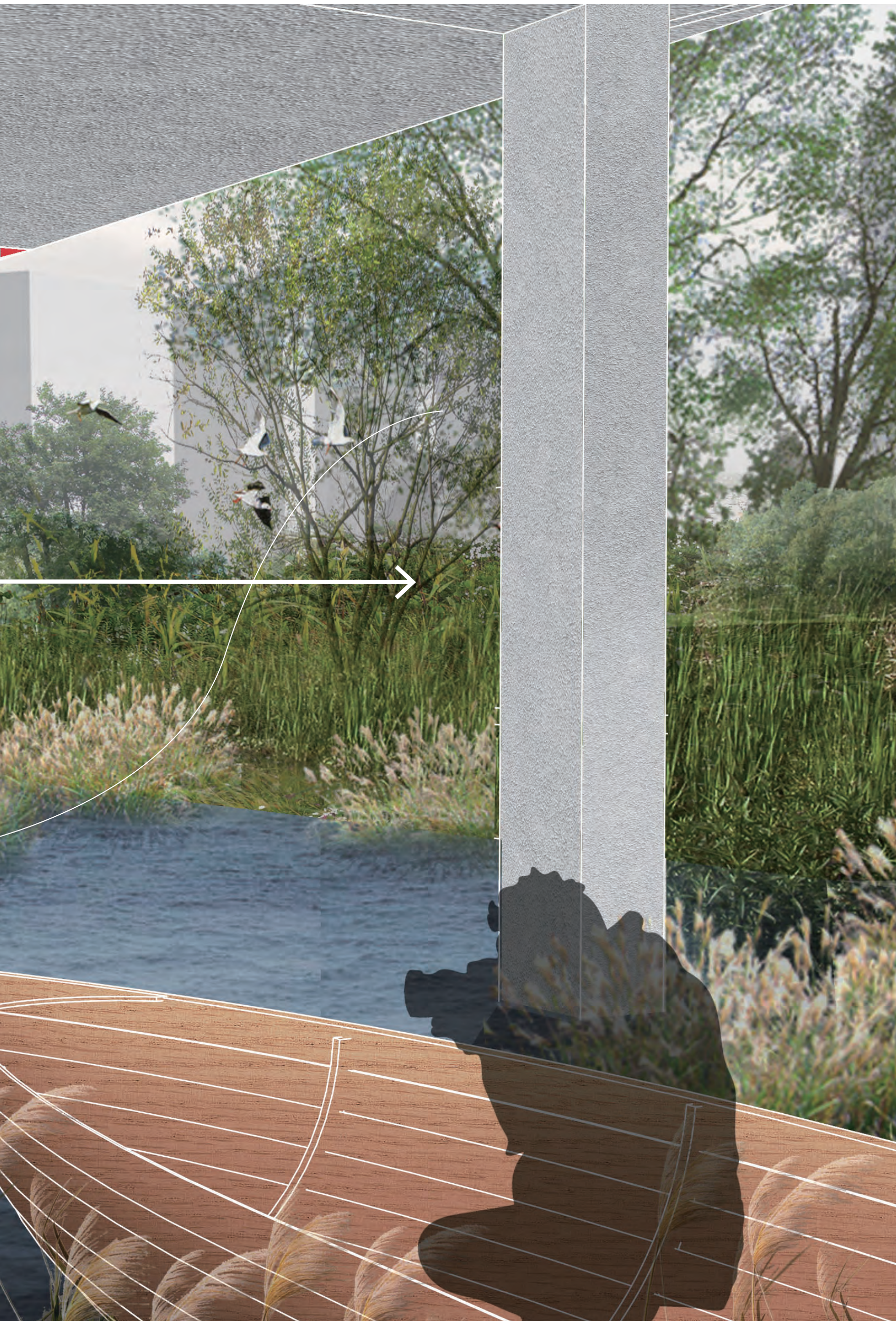


LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE



## 5. Design Exploration

### 5.11 Site-The End Part

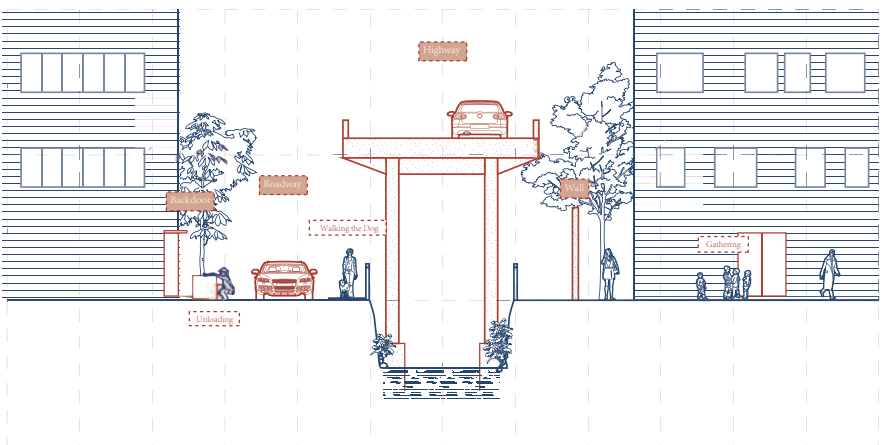
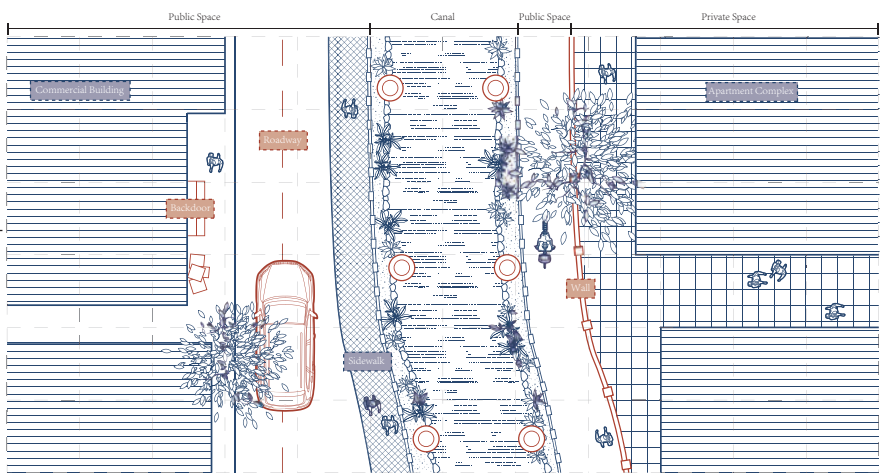




CURRENT SITUATION

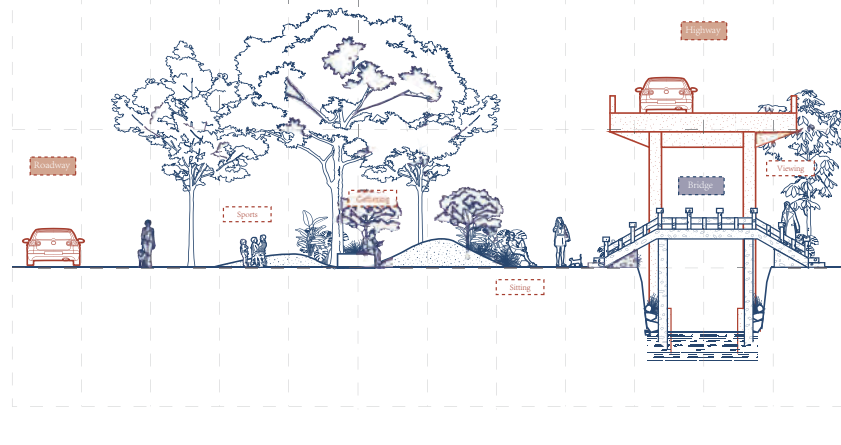
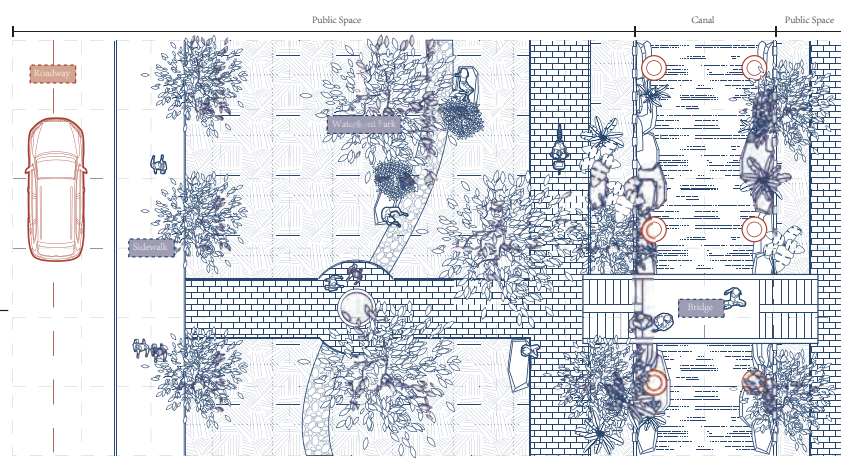
03

Commercial Building | Apartment Complex



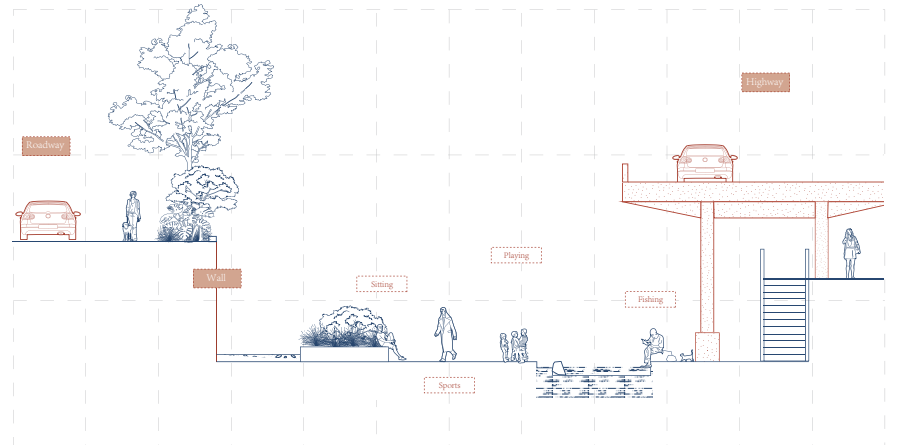
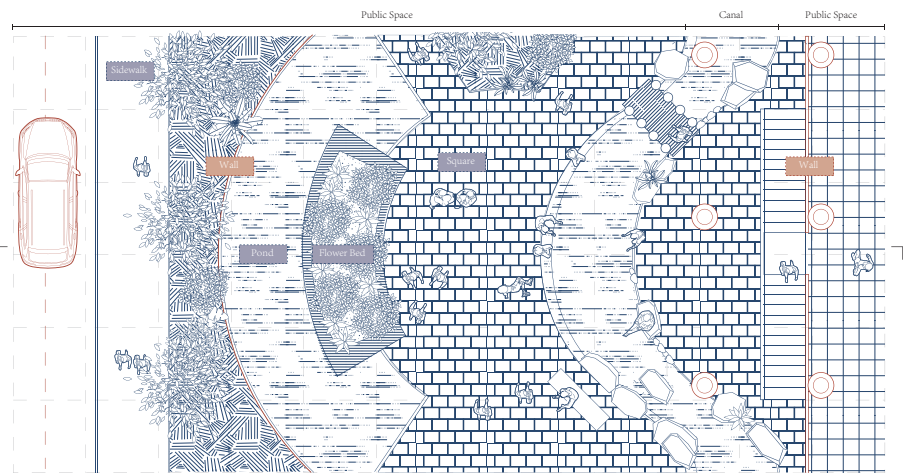
04

Waterfront Park |



06

Open Square



POSSIBILITIES

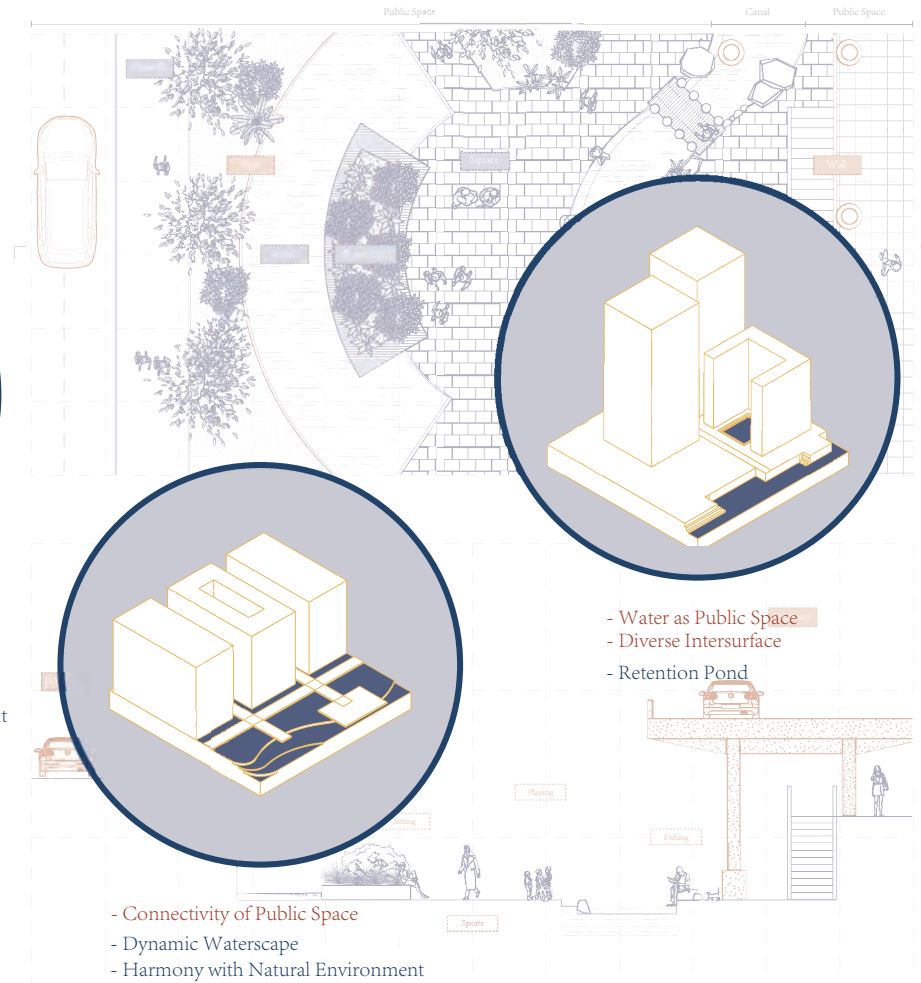
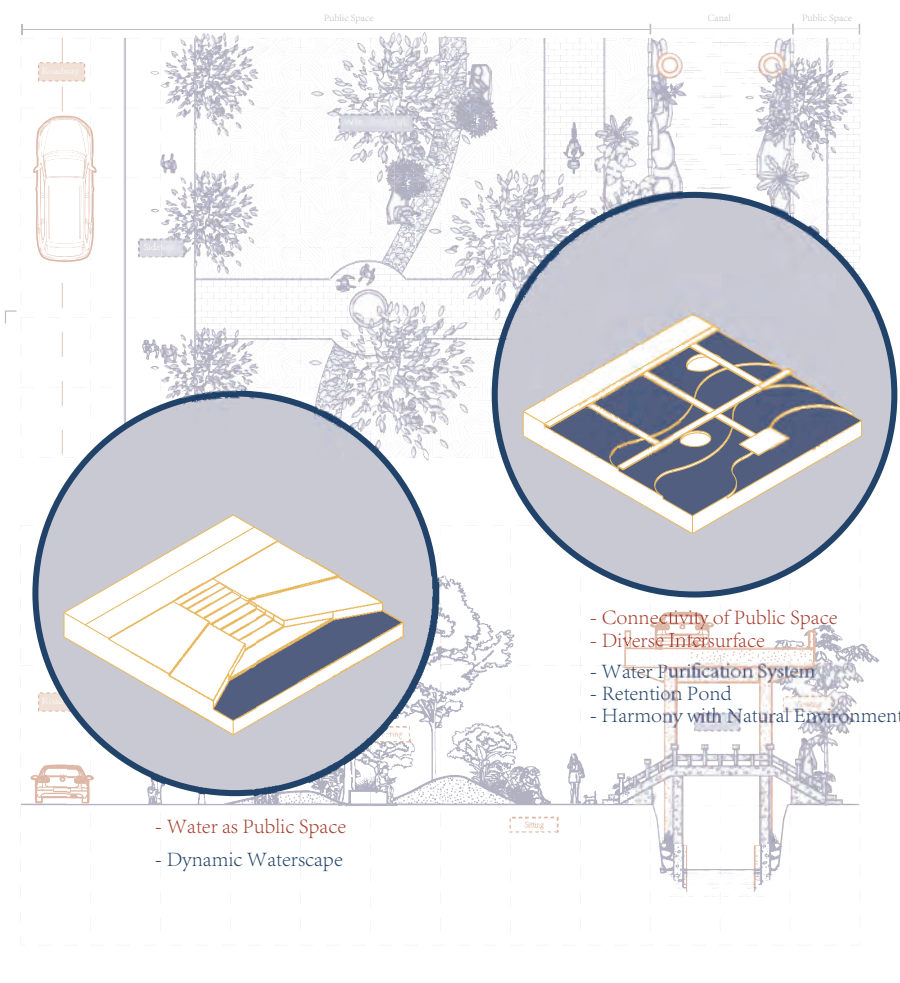
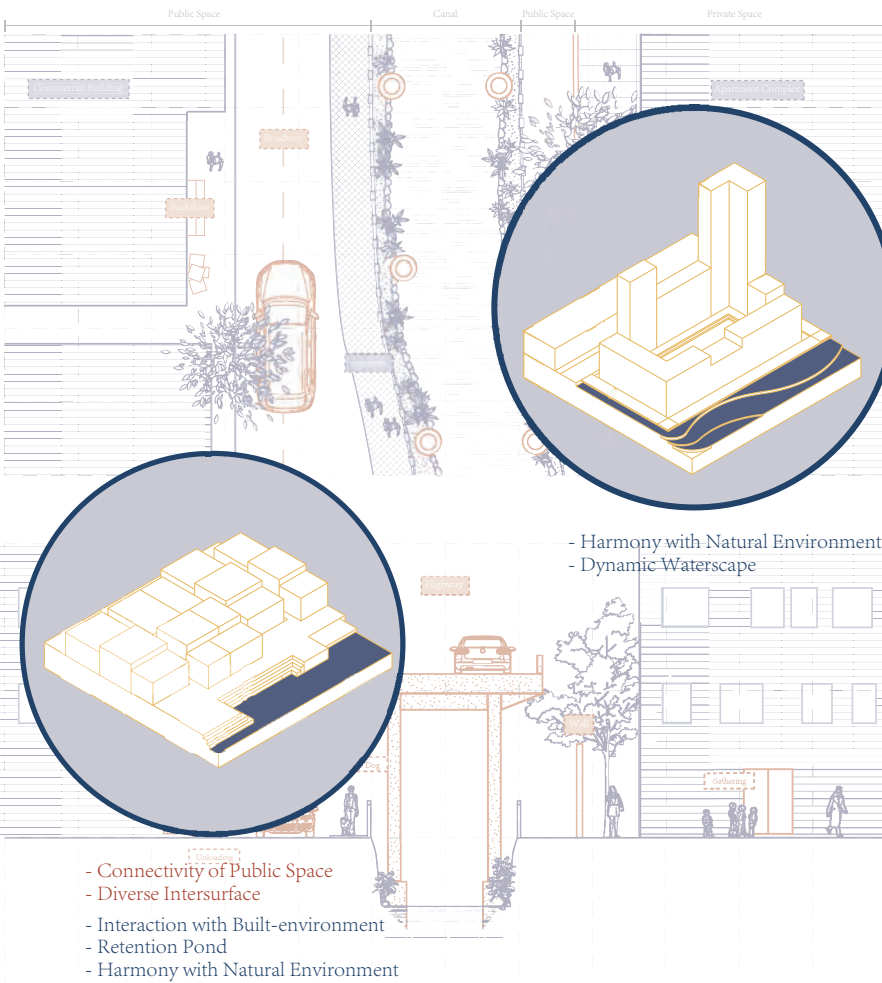


Figure 5-63 Design Exploration of Other Sections, Drawn by Author





Figure 5-64 Site Other Section, Drawn by Author

Except for the three sites I have described above, there are also general sections between them. These sections focus on different interfaces, between the apartment complex, or the open square along the canal. Each of them I also did the design exploration, apply the design principles in it test the potential of the site and design principles themselves.





Figure 5-66, 5-67 River Mouth of East Moat, Photo by Author

Figure 5-65 River Mouth of East Moat, Drawn by Author

As for the port area, at the side of Pearl River. I also have the vision to emphasize the connecting point of the canal and Real River.

This area originally continued the design of the entire road along the river without highlighting the key points. The entrance of East Moat was hidden under the viaduct, which caused people not to realize the important historical value of this area and the significance of the landscape. In the estuary area, a platform protruding from the river surface is used to emphasize its status as the connection point between Donghaoyong and the Pearl River. Its river-facing form mainly refers to the historic commercial district along the river, allowing the design to respond to history at the same time.



## 5. Design Exploration

### 5.13 River Mouth

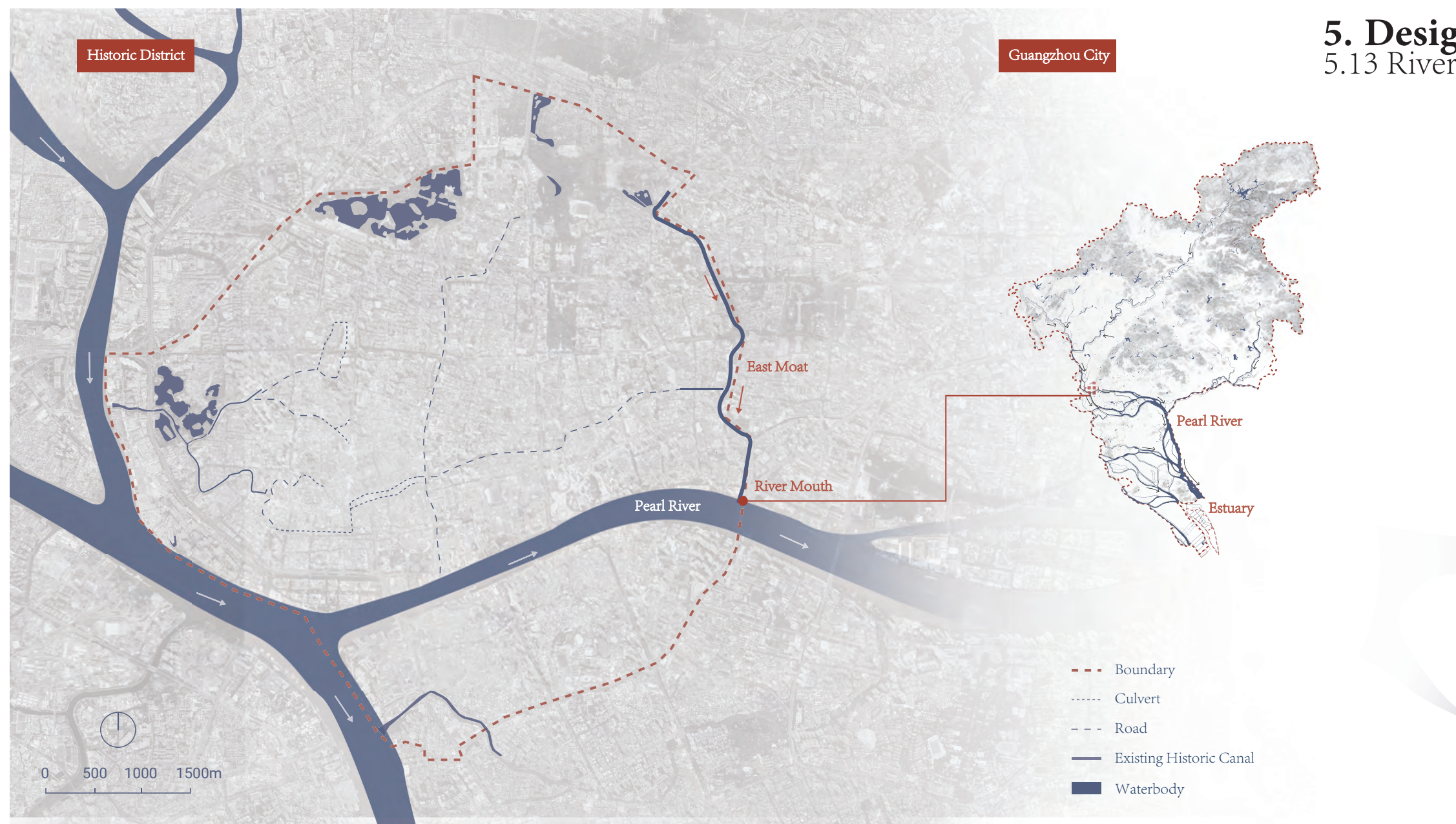


Figure 5-68 River Mouth of East Moat in Pearl River Delta, Drawn by Author



Figure 5-69 Vision for River Mouth, Drawn by Author





Figure 5-71, 5-72 Upperstream, Photo by Yilunanfeng, 2020

Figure 5-70 Upperstream of East Moat, Drawn by Author

The upper stream part consists of the lukwu lake, the initial water source of the canal, and the residential area between them. My vision for this area is to rediscover the historical value and connection between the lake and canal, restore the historic canal and the water activities on it.

The upstream part is composed of a part of the canal and the former water source, where Luhu Lake is located. The canal in this part is fragmented and interrupted by the continuous main road. And the canal mainly flows along the direction of the road. In the design, the fragmented canal is connected with bicycle lanes and landscape trails to expand the surrounding green space and activity space, extend the atmosphere of the main canal to Luhu Park, and form a continuous landscape axis.



## 5. Design Exploration

### 5.14 Upper Stream

- Continuous Greenway
- Combined with local identity and cultural elements
- Activity Center for Neighbourhood

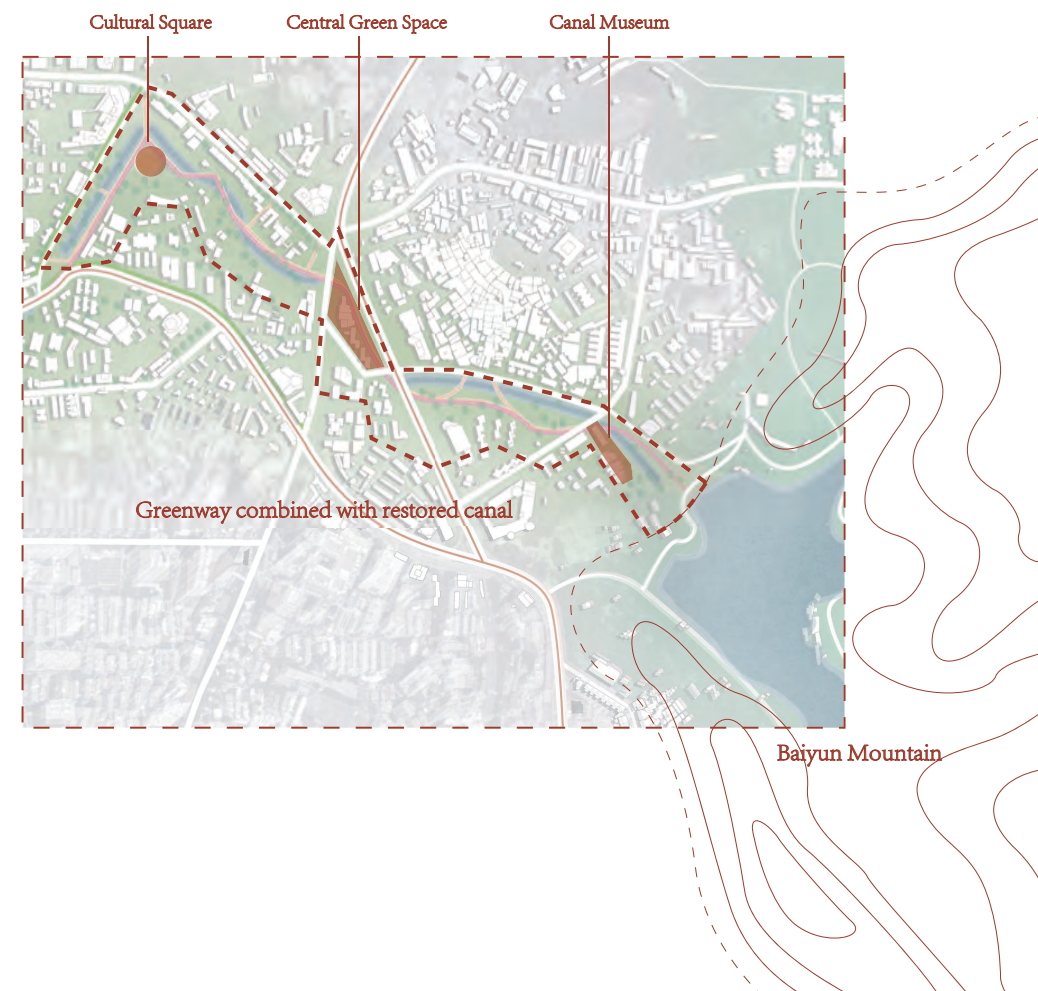
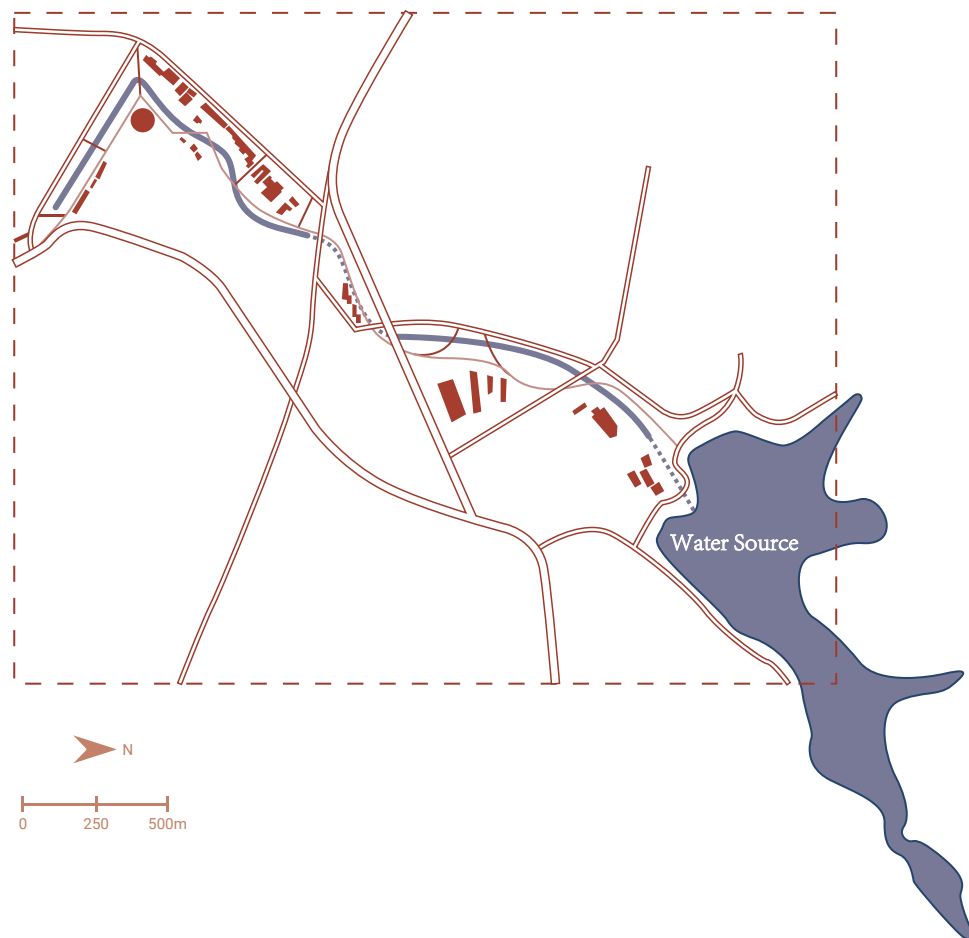


Figure 5-73 Upper Stream of East Moat, Drawn by Author



Figure 5-74 Vision for Upper Stream of East Moat, Drawn by Author





LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE



5. Design Exploration  
5.15 Visiting Routes

To create a continuous experience through the Canal, there are two visiting routes from the Pearl River to the lake, and a boating route in the main canal area. These three roads connect various venues and green spaces, such as community parks, forest parks, and open markets. At the same time, these three roads are well connected with the existing transportation system, including subway stations, bus stations, and bicycle rental offices.

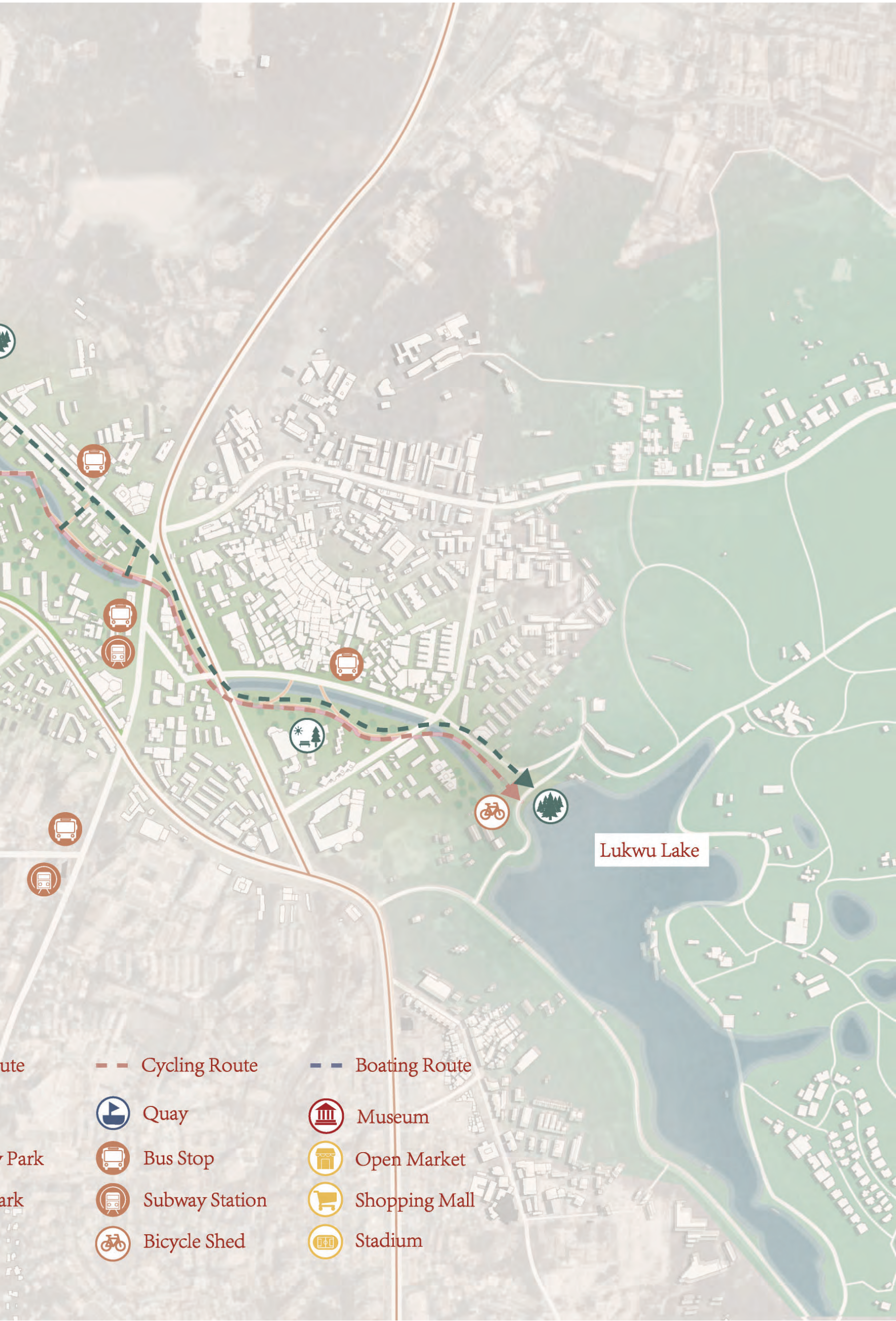
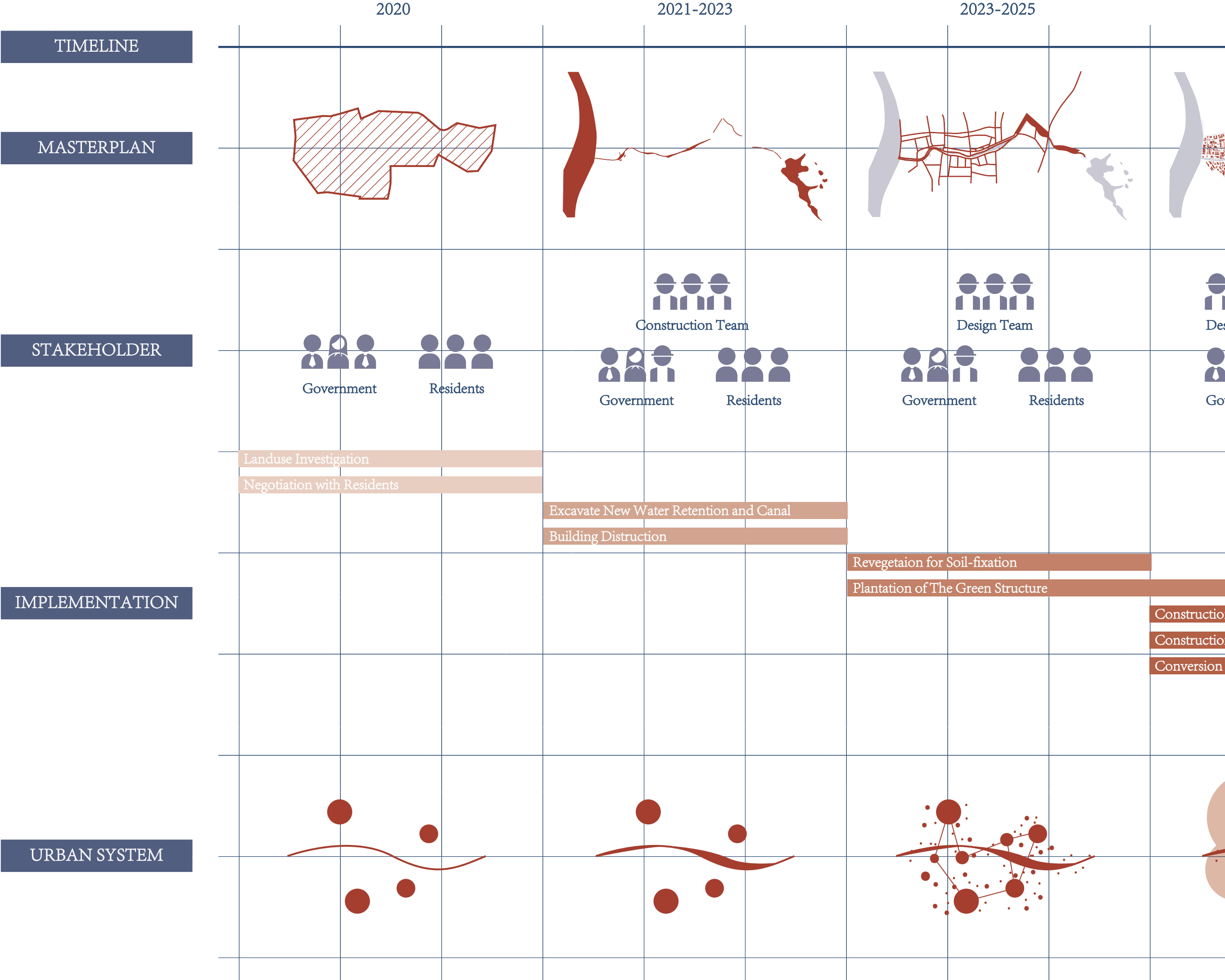
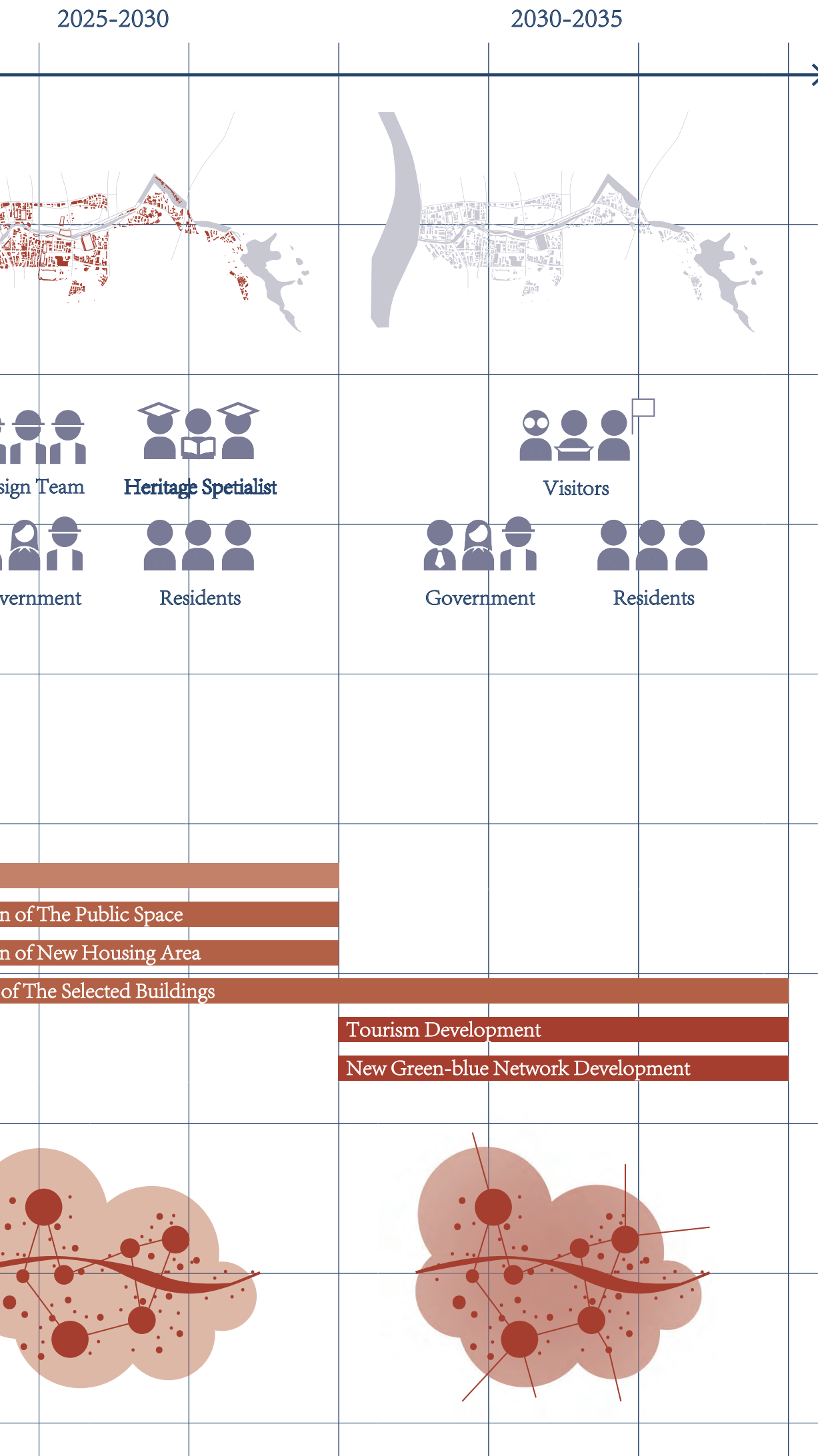


Figure 5-75 Visiting Routes, Drawn by Author







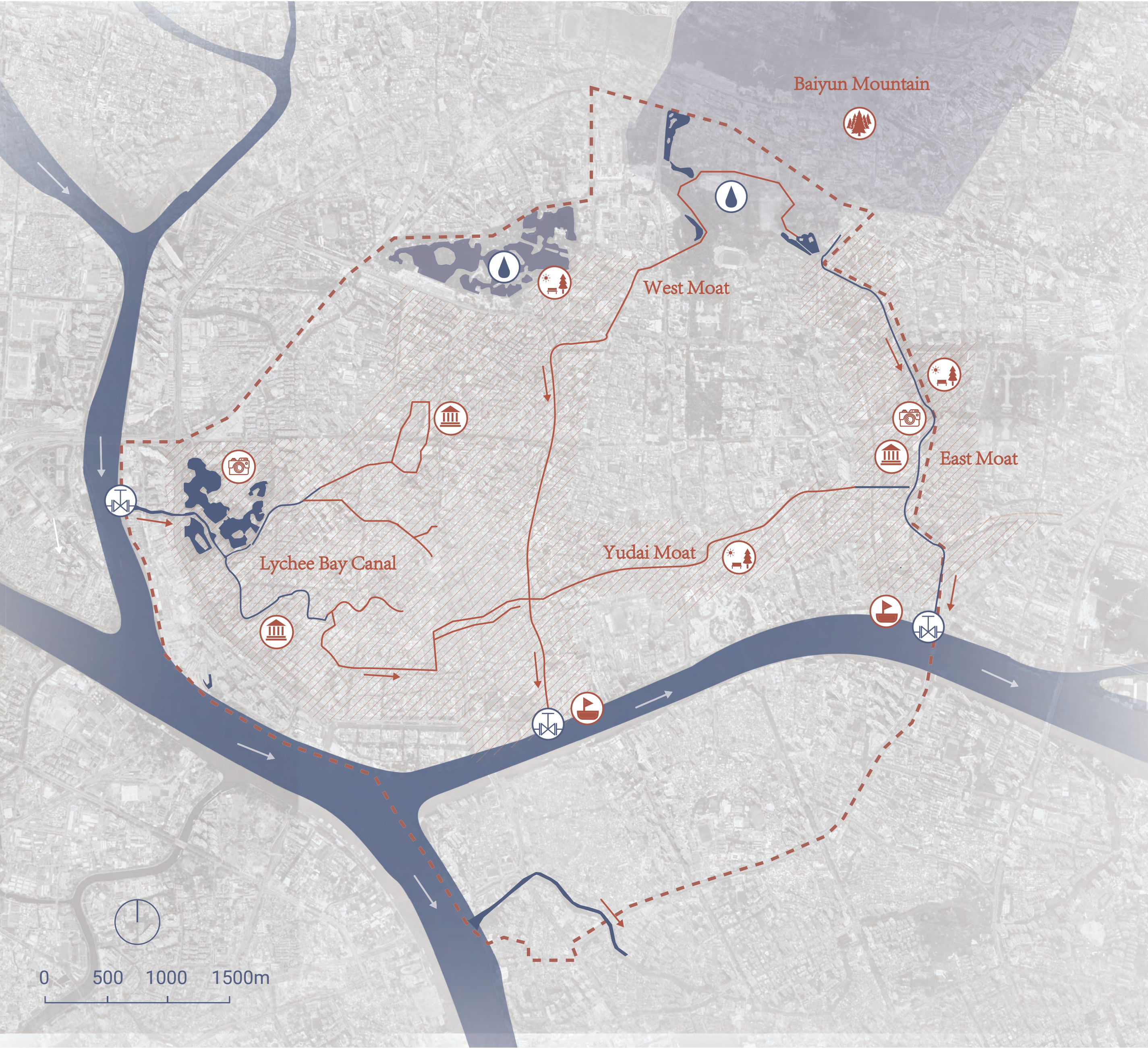


This project needs five phases to be completed, From the first, the land use investigation of the historic district is very important to preserve the heritage, and the discussion with the residents, then the new canal and retention pond excavation. After the plantation and the construction of new communities, more potential projects would be generated in this area.

The construction of this plan needs to be divided into five stages. First of all, in 2020, before the actual start of the plan, a careful study of the use of the land and the year and state of use of the construction is required. Because there are many historically built areas in this plot, the dilapidated buildings that have been in disrepair need to be maintained or demolished to provide space for the planned new public space and river channels. Prioritize protection of architectural river areas with important historical significance and important regional renewal will also be carried out around these areas. At the same time, because many places in the plan need to be demolished, new residential areas will be built in the future. Therefore, the development of the plan requires consultation with residents, and the design requires the participation of residents. The second stage is to formally carry out the demolition of the building and the project to widen the river. This stage is mainly the participation of the construction team and the supervision of citizens. The third stage is to plant vegetation on the new riverbank to stabilize the soil while planting where the new green net is located. At this stage, landscape architects participate, and landscape architects guide planting, choose native tree species, and recreate the atmosphere of Lingnan Water Town. In the fourth phase, the construction of public spaces and new residential areas was officially carried out, and the maintenance of historical buildings was carried out under the guidance of historical experts. The last stage is that after all construction plans are completed, residents will move back and new communities along the water will be established. New water-related activities are launched in the community to enrich the lives of citizens and stimulate the vitality of the canal area. The new play route will attract the tourism industry. A beautiful environment will attract more and better plans to be implemented in this area.

Figure 5-76 Implementation in Phases Drawn by Authur





LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE



The reborn historic canal system is also a new green-blue system. It flows through every corner of the city and communicates in the city. It creates more space for water and opens up new river channels. In the rainy season, the river system can quickly drain the water in the historic city to the Pearl River. During the dry season, it has more space to store water.

On the other hand, as the urban landscape infrastructure, the canal system is an integral part of urban ecology, landscape environment, and urban spatial pattern on the material level, and is a part of urban life on the social level, and bears the function of serving the community and serving the city. As the starting station of the Maritime Silk Road, Guangzhou 's historical development is also closely related to the water system. Each river has its unique significance. Through the improvement of the rivers in the central city of Guangzhou, comprehensive management of the environment has restored the relationship between the city, the river, and the people, reproduced the broken water culture, city culture, and humanistic culture, and found the memory of Lingnan Watertown, to rebuild a vibrant and cultural waterfront space city.

- Continous public space and experince
- New green-blue structure
- Give new energy to canal area
- More space for water
- More permeable surfece
- Canals flow thourgh every corner of the historic district

- - - Boundary of Historic District
- Historic canals to be restored
- //// Canal area to be transformed





LIVE BY WATER, DESIGNING THE HISTORIC CANAL SYSTEM OF GUANGZHOU AS URBAN LANDSCAPE INFRASTRUCTURE



## 5. Design Exploration



Figure 5-78 Bird Eye View of East Moat, Drawn by Author



# 6

## CONCLUSIONS & REFLECTION

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This chapter presents the reflection on this graduation project. It answers the research questions one by one, and gives reflective ideas on the process of research. There is also a discussion on the role of design in this research, if the design exploration plays its role in the research. The third part is about the lesson I learned in the process of research and design, and what knowledge on landscape architecture it has produced. The last is the outlook for this research on its possible usage on other place around the world.







## Research Objective and questions

To redefine the role of the historic canal system in Guangzhou as water landscape infrastructure adapting to future urban development, first of all, the historic canal and its surrounding area need to be understood as a whole system. Since the canals have a long history, and have deep relationship with the city, to understand the system, looking back to the history is necessary in this project. By comparing the condition between history and current situation, the nature of the challenges they faced now could be easily understand. Also, looking back to the history does not mean to recreate the scenes from history, it means to learn the design principles from it, and apply them into the current situation. In these days, people always seek the solution from modern technic. However, the nature of problem could be very similar to historic situation in many cases, and the answers to the questions are already in the history.

To understand the challenges Guangzhou is faced with, the layer analysis has been done in this project. The urban landscape is a complex system, consisting of the natural layer and urban layer, and they affect each other. To look into the challenges of the urban area, the basic nature condition is the essential element to be taken into account because it is the base of the city development. The question is answered by the mapping layers in the diagnosis part of this project. The analysis begins with the natural base, then into the city development and condition of public space.

Lastly, how could the reborn historic canal system work as a new urban landscape infrastructure? Landscape infrastructure is an important driving force for the process of shaping the built environment and contemporary space. The reborn historic canal system could be the driving force for the development of the surrounding area. It creates a new green-blue structure and reorients the city back towards the canal. A new active waterfront area is created along with the canal.

## Limitation of the Study

The biggest problem I have encountered during the research is the lack of a source of history study. Since my topic is focused on the historic canal and looking back into the history is an important part of my theories, understanding the historic canal and its development is essential in my research. However, some important historical materials and documents are only in paper versions and are stored in museums in Guangzhou. Due to the COVID-19, I could not get access to the materials easily, and this means that the historical study chapter of my project has some gaps and it is uncompleted. To fill this gap, I chose to study more on the relevant cases and do more site visits in Guangzhou, for instance, the Lychee Bay Canal renovation project, to learn more in field observation.

As for the design, because the historic canals are mainly located in the historical inner-city, it is difficult to do big renovation and has big ambition in such district. Many different issues need to be considered in practical, such as the protection of historic buildings and the repair of dilapidated buildings. Also, the negotiation with local people is very important, since many residents there have lived there for generations. I need to have a proposal that could protect the historical relics well, and at the same time allows them to have new possibilities in future development. However, because of the lack of data and the time limitation, I could not do such a thorough field study and get the chance to discuss with residents. I hope my project could give a new perspective on the historic canal renovation project, and I could have a chance to do the field study in future practice.



### Research through Design

The relationship between research and design could be dynamic and they affect each other. On the other hand, the design could be the orientation of the research. The goal of design sets the framework of research, making the process of research targeted and efficient, as well as the content of research. On the other hand, Research works as the major input for the design. It provides the acquired knowledge background and informs the base of the design. In the design exploration part of this project, the research created the base of the design, so that the design could be begun in a set scene.

Design is also a part of the research strategy in this project. To explore the possibilities of the design principles learned from history in the modern challenges and specific site conditions, design is an important tool to generate different concepts and ideas in this process. This is also an important process to transform the knowledge from research into practice design. In this case, the design principles learned from history are not enough for the design. They need to be tested and transformed due to specific conditions. In the design exploration part, I tried to combine different design principles and made several design models see what would that look like. This process has enriched the design principles, making them not only could work in Guangzhou but also have the possibility to work in other places in the world.







## 2. Lesson Learned

1) Historic canal could be activated as urban landscape infrastructure.

Guangzhou is not the only city with abundant canals and close cooperation with water. In the process of modern urban development, the canals suffered from flooding and other water source problems due to their geographical conditions and urban development, and gradually disappeared in local life. Historic canals could work as the back bone of the urban life, which facilitate social and ecological interactions and shape the built-environment and contemporary landscape a better place.

2) We could draw design principles from history.

History can help us better understand the ways, times, and causes of large-scale changes. “Those who don’t study history are destined to repeat the same mistakes.” These words were originally said by George Santayana, and because of their authenticity, they are still very relevant today. History provides us with the opportunity to learn from the mistakes of the past. It can help us understand the many reasons why people behave in their own way. As a result, it helps us become more compassionate and become more decision-makers.

3) Design exploration is important to explore multiple possibilities of the principles and sites.

To explore the possibilities of the design principles learned from history in the modern challenges and specific site conditions, design is an important tool to generate different concepts and ideas in this process. This is also an important process to transform the knowledge from research into practice design. In this case, the design principles learned from history are not enough for the design. They need to be tested and transformed due to specific conditions. In the design exploration part, I tried to combine different design principles and made several design models see what would that look like. This process has enriched the design principles, making them not only could work in Guangzhou but also have the possibility to work in other places in the world.

## 3. Outlook

This research aims to help readers understand the importance of the historical canal system, its socio-cultural impact on surrounding areas, and what it can do in climate change. In the theme of my graduation, I want to bring back the social, cultural and ecological value of water infrastructure and explore how water infrastructure affects the surrounding built environment.

Guangzhou is not the only city with abundant canals and close cooperation with water. In the process of modern urban development, the canals suffered from flooding and other water source problems due to their geographical conditions and urban development, and gradually disappeared in local life. A new perspective has been raised in this project for solving this problem by reviewing history and exploring the potential of the city’s long-standing waterways in terms of cultural and social value and spatial quality. The design has provided the possibility for the development of adaptable coastal cities and provide guidance for other similar projects.







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