

**Urban Waterfront Revitalization and Open Space: A Case of  
Rezoning Waterfront of Yong River in Nanning, China**

A thesis submitted by

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## **ABSTRACT**

Renovation of public open space on the urban waterfront is a unique part of the urban setting of many waterside cities. Urban waterfront revitalization is not just old city reconstruction and new zone development; it is also a balance between economic needs and the public's demand for access to the water. Waterfront revitalization is a phenomenon in Nanning, China. The Yong River offers main waterfront shorelines in Nanning's core urban area, which covers about 70 kilometers on each bank. The government is gradually emphasizing waterfront open space. A decision to convert undeveloped land, which consists of 50% of total waterfront area, into public space has been made and will result in an increase in public waterfront space from 10% to 20%. This research employs a case study method based on both qualitative and quantitative approaches, utilizing archival research, site observation and survey. The study details the current situation of Nanning's waterfront open space and then makes recommendations for how policy makers and urban planners in Nanning can balance public open space with other land uses in revitalizing their waterfront.

## ACKNOWLEDGEMENTS

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## CHAPTER 1 – INTRODUCTION

During the last few centuries, waterfront areas in cities have undergone large transitions. Although more people have found more ways to take delight along river banks and seaside, such areas have increasingly been taken away from public uses. The use of the urban waterfront has been usurped by giant ports and other uses, such as warehouses, factories and transportation. However, an interesting urban waterfront phenomenon emerged five decades ago in post-industrial cities. In these cities, the main aim of waterfront development was to reuse the centrally-located waterfront areas, which were previously occupied by industrial, railway and port activities. The move was stimulated by public demand for better access to the water through the provision of public space on the banks.

Nanning, China is one of those cities that has experienced waterfront development. But urban development, especially waterfront development in Nanning, results in a different manifestation of the urban waterfront phenomenon than found in North America and Europe. In Nanning, waterfront area can be used as formal and informal. This is driven both by demand from the government seeking to accommodate public projects, and from the local citizens seeking land for agricultural use.



## **1.1. A Case of Waterfront Rezoning of Yong River**

The waterfront rezoning of Yong River caught my attention when I was working for Urban Planning & Architectural Design Institute of Fudan University as an intern back in the summer of 2015. Our team was invited to Nanning, China to make some suggestions for the redevelopment plan of the city's waterfront. During the visit, I noticed that the redevelopment of the waterfront of Yong River could become a very meaningful and challenging research project.

With a total length of 83 miles (133.8 km), the Yong River is one of the most important rivers of southern China. It runs through Nanning, the capital city of Guangxi Zhuang Autonomous Region. It joins into the Yu River and flows into the South China Sea. Nanning is the only city in all the autonomous regions of China with open coastal areas.

The usable land along the Yong River is 143.41 square kilometers, but only 12-13% of the usable area is public open space and for commercial use, including schools and hospitals; in the city center area, over 50% of the land is agricultural and undeveloped open space. Therefore, Nanning's waterfront area lacks public and commercial uses, which has resulted in the local government's desire to rezone the waterfront area and bring more urban

vitality. The city is now experiencing a redevelopment plan and this thesis will make suggestions for the plan.

## **1.2. Definition of Terms**

“Urban waterfront” is defined as the water’s edge in cities and towns of all sizes. The water may be a river, lake, ocean, bay, creek or canal. A waterfront project may include buildings and areas that are not directly on the water but are tied to it visually, historically or ecologically or are linked to it as part of a larger scheme.

The term “public” is used to define land and services that are accessible for everyone to use, regardless of whether the land and land uses are owned publicly or privately. Public land is land which people can access freely or with a very low cost (such as a ticket). Public use means open or accessible to all; by contrast, residential and industrial land can only be accessed by specific groups of people. Natural or agricultural land are also not able to be accessed by the public. It should be noted that in this thesis, I include commercial land into public land since it is also accessible by the general public.

The definition of “recreation area” described in this thesis is a public-use area planned as a leisure attraction, in which all the displays, buildings,

activities, and etc., are based on or related to one particular theme and is also merged with local landscapes.

### **1.3. Purpose of the Study and Research Questions**

Public open space on the urban waterfront is a unique part of the urban setting of many waterside cities. Since the 1960s, more of these spaces are being provided in attempt to bring more people to waterside areas.

This thesis aims to investigate the relationship between the city and the water, as manifested in the public open spaces on the waterfront, by using Nanning as a research case. I explore how the available public open space on the waterfront is consumed, the value of waterfront open space, and how cities balance public open space with other land uses in waterfront zoning. I've summarized the following questions as a guide for my thesis research:

Primary Research Question: How can policymakers and urban planners in Nanning balance public open space with other land uses in revitalizing their waterfront?

Sub-question 1: What is the current situation of Nanning's urban waterfront redevelopment, especially of waterfront open space?

Sub-question 2: What is the value of waterfront open space in Nanning, China?

Sub-question 3: How is the available public open space on the waterfront consumed?

Before we enter the case of Nanning, a chapter of reviews and analysis of prominent waterfront projects in Shanghai, Paris and London was compiled, to examine examples of promoting open space on urban waterfronts to revitalize the city. The next 2 chapters examine urban waterfront redevelopment in Nanning and develop a framework for the redesign of Yong River's waterfront space. Urban waterfront redevelopment is a challenge for Nanning, but with a beautiful natural landscape and rich history, a unique waterfront can be built in the city. The last 2 chapters consist of the recommendations for the redevelopment of Yong River in Nanning, China and address the limitation of the thesis.

In this thesis, a recommendation for redeveloping Nanning's waterfront area will be put forward. Furthermore, the case of Nanning can establish an understanding of informal, marginal and ephemeral public spaces, with a focus on those created on reclaimed land. This type of public open space is rarely

studied, particularly in this part of the world. Understanding this space, as in learning how it is physically and socially created, how it is used, and what roles it plays in the lives of the residents, could redraw the map of the waterfront public open spaces. It could also help reshape formal public space.

## CHAPTER 2 – METHODOLOGY

This chapter outlines the methodology used to answer the previously stated research questions.

A literature review and a case study are chosen as appropriate methods to answer the research questions. The first step was to conduct a literature review to better understand the relationship between city, water bodies and open space. Reviewing and analyzing prominent waterfront projects in Seine River Basin (Paris), Thames River Basin (London), and Huangpu River (Shanghai) contributes to understanding the complexity and variability of Nanning's waterfront revitalization as they bear many resemblances to Yong River, such as width, length and meander; these cities built along rivers have similar urban development movements. To visualize the prominence of waterfront areas along the Seine and River Thames, satellite images with hotspots were used. To understand how waterfront areas are used in London and Shanghai, the main land-use distributions were examined. Embarkment design patterns of each bank of the Huangpu River in Shanghai were compared and were demonstrated in detailed graphics.

The case study method includes designing a case study, collecting the study's data, analyzing the data, and presenting and reporting the results. The

methodology rests on a case study strategy with a qualitative approach. Data was collected from two major sources. The first is Archival Research, which was analyzed for the historic transformation of the waterfront of Nanning. Nanning Library provided access to the historical archive of Nanning and Yong River. In addition, data was also collected from public records and downloaded from the official website of the Bureau of Urban Planning of Nanning. A digital map and a satellite map of Nanning were provided by Nanning Urban Planning Bureau. Other satellite images of prominent cities were retrieved from Google Earth and edited by author. The satellite maps were also used in measuring the shoreline length of each land-use, and this was done on AutoCAD software. Photographs of Nanning and Shanghai are either taken by the author or retrieved from Baidu images. For zoning information, the data source is the official zoning maps provided by Nanning Urban Planning Bureau. The second source of data was direct field observations. The observation is mainly focused on physical environments. Collecting observational data takes the form of a narrative based on what I have seen, heard, or otherwise sensed and recorded with camera. I travelled to Nanning and spent 7 days in August of 2015, worked with the local government and collected abundant valuable information such as the

development in progress and master plan of the waterfront rezoning of Yong River. In July of 2016, I went to Nanning again to take more photos about the riverbank usage, which can better demonstrate the current condition of the subject of study in this thesis.

Furthermore, to discover the attitude and expectations of Nanning's residents towards waterfront land usage, I utilized the result of a survey currently conducted by the government of Nanning. The results of the questionnaire revealed the citizens' preference of current facilities in the open spaces and how they would like to improve them. However, beyond description of the survey results, I did some statistical analyses using STATA to answer three questions related to the citizens' attitude to the Waterfront open space in Nanning: first, does the fact that responders come from various districts affect their attitudes toward the improvement of current waterfront public open space? Second, what predictors from the data set can be the best ones to predict citizens' behavior towards waterfront public open space? Finally, does the travel time from the responders' home to the open space impact the frequency of visit and satisfaction towards the open space?



To answer the first question, I generated two tables of summary statistics to have a more comprehensive understanding. The second question can be answered by running some regressions. Simple linear regression analyses were conducted to identify which predictors were significantly correlated with the frequency of using open space ( $p < 0.05$ ). I used different combinations of dependent variables to build the three models and wanted to choose the one with the best fit. The last question can be solved by chi squared test and analysis of variance.

## CHAPTER 3 – LITERATURE REVIEW

The waterfront redevelopment phenomenon spread from North America to the rest of the world and became one of the most outstanding contemporary urban trends. This process normally transforms old waterfront industrial and commercial zones into new mixed-use office and residential developments, associated with upscale retail services, vibrant marketplaces, leisure areas and public amenities. While in North America, this pattern is most visible in showpiece seaport cities such as Boston, Baltimore, Seattle and Toronto (Sieber, 1991). Many of these projects were successful in bringing the public to the waterside. However, it is not a coincidence that these cities were successful in balancing the city's economic needs with the public's demand for access to the water. Moreover, the urban waterfront regeneration plans have become increasingly important in urban politics: in waterfront urban areas, the competition for waterfront space, the need for public access to the shore and the conservation of waterfront biodiversity as a natural resource have become an increasingly topical issue in urban policy (Breen and Rigby, 1991).

Feldman insisted that contemporary urban waterfront redevelopment and regeneration projects represent today an international undertaking in urban

planning and politics (Feldman, 1999). According to Norcliffe, with the influence of postmodern culture, the new urban waterfront has five main groups of overlapping activities: employment, housing, recreation, hospitality industries, culture and heritage, which present a complex landscape and land-use in urban waterfront (Norcliffe et al., 1996).

The varied physical context and multiplicity of needs make design and rezoning both a challenge and an opportunity. The popularity of waterfront development is caused by the redundant old port and industrial areas from downtown waterfronts (Dovey, 2005). Those de-industrialized waterfronts are characterized by their proximity to city centers and offer a variety of scales, uses and development opportunities (Fagence, 1995). Besides these opportunities, the long negligence and the environmental decay of many waterfronts led to the rise of public pressure for improved, accessible waterfronts which they could use and enjoy (National Research Council 1980). Waterfronts are naturally prone to renewal and regeneration because they are usually in the oldest parts of the city. Tunbridge, however, suggested that, contrary to popular belief, there is more to it than simply opportunities and people's demands for development (Tunbridge, 1988). He concludes that the waterfront revitalization movement provides a parallel thread to the overall

urban regeneration process. Thus, all existing motive forces of the movement affect it, not only by those factors that are inherently water-related.

Waterfront regeneration has undergone a significant degree of documentation and analysis, but the majority of these developments are in the developed world (Hoyle 2001). Therefore, a large part of the available literatures is highly related to developed countries, such as the redevelopment of port cities and its link with the process of urban renewal and urban regeneration in post-industrial cities. It is meaningful to read through the waterfront phenomena in different countries' context. For example, in a North American context, the waterfront is considered to be part of the urban renewal process, whereas in Europe it is regarded as a mere side-effect of the changes in maritime transportation (Hoyle 2000, 2001).

Nowadays, the popularity of the waterfront revitalization has spread across the world and there are increasing studies from both developed and developing countries.

## **CHAPTER 4 – REVIEW OF PROMINENT WATERFRONT PROJECTS**

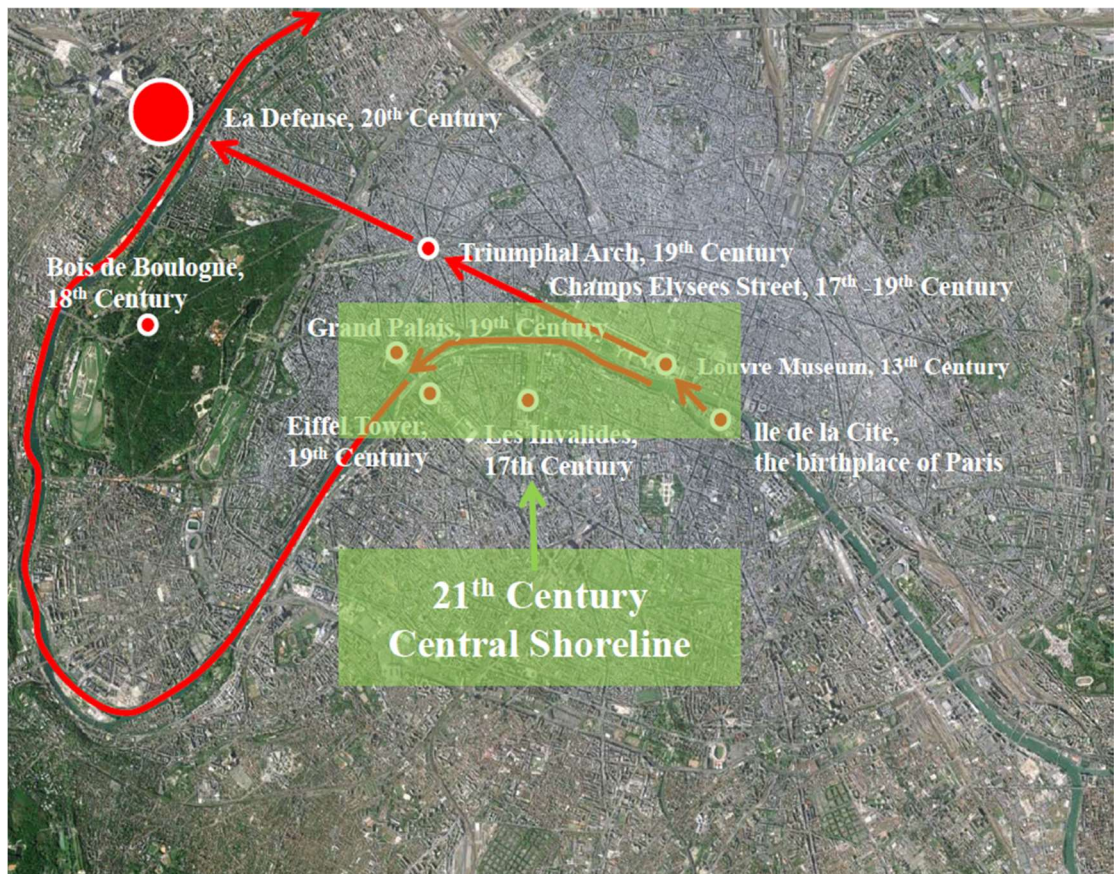
This chapter describes successful approaches and best practices of prominent waterfront projects. Reviewing and analyzing prominent waterfront projects in Seine River Basin (Paris) and Thames River Basin (London) and Huangpu River (Shanghai) contributes to understanding the complexity and variability of Nanning's waterfront revitalization as they bear many resemblances to Yong River, such as width, length and meander; the cities build along rivers have similar urban development movement.

### **Paris**

The Seine is a 777-kilometre-long (483 mi) river and an important commercial waterway within the Paris Basin in the north of France. It divides the Paris into two parts yet unites it as a robust and dynamic city. Paris is known as the city of art, and also the city of romance. Just imagine strolling down the Seine, with community public cultural facilities everywhere and international cultural activities from time to time.

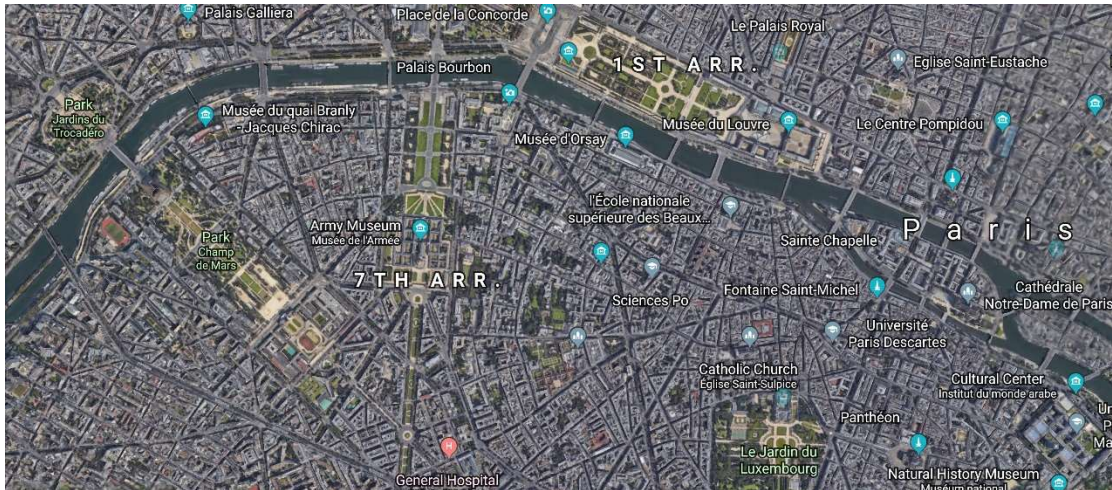
As for the urban evolution, from waterfront to inner land and back to waterfront, the development path of Paris is very similar to Nanning (Figure

4.1). Today, the most attractive public area for citizens and tourists is still the waterfront area along the Seine.



**Figure 4.1 Satellite Image of Showing Sketch Map of Paris Urban Development**

*Source: Google Earth, edited by author*



**Figure 4.2** Satellite Image of Paris Showing Hotspots Along the Seine

*Source: Google Earth*

As I marked some hotspots along the Seine, it is obvious that the most fascinating museums in Paris are mostly located along the riverside of Seine, such as Louvre Museum, Orsay museum, Orangerie museum; international art and cultural events also take place along the riverside, like fashion show week, Autumn Festival in Paris, etc. These hotspots are multi-types, they include theatre, museum, historic site, restaurant and station. In addition, these hotspots are multi-level, there are top art palaces, urban public art spaces, and street art displays. Last but not least, these hotspots are multi-scale, for instance there are waterfront trails, waterfront avenues and waterfront large green space.

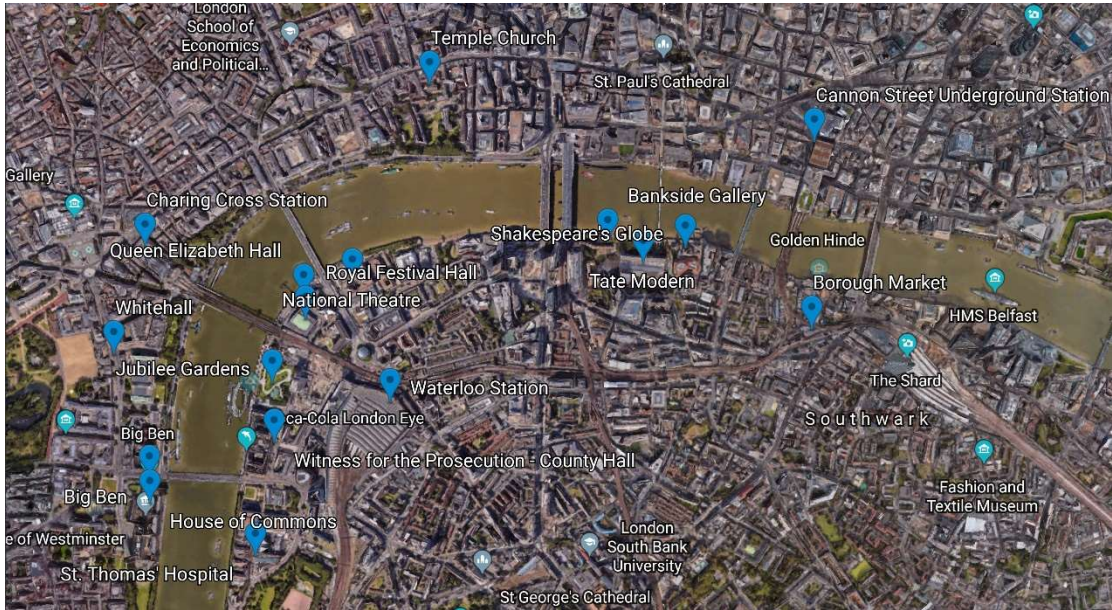
## **Successful Project: Parc Rives de Seine**

The project turned a mile-long stretch of road along the Left Bank of the Seine into a new riverside walkway with bars, floating gardens and sports areas. Since 2013, walkers and sports enthusiasts have enjoyed access to revamped left bank of the Seine, between the Orsay museum and the Alma Bridge. Attracting some four million visitors since it opened in 2013, the redeveloped left bank is hugely popular with visitors. It was the main drag out of Paris on the Left Bank; it would have been chock-a-block with cars. Now it's been completely redone and pedestrianized. Spanning 2.3 kilometers, the riverbanks are dotted with sports facilities, play areas for kids (big and small), and places to relax, all open to the public. Designed to protect the environment, sustainability is also at the heart of this space. There are bars, groups of people picnicking, people with their feet dangling over the edge, children, people jogging, and cyclists. This is a big permanent change to the Paris cityscape and one that both Parisians and visitors to the city have already taken to their hearts.



## London

Starting as a small trickle in the Cotswolds, the River Thames travels over 210 miles through the heart of some of England's most picturesque towns, right into the center of London and eventually, out into the North Sea.



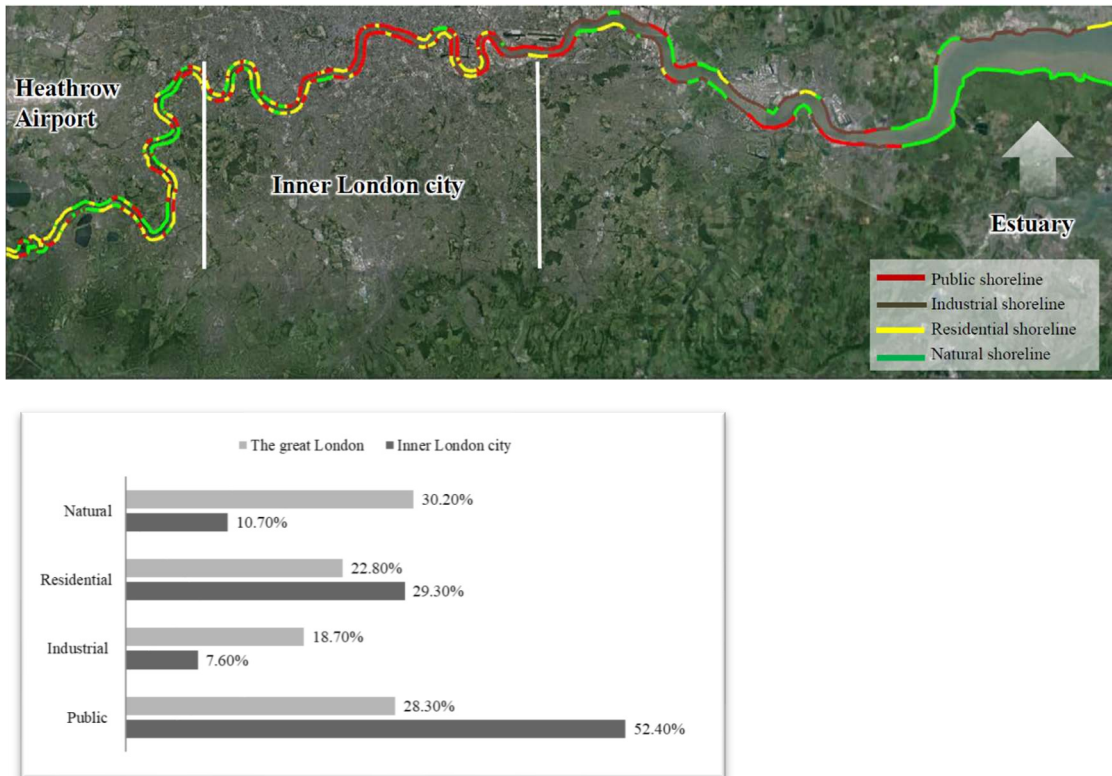
**Figure 4.3 Land-Use Distribution on The Shoreline of River Thames**

*Source: Google Earth*

### The Greater London area

Figure 4.3 is a satellite image of River Thames, the intercept length shown is 70 km, and the shoreline length is about 110 kilometers. I have marked 4 main land-uses on Figure 4.4 in each color; thus, we can summarize them intuitively.

To have a better understanding of the land-use planning in different parts of the urban area, I compared the land usage in the greater London area and inner London city in Figure 4.4. The inner-city segment is 25 kilometers in straight length and the coastline is about 40 kilometers.



**Figure 4.4 Satellite Image of Paris Showing Land Uses & Land-use Distribution on the Inner London City and the Great London Area**

*Source: Google Earth. edited by the Author*

*Data source: <http://www.geoinformationgroup.co.uk/ukmap>*

It is surprising, yet also to be expected, that public open space accounts for a significant proportion: the proportion of public shoreline in the central urban area reaches 52.4%, and a large amount of natural ecological land is conserved. The overall public shoreline reaches 28.3% out of the whole

intercepted segment. Islands and Bridges are mostly constructed for public use. The distance between each vigorous area that attracts crowds is about 3.5-4.0km (shoreline length) in the central area, while in the peripheral region it is gradually widened to about 6-21km. In the most vibrant core segment of the city, an attractive facility was built on average every 300 meters, and this shaped a continuous belt of vitality. Due to the preservation of historical buildings, the width of the river, and the expansion of the horizon, the waterfront space does not emphasize dense-high-rise building skyline.

## **Shanghai**

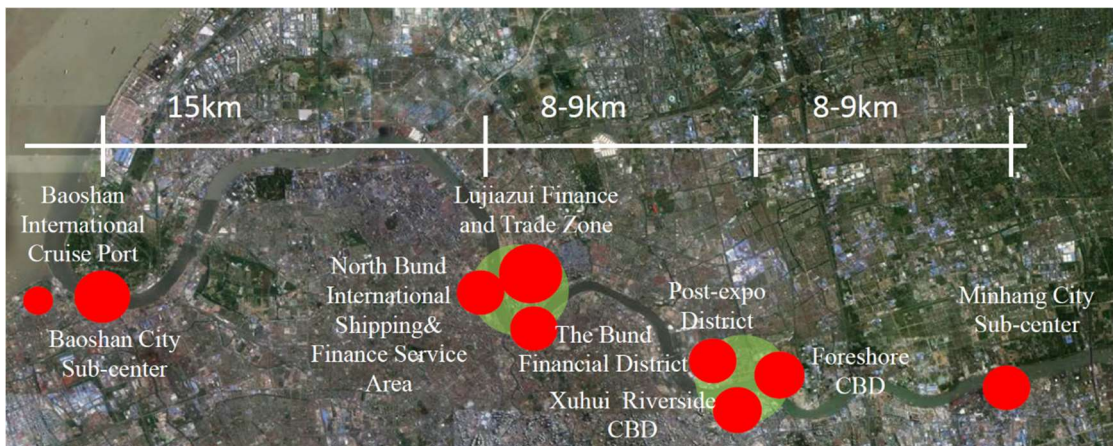
Huangpu River is a landmark of Shanghai, separating the city into two parts, Pudong the east and Puxi the west. With a total length of 113 km (70 mi) and a width of 300-770 meters, the river runs through over 10 districts in the city. It is regarded as the Mother River of Shanghai, serving multiple functions including drinking water, shipping, drainage, fishery and tourism. Several submarine tunnels and bridges have been built under and on the river to provide better transportation conditions. On both sides of the river, there gather various styles of architectures and essential scenery. Famous attractions like the Bund and Lujiazui Finance and Trade Zone are located along the river.



**Figure 4.5 Shanghai Skyline**

*Source: Baidu Images*

Urban core functions spread along the river since ancient times; the river formed the axis of urban development. The linear distance of urban centers is about 8-9km, and it is built along the Huangpu River. The city's famous and iconic skyline, which has become one of China's international images, is also built along this river.

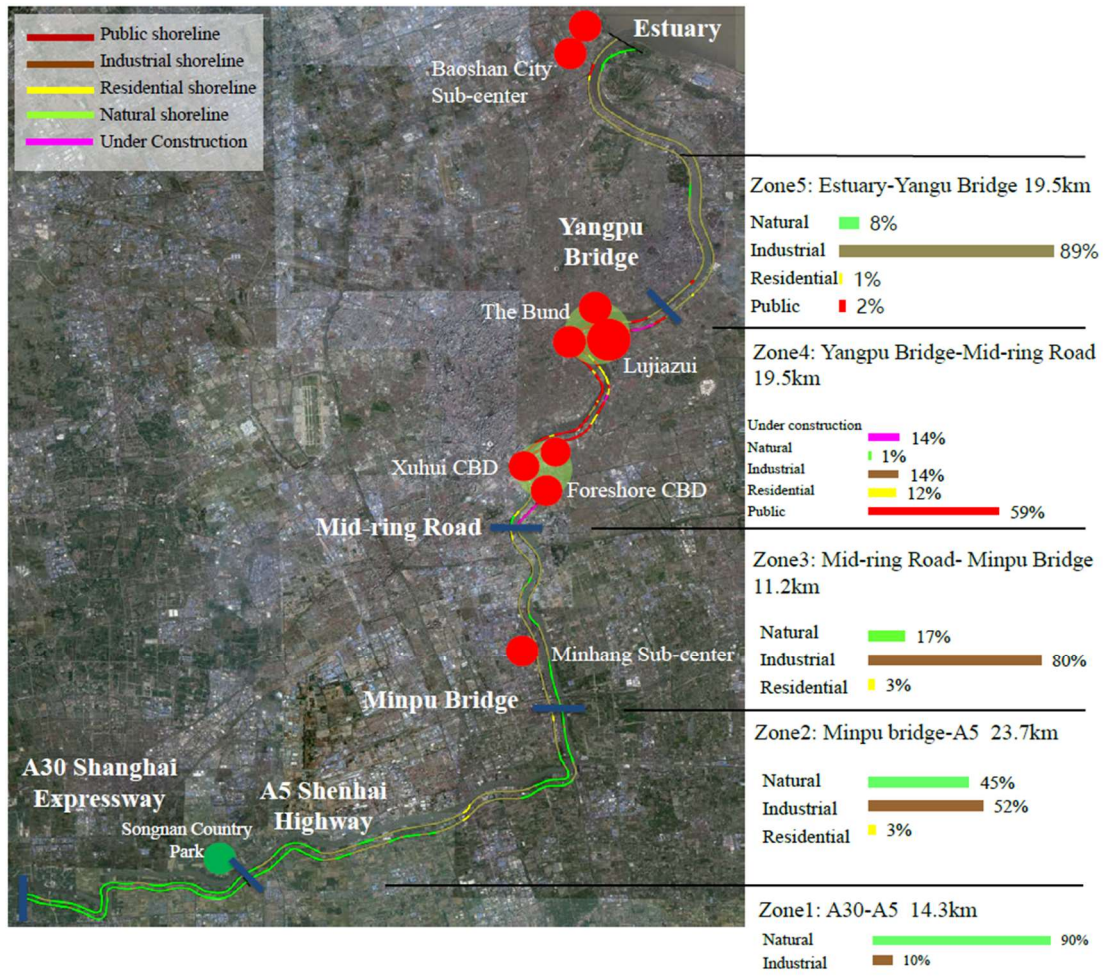


**Figure 4.6 Satellite Image of Shanghai Showing Major City Centers**

*Source: Google Earth. edited by the Author*

I intercept Huangpu River's inner-city segment, which starts from the estuary to the city's outer beltway, measuring 88.2km shoreline length. The colored shorelines demonstrate the proportion of each type of waterfront land use: the industrial shoreline is 48%, the natural shoreline is 31%, the public shoreline is 14%, the residential shoreline is 4%, and the rest 3% is under construction.

In addition, I divided the 88.2km long segment into five sections according to its vitality, basically core center, sub-centers and suburb. In the urban core center area, the public shoreline accounts for as high as 59%. Moreover, with the future development of Baoshan and Minhang sub-center, the construction of the post-expo and foreshore business district will further increase the proportion of public shoreline.



**Figure 4.7 Satellite Image of Shanghai Showing Land Uses in 5 Zones**

*Source: Google Earth. edited by the Author*

Here I display a typical waterfront pattern of the Pudong, the east bank of Huangpu River. This urban core center, located in Lujiazui District, has a highly vigorous waterfront. Every 60 to 80 meters there is a public attraction spot to fulfill people’s city life. This guarantees the popularity and vitality of the waterfront public open space. Some areas along the Huangpu River such

as Zhengda Square crosses roads through the corridor to link the riverside green area.

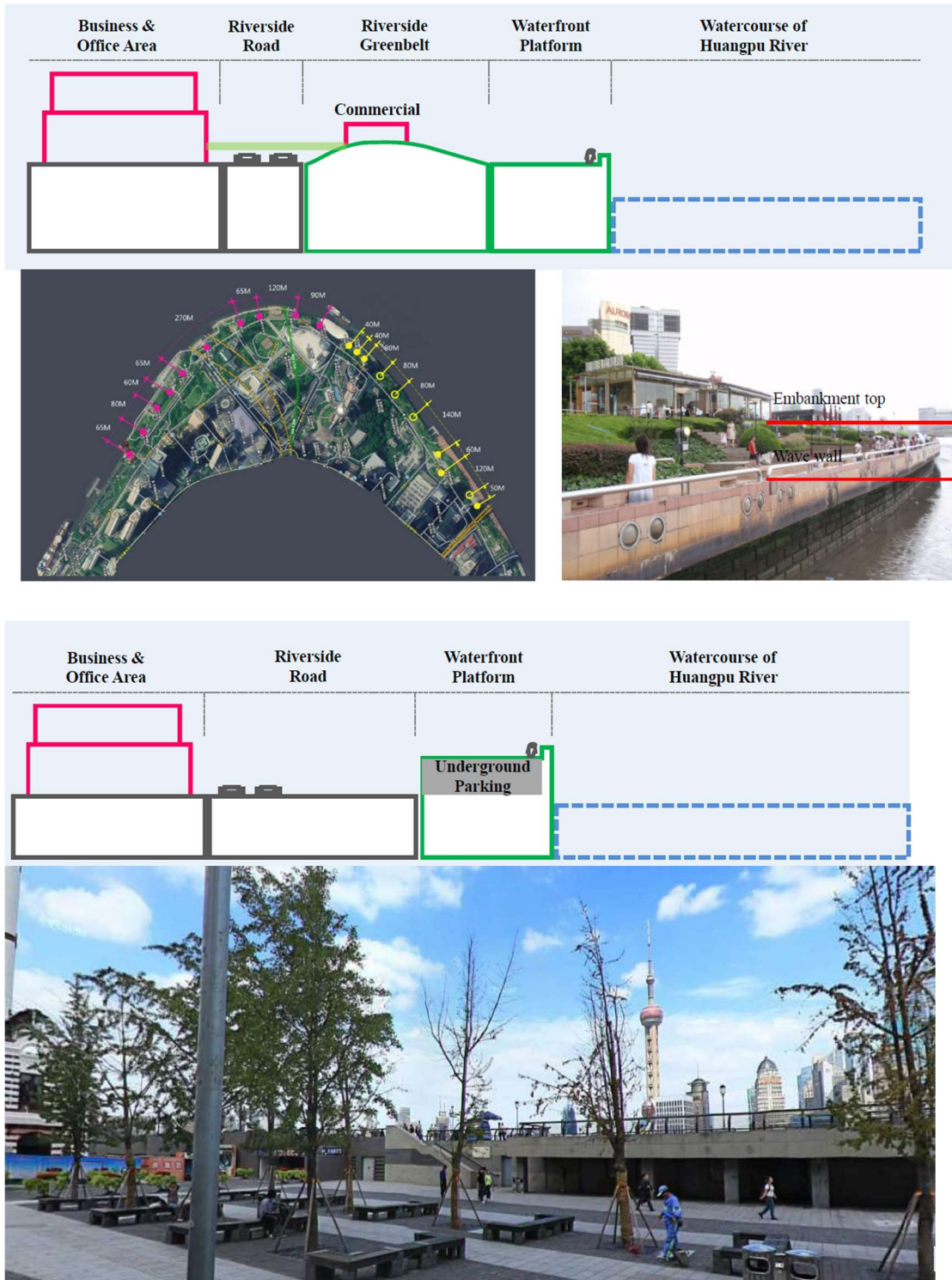


Figure 4.8 Waterfront Patterns of Pudong And Puxi

As shown in figure 4.8, Puxi the west bank is different from Pudong. It is subject to the embankment space, as well as a huge demand of flow distribution during frequent public activities

### **Summary and Conclusion**

For the past and present, rivers have always driven urban development because of their unique advantage. The common point of Paris, London and Shanghai is that the river tends to be the main axis of urban development.

Furthermore, I summarized that in the urban area, the share of the public shoreline usually varies from 15% to 30%, and for the most vigorous core center of the city, the proportion rises to 45 to 60 percent.

Moreover, for better increases to waterfront vitality, a vitality spot, which attracts people and meets citizen's city life needs ought to be provided every 2-4km. Last, from the city center to the periphery, the ecological feature of the waterfront public open space is increasing while the city development intensity is decreasing. The study of these three prominent waterfronts gives me a deeper understanding of how to make waterfront public open space meet public demands.



## **CHAPTER 5 – CASE STUDY: NANNING CITY**

### **5.1. Introduction of Nanning**

Nanning city is located in southern China bordering with Vietnam, and it is also known as the “Green City” due to its lush tropical foliage making it the greenest city in China. The city has a total population of 6.9 million in its urban areas. The city is well endorsed with a vibrant mix of traditional and modern urban development. Nanning’s urban area covers approximately 22,293 square kilometers with more than 30 ethnic minority groups living harmoniously (Galland & Hansen, 2012). The city is rich in its cultural background, education, and social resources. It is not only the political, economic and cultural center of the province, but also plays an important role in the economic development of southwest China. Pleasant climate endows the city with evergreen trees and fragrant flowers all year round, hence the name 'Green City.' The city is located on the north bank of the Yong River, the chief southern tributary of the Xi River, and lies some 30 km below the confluence of the Yu and the Zuo rivers.

Nanning has a history of more than 1,600 years. In 318 A.D. Nanning came into its existence as a county. It was named Yongzhou, or Yong for short in the Tang Dynasty; Yongning prefecture in the Song Dynasty, Yongzhou

headquarters in Yuan dynasty; Nanning prefecture in Ming and Qing Dynasties and Nanning county after the revolution of 1911. It did not acquire the present name until 1949. Nanning city is one of the oldest cities in China and as a border city; Nanning has a close cultural exchange and economy with Vietnam and Indo-china. Its interaction with southeast cities of China like Guangdong, Hong Kong, and Macao has also been tight over the years. As early as during the Yuan Dynasty (13-14th century), Nanning became a medium sized market town that attracted European traders into the region. The trade alliance between the European traders and the Mongols was operated mainly within the open rivers in Nanning town connecting to the eastern border of China. This created more trade alliance for Nanning city, and caused a rapid development of infrastructure within the city.

Moreover, its wild nature, parks and natural waterfront make the city a perfect tourist attraction. The city attracts 69.5 million tourists in the year of 2014 and 80 million in 2015; Nanning Tourism Bureau claims there will be more tourists in next 5 years due to the rich recreational facilities, which have been or will have been built in the near future.

## 5.2. About Yong River

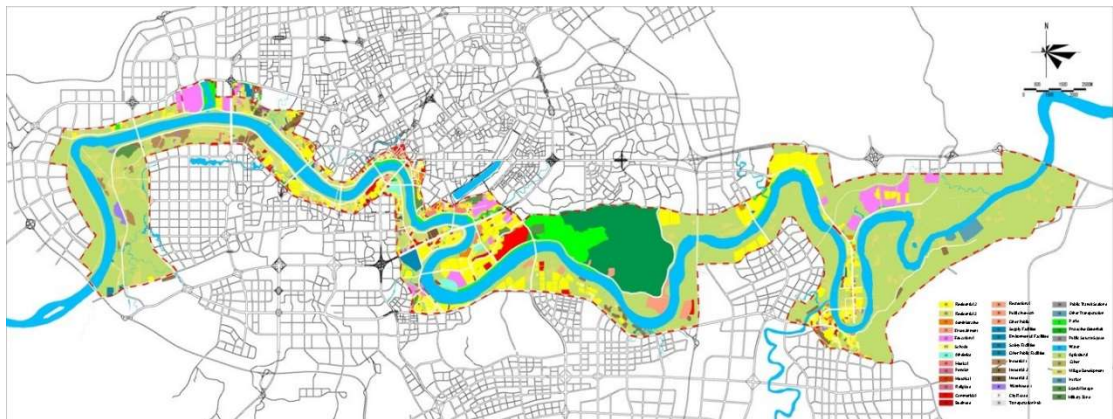
Yong River is a tributary of the Xijiang river of Pearl River Basin and flows from west to East through the city of Nanning. It has a total length of 133.8 km and a total catchment area of 73728 square kilometers, with an average annual flow of 1292 cubic meters per second.

The river is navigable thanks to its depth (16-23m) and width (300-400m), as well as high water volume. Known as the mother river in Nanning, Yong River is the main water supply source of the city. Moreover, the river view is very picturesque and plays a very important role in the urban development.

In recent years, the government of Nanning is putting more emphasis on the construction of waterfront open space since people realized it is not sufficient and lacks vitality. The Yong river offers main waterfront shorelines in Nanning core urban area, which covers about seventy kilometers on each bank. Thus, the study of rezoning the Yong River's waterfront space is very meaningful. A decision to convert unzoned land, which consists of 50% of total waterfront area, into public space has been made by municipals and will result in the increase of public waterfront space from 10% to 20%.

### 5.3. Current Condition of Yong River's Waterfront

As mentioned above, Yong River's waterfront area lacks core function and land uses are mixed and insufficient. In the planning area of 143.41 square kilometers, public service facilities/land-uses occupied by the 12-13%, and most of them are colleges and hospitals, while the public function of the area along the river is very weak.



**Figure 5.1: Zoning Map of Waterfront Area Along Yong River**

*Source: Nanning Urban Planning Bureau*

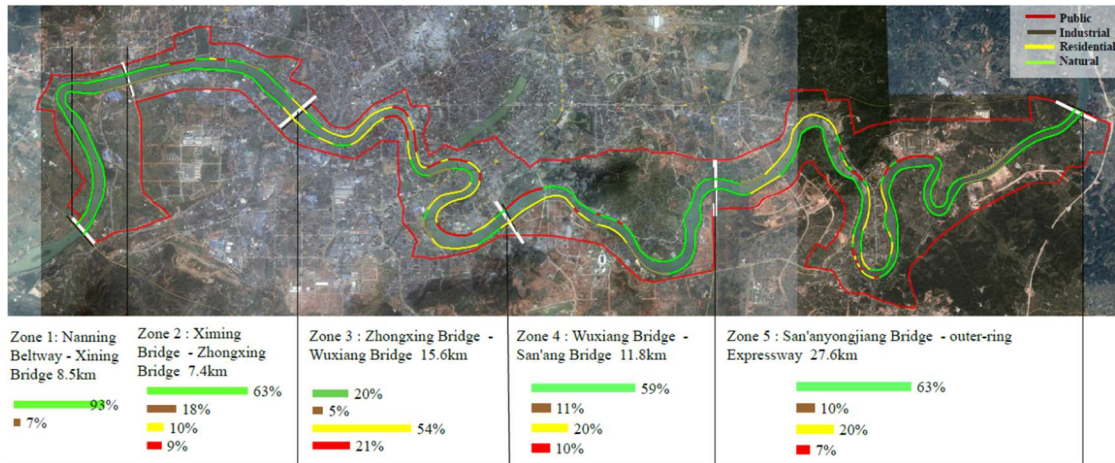
Industrial use accounts for 9% of the shoreline, 56% natural and undeveloped, 10% public (including open space and commercial), 25% residential.

The total length of the waterline of the studied area is approximately 24.6km (Figure 5.1). The accumulated length of the open spaces on the

waterfront is approximately 46.24km, which represents 66% of the total length of the selected waterfront. Within this category, 84% is agricultural or naturalistic area, and only 16% is public service area. Compared to Huangpu River mentioned in chapter 4, the proportion of Yong river's entire residential and natural shoreline is much more than Huangpu River. Also in the city center segment (Zone 3: Zhongxing Bridge to Wuxiang Bridge) of the shoreline, the land used as public service is 21%, while Huangpu River is as high as 59%.

#### **5.4. Five Zones of Yong River's Waterfront**

In the following part, I divide the planning waterfront area into five sections to better describe their distinguishing features: Zone 1 Nanning Beltway to Xining Bridge, Zone 2: Ximing Bridge to Zhongxing Bridge, Zone 3: Zhongxing Bridge - Wuxiang Bridge, Zone 4: Wuxiang Bridge to San'an Bridge, Zone 5: San'an Bridge to Outer-ring Expressway. These zones are not only distinguished by the geographic location but also zoning plans from last few decades and in the future.



**Figure 5.2 Satellite Image of Yong River Showing Land-Use Distributions**

*Source: Google Earth, edited by the Author*

As shown in Figure 5.2, Zone 1 is mostly covered in natural lands, including agricultural use and undeveloped wild field. This part of Yong River is not predicted to encompass a large population; whereas the ecological characteristic of the land should be fully utilized. This zone should be labeled as ecological and for recreation use. Zone 2 has a very typical urban-rural mixed land use distribution, and all the public, industrial and residential usage is in disorder; apparently this zone is not built under a master plan. For this zone, the local government should initiate one to two feature projects and make the whole area more unified. Zone 3 is the center of the city, with the most public open space and least undeveloped or agricultural use land. Compared to those cities mentioned in Chapter 4, with public use open space occupying from 45%-60%, this core area of Nanning still needs improvement.

This zone should be the most popular place for outings and attract citizens and tourists all year long. Zone 4 and Zone 5 have similar land use distribution while the former has more undulating topography and the latter located at the downstream and suburban area. To better renovate the zones, urban planners should base their efforts on their local features and geography. Cultural tourism, convalescent tourism and so on can be introduced to Zone 4 to utilize the mountain views. The government can bring in theme parks and themed towns, which the Nanning as a big capital city lacks, to Zone 5.

Each zone is explained more in more detail further below:

#### *5.4.1 Zone 1: Nanning Beltway to Xining Bridge*

Zone 1 area is the western part of the planning area, located upstream of Yong River. The length of the selected reach is 8.5km and the selected planning area measures 24.42 km<sup>2</sup>. It is composed of 14% water body, 57% agricultural and forestry land, 7% residential land, 18% industrial land, 1% road network, and 3% unused land. On the west Bank of river, there are mostly farmland and some ecological reserves, while the east bank is mainly used for ongoing suburban construction.

Basically, Zone 1 is a featureless western rural area in Nanning, but its ecological landscape resources are superior to other areas around Nanning.

- Upstream of Yong River, West to the urban area

This water body is the upstream of Yong River; this town area is the gateway to Yangmei Old Town, Nanning Beautiful Scenic South Creational Park.

- Rural area with unplanned land use

It can be defined as rural area although it was planned to be suburban. There is only good infrastructure along Luowen Avenue and Diyuan Road, other places are far from constructed. Most land is used for R3 type residential (residential mixed with industrial), industrial and warehousing. It is a premature and scattered development.

- Poor transportation system and defective construction

There are only three major roads in the whole 24 km<sup>2</sup> zone1 area; most roads are narrow with low capacity. The residential houses/buildings are mostly built by local families; factories and warehouses are mainly low-rise industrial buildings. Thus, the area looks like a rural town due to its



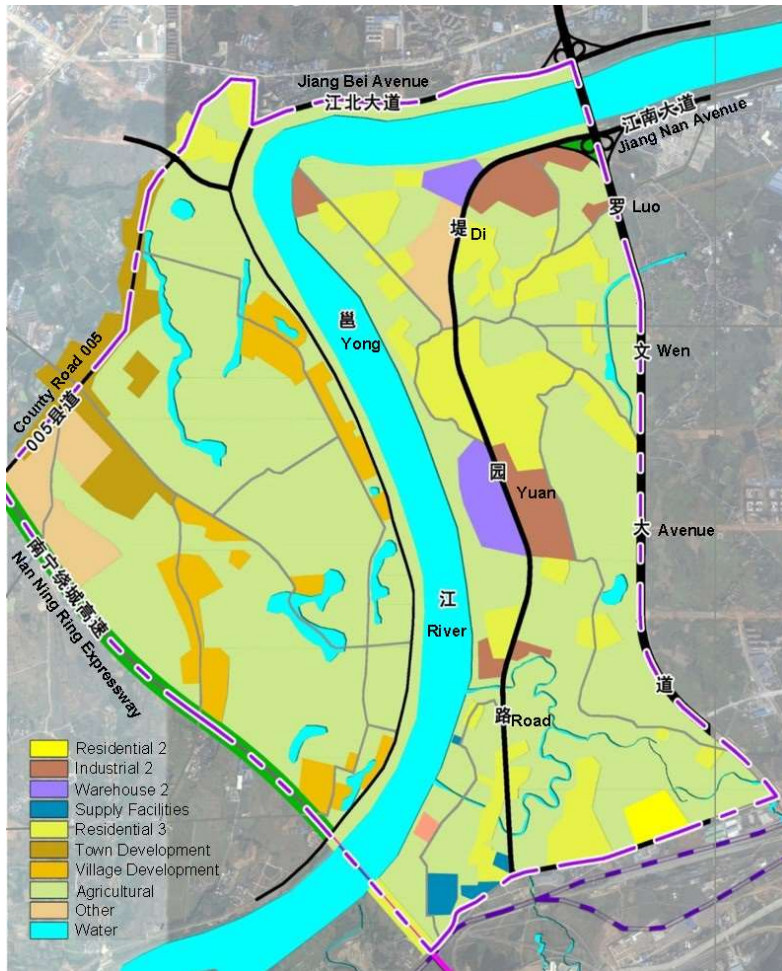
disorganization, while in fact it is just 15 km far from the city center of Nanning and the citizens are not poor at all.

- Excellent ecology landscape

The embankment of Yong River in Zone 1 is mostly natural with lush plants, which is very beautiful and deserve much more attention. However, there is no waterfront viewing platform or promenades constructed by city planners, only a few natural viewpoints. The west bank of Yong River is mainly agricultural land or heavy forestry, with a large number of ponds. It can be zoned to an ecological reserve.



**Figure 5.3 Five Photos Of Waterfront Public Open Space Along Yong River In Zone 1(August 2015)**

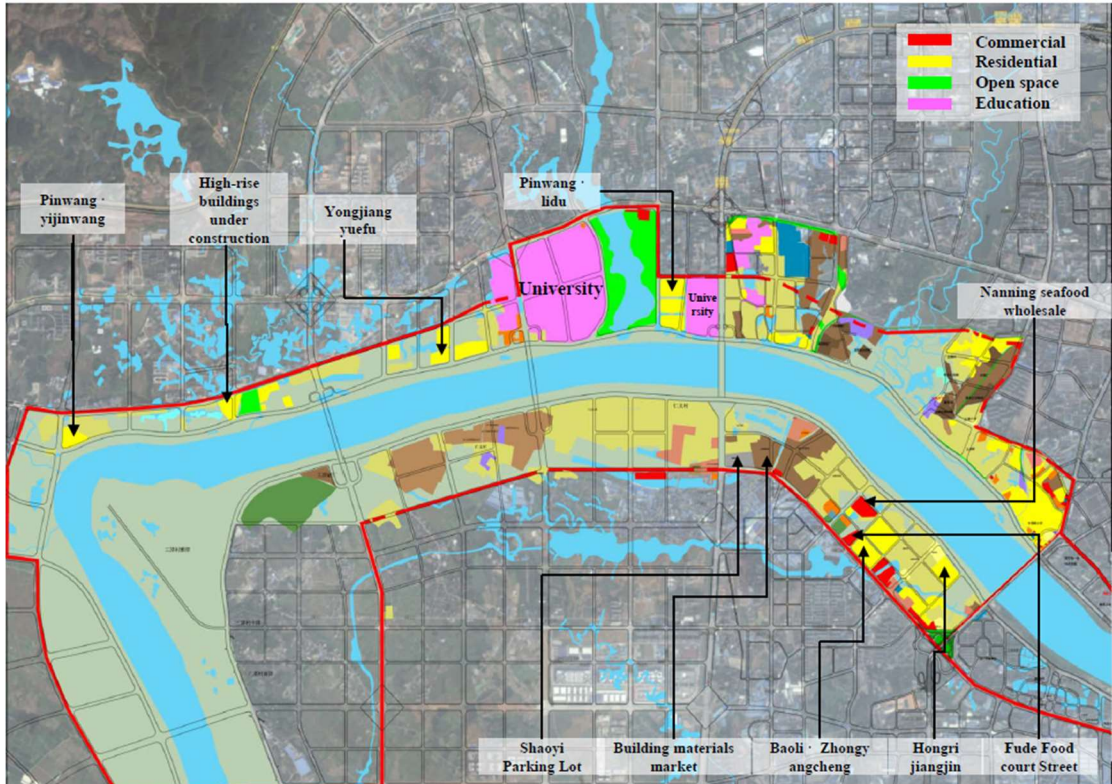


**Figure 5.4 Current Zoning Map Of Zone 1**

*Source: Nanning Urban Planning Bureau*

#### 5.4.2 Zone 2: Ximing Bridge to Zhongxing Bridge

Zone 2, as a semi-urban area, seems to be better zoned than Zone 1 because of some regional function land uses such as a university district and well-designed apartment homes.



**Figure 5.5 Satellite Image Of Zone2 Showing Land-Use Distributions**

*Source: Nanning Urban Planning Bureau, edited by the Author*

As shown in the graph, the south bank of Yong River in Zone2 is mainly composed of warehouses for the storage of building materials, light industrial factory, several constructions material markets, wholesale food market, urban villages, old communities, new communities, a small number of public facilities such as a large public parking lot, and undeveloped lands. Most roads are well-paved, but the western part of Jiangnan Avenue has very rough and sandy condition with lots bumpy and hollows.

The north bank of Yong River in Zone2 is relatively modern, compared to the south bank. There is a university district, high-rise apartments, industrial warehouses, urban villages, and a few undeveloped lands.

Urban villages are a prevailing and special phenomenon in the process of China's urbanization. They are villages that are built on both the outskirts and the downtown areas of major Chinese cities, especially in Southern China. They are surrounded by skyscrapers, transportation infrastructures, and other modern urban constructions; these urban villages are often inhabited temporarily by the impoverished, and as such they are associated with hygienic, overcrowding and social issues.

There are adequate undeveloped waterfront open spaces on both banks, which may be used as scientific research innovation spaces, and highly associated with the current functional blocks, including industrial park, university campus and business park, of the Yong River, forming a strategic pivot "linking" the two sides across the river connecting the south and north and the core location for regional coordination, promoting scientific research and the industrial function interaction of both sides of Yong River, extending

the industrial chain, promoting the industrial development level in the whole western region and guiding the innovation and development of urban industry.

#### 5.4.3 Zone 3: Zhongxing Bridge to Wuxiang Bridge

Zone 3 is located in the Old town, which is the historic and original core of the of Nanning city. It is densely populated and needs to be revitalized in the near future. Surprisingly, different from most ancient waterfront towns in the south of Yangtze River such as Zhouzhuang and Wuzhen, the old town of Nanning seems to not make full usage of the natural connection to the water. For example, we can barely see water-oriented construction or activities except Mingsheng Square, a big public park located on the north bank. As an old town, it is not very well preserved as I did not observe many historic old buildings.



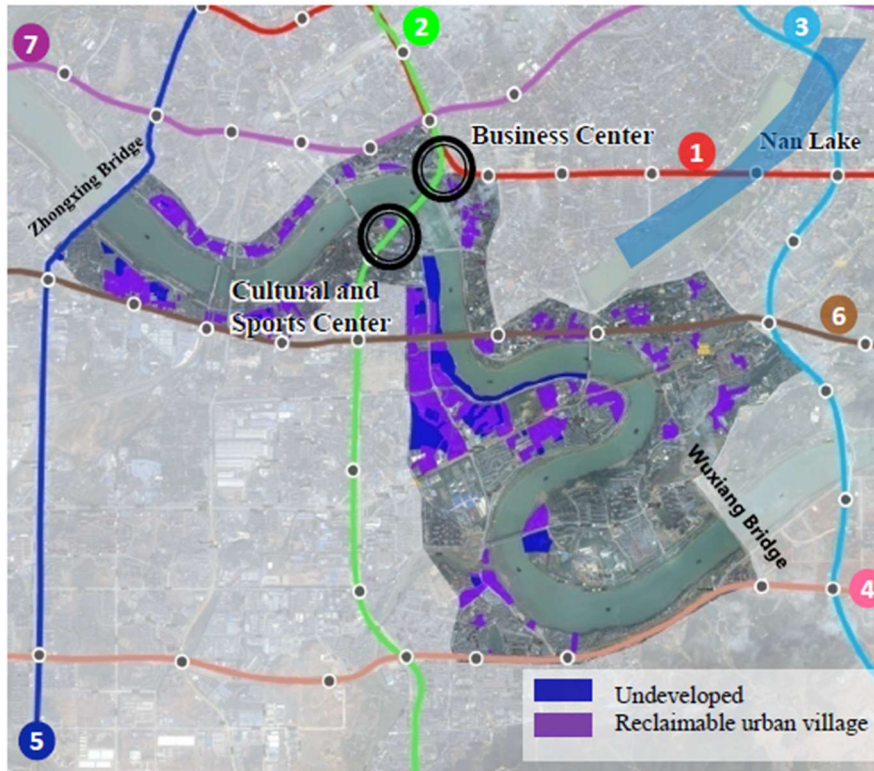
**Figure 5.6 Satellite Image Of Yong River With Zone 3 Area Marked In Red**

*Source: Baidu Maps, edited by the Author*

This waterfront area is actually the hub of commercial centers, recreation and sports, as well as the newly opened metro railway. As it brings together main urban functions and spatial elements, it is the most vibrant zone among all 5 zones.

The length of the shoreline within Zone 3 is 15.75km; it is the most sinuous segment of the urban center area. The Yong River curves back and forth across the landscape and makes the waterfront more delightful since meandering can enhance visual effects.

The segment area is about 24.44k m<sup>2</sup>, and the area waiting to be developed and reclaimed is about 3.22k m<sup>2</sup> (Undeveloped space is about 0.61k m<sup>2</sup>, the urban village land that can be expropriated is about 2.61k m<sup>2</sup>), mostly located in the south bank.



**Figure 5.7 Satellite Image Zone 3 Showing Reclaimable Lands**

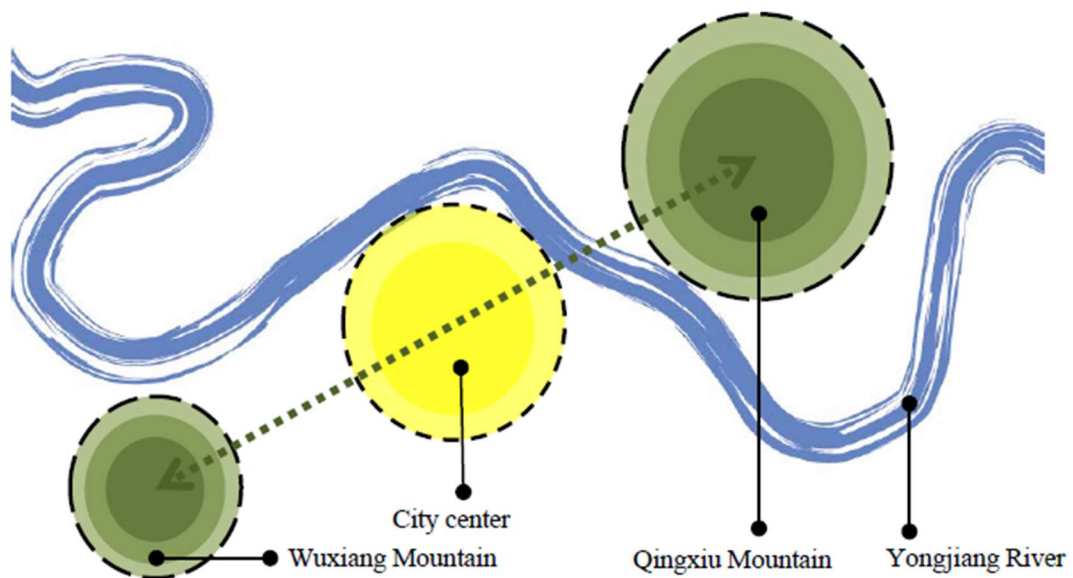
*Source: Baidu Maps, Nanning Urban Planning Bureau, edited by the Author*

Thus, there is a big opportunity and challenge for the urban planner to create a project to revitalize this waterfront. Both the north and south banks in this segment have considerable public open spaces. This is a perfect place to form a characteristic Chinese urban landscape called “One river, two banks”, which means both banks work in cooperation to make the river and riverfront beautiful and harmonious. Because it is in current good condition, more civic activities can be introduced, further motivating urban vitality and forging this zone into the hottest waterfront public open space for Nanning citizens.

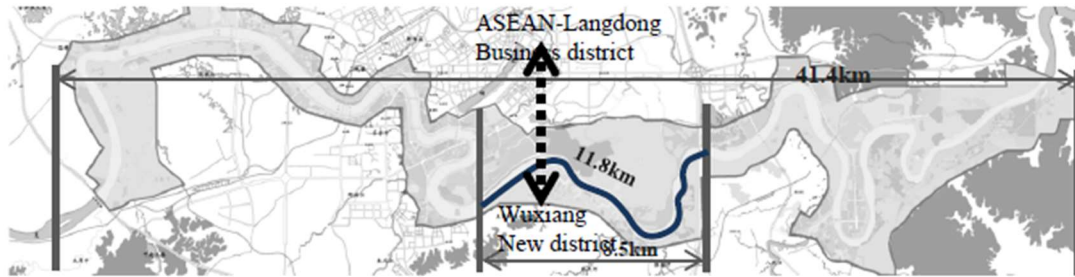


#### 5.4.4 Zone 4: Wuxiang Bridge to San'an Bridge

The straight length from Wuxiang Bridge to San'an Bridge is about 8.5KM, and the shoreline length is about 11.8KM. This segment of Yong River is located between two mountains. The southwest side of the segment is Wuxiang Mountain Forest Park, and the northeastern side is Qingxiu Mountain Scenic spot. Because of the interweaving of mountains, river and urban city, Zone 4 has attracted a large amount of people to move in or for sightseeing.



**Figure 5.8 The Location Of Yong River, Nanning City Center And Two Mountains**

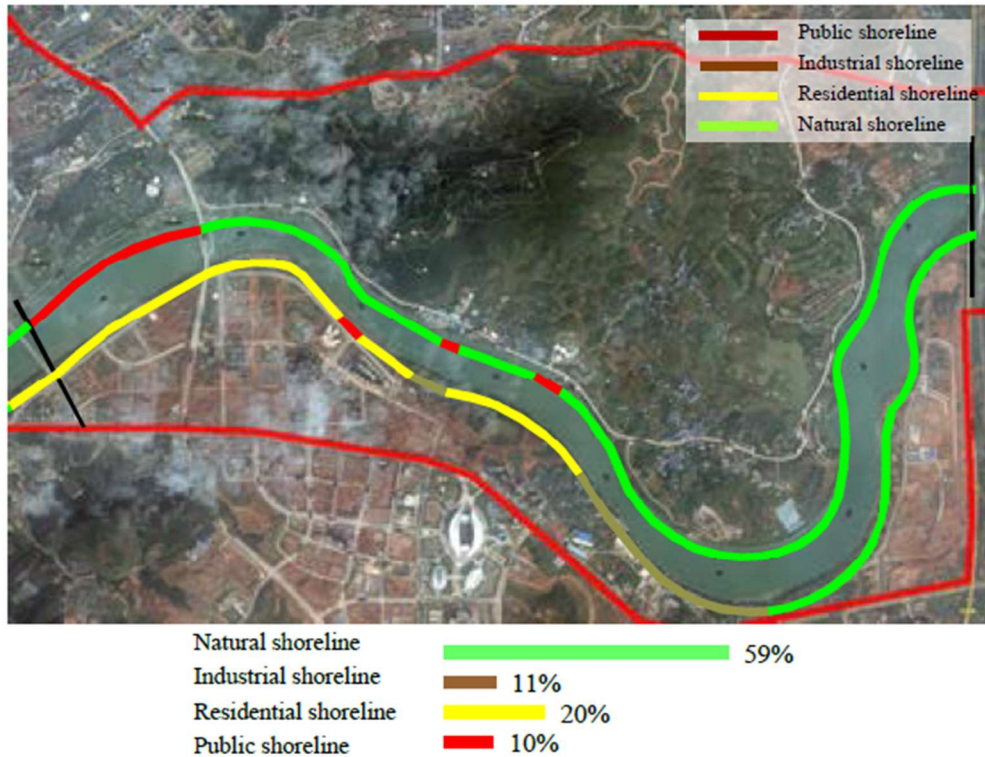


**Figure 5.9 Map Of Yong River With Zone 4 Area And Two Central Business Districts Marked**

*Source: Nanning Urban Planning Bureau, edited by the Author*

In addition, two Central Business Districts are not far from Zone 4. The north one is ASEAN-Langdong Business District, and the south one is Wuxiang New District Base Headquarter core area. Since it is located in the middle of the ASEAN business area and the headquarters base, this zone needs to undertake the business reception, leisure and healthcare functions, etc.

The current composition of shoreline is mainly natural and living shorelines. Wherein the natural shoreline accounts for 59%, the living shoreline accounts for 20%, Industrial shoreline accounts for 11% and the public service shoreline accounts for 10%.



**Figure 5.10 Satellite Image Of Zone 4 Showing Land-Use Distributions**

*Source: Nanning Urban Planning Bureau, edited by the Author*

The north side of Yong River is close to Qingxiu Mountain, so it cannot form a continuous public shoreline there. In short, it is unable to take advantage of both banks of Yong River since the north side is mountain area while the south side is planned mainly for residential. That is the reason for the small proportion of public service shoreline.

According to the city's regulatory plans, in Wuxiang New District, the plot ratio (the gross floor area of the building divided by the area of the site on which the building is erected) is mostly around 4.0 (which is very high). The

high-intensity development means a lot of high-rise residential apartment buildings and it will separate the beautiful view between Wuxiang Mountain and Qingxiu Mountain and is not conducive to the openness of riverside area.

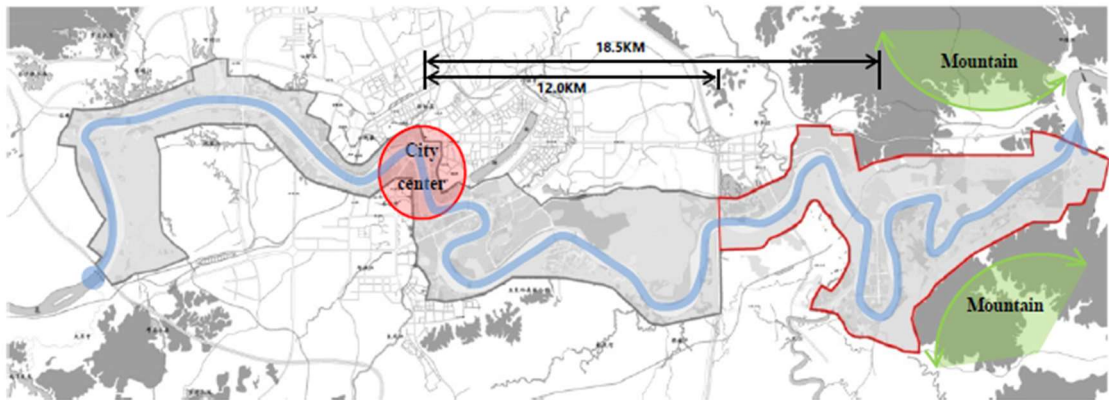


**Figure 5.11 The Plot Ratio And Zoning Of Zone 4**

*Source: Nanning Urban Planning Bureau*

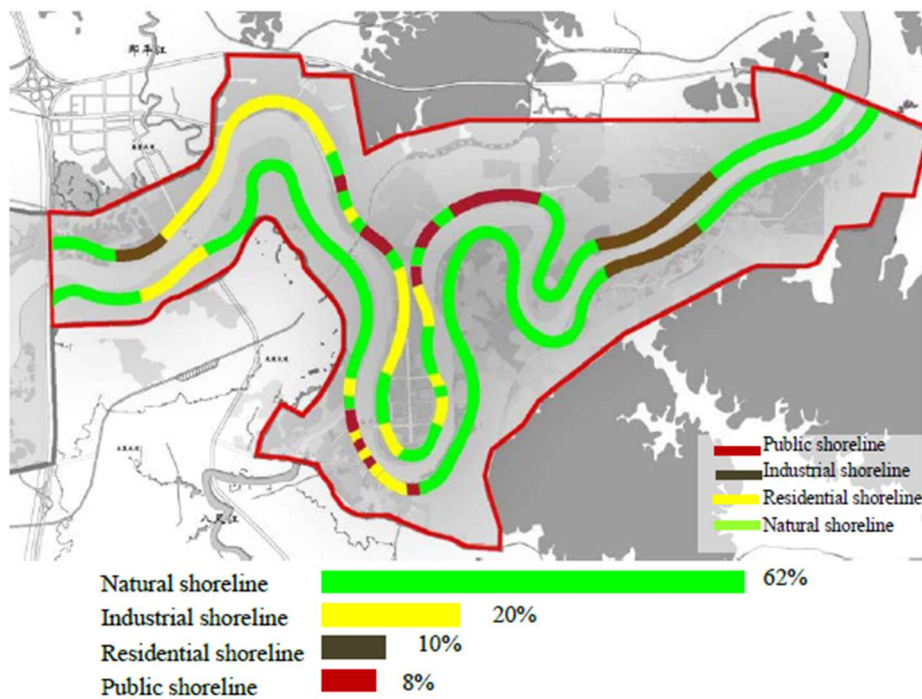
The lands of Wuxiang new district are mostly transferred to enterprises. A few lands have been constructed while most of lands are in the land smooth stage as for the land arrangement; there is very little undeveloped land remaining.

5.4.5 Zone 5: San'an Bridge to Outer-ring Expressway.



**Figure 5.12 Map Of Yong River With Zone 5 Marked In Red**

*Source: Baidu Maps, edited by the Author*

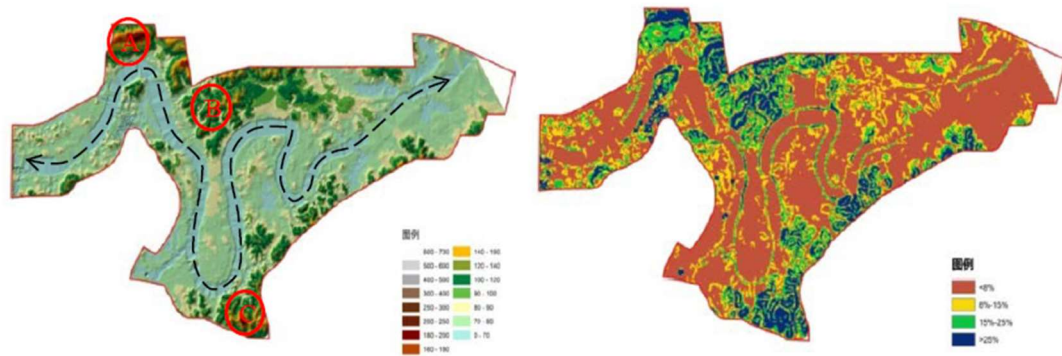


**Figure 5.13 Map Of Zone 4 Showing Land-Use Distributions**

*Source: Nanning Urban Planning Bureau, edited by the Author*

Zone 5 is located at the downstream of the Yong river and is also the urban fringe of central city. The whole area is valley shaped and its geological

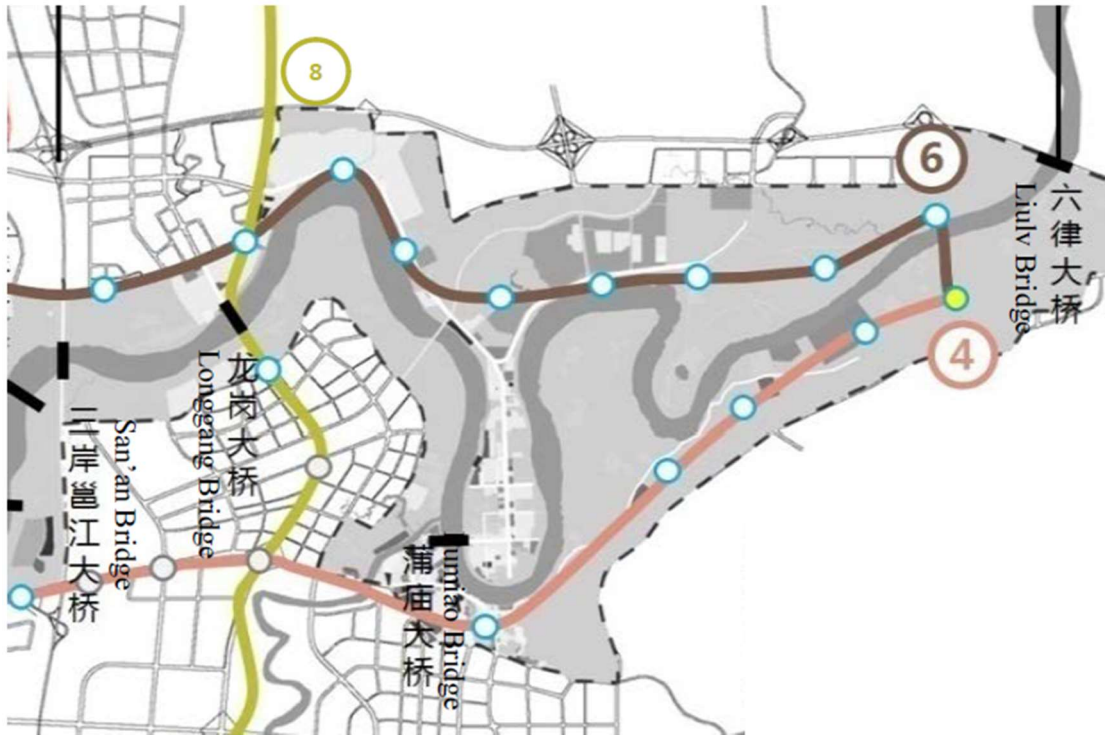
situation is very complex. This upwind area is also the most ecologically sensitive zone out of the 5 zones. There are three peninsulas (circled in red in Figure 5.14) which make a unique topographical feature.



**Figure 5.14 The Ecological Sensitivity Of Zone 5**

*Source: Nanning Urban Planning Bureau*

Three metro lines have been planned for this area in the future, namely No. 4, No. 6 and No. 8. The underground network brings high accessibility for citizens and tourists. Meanwhile, the underground metros in this central region form a unique traffic system which plays an important role in the connection between these peninsulas. By the time these new metros are in full function, most pedestrians will choose to use the underground metro instead of the bridge over Yong. This will affect both the ground and underground traffic. In addition, the location of the stations of these planned metro lines has already made effects on the surrounding commercial layout.



**Figure 5.15 Zoning Map Of Zone 5 Showing Metro Lines**

*Source: Nanning Urban Planning Bureau*

The section above discussed the how the 5 zones of Yong River waterfront are classified and explained each zone in detail. Before we move to recommendations about renovating and planning, I need to highlight a survey conducted by the local municipal bureau on residents' attitude toward urban waterfront open space. Hearing people's voice is one of the most important missions of urban planners, I believe this survey's results can assist planner to achieve a more comprehensive proposal.

## **5.5. Citizens' Voice - A Quantitative Study of a Survey Conducted by Nanning Government**

As an increasing number of people have found more ways to take delight in the waterfront recent years in Nanning, the government is gradually putting more emphasis on the urban infrastructure along waterfront open space. A decision to convert undeveloped land, which consists of 50% of total waterfront area, into public space has been made and will result in the increase of public waterfront space from 10% to 20%.

To discover the attitude and expectations of Nanning's residents towards waterfront land usage, I did a quantitative study on the results of a survey conducted by the government of Nanning. The results of the questionnaire revealed citizens' preferences for current facilities in the open spaces and how they would like to improve them. However, other than description of the survey results, I did further research by using the survey data to explore three questions: first, does the fact that responders come from various districts affect their attitudes toward the improvement of current waterfront public open space? Second, what predictors from the data set can be the best ones to predict citizens' behavior towards waterfront public open space, as represented



by their frequency to use the open space? Finally, does the travel time from the responders' home to the open space impact the frequency of visit and satisfaction towards the open space?

The survey on residents' attitudes toward urban waterfront open space was conducted by the employees from Nanning Municipal Bureau for Urban Planning. The survey used simple random sampling (SRS) and it has 136 valid responses. This 11-question questionnaire was designed to trace the attitude and expectations of Nanning's residents towards waterfront land. It starts with five questions to gather information about responder's age, gender, education, district of residence, and annual income. There are 6 districts in Nanning, they are Xingning District, Qingxiu District, Jiangnan District, Xixiangtang District, Liangqin District, Yongning District. Then it includes four behavior questions to find out the responder's frequency of visits to a waterfront open space and the means of transportation he/she took to reach the place, as well as how much time he/she used to get there. Also, the questionnaire asks the responder to point out which facilities they used the most often. The last two questions are about responder's preferences for the waterfront open space: does he/she think the open space is sufficient and how to improve it.

## Description of data

The data sample size (N) is 136 and is composed of 21 variables. There are eight categorical variables: “age”, “gender”, “education”, “district” (neighborhood), “income”, “frequency” (weekly), “transportation” (mode) and “time” (travel time in minutes). The categories of income and education are the most common standard in China. The six categories of education are 1. Primary school, 2. Middle school, 3. High school, 4. Bachelor's degree, 5. Master's Degree, 6. PhD. MD or other advanced degree; the 8 categories in income are the annual income of 1. 0-5000RMB 2. 5000-9999RMB, 3. 10000-19999RMB, 4. 20000-29999RMB, 5. 30000 - 39999RMB, 6. 40000-49999RMB, 7. 50000-59999RMB, 8. over 60000RMB. The "facility" and "improv" series variables are dummy variables, as well as "sufficient".

The government might have fixed the data set already before they publish it; thus, there is no missing variable in the data set. It is interesting that no responder ever chooses the option of “others” in the questionnaire. Chinese people usually do not tend to raise different ideas when they are doing anonymous survey. I ran the Pearson correlation coefficient table (see appendix1) to discover the relationship with the data set. There is some significant correlation between the variables recording responder's

background information: “age” and “education”, “age” and “income”, “education” and “income”. These facts variables making good correlation meaning the data set is a good one— it follows the trend of social statistics. The variable “age” has significant correlation with “frequency”. “facility2”, and “facility3”. The variable “time” has significant correlation with “frequency”, “sufficient” and all “facility” series. The variable “frequency” has significant correlation with all “facility” series and “sufficient”. The “facility” series has correlation with each other, which means when people use one kind of facility in the waterfront park, they more or less tend to use the others. Also, “education” and “sufficient” are positively related. A table showing the summary of all statistics can be found in Appendix I.

### **Summary of Results**

1. Citizens from each district have preferences towards the improvement of current waterfront public open space, as well as the preference of current facility usage. But citizens’ attitudes are not statistically significant across districts.

As shown in table of district improvement distribution in Appendix I, there are clear preferences with residents from different districts. For instance,

people living in Xingning District tend to choose more improvements than others when they filled the questionnaire; in addition, they have highest percentage of responders choosing improvement 2, 4, and 6, which are country style, eco-technological style, and Zhuang style. In Qingxiu District, a higher proportion of residents favor improvement 5, Cultural innovative style, over the other possible improvements. In Liangqin District, all six improvements were chosen by over half of the respondents. This could indicate that Liangqin District has a lot of potential for improvements. The planner could consider this result to design the develop plan.

When I calculated the District facility distribution (Table3 District facility distribution in Appendix I), people living in Xingning District tends to use facilities most as the proportion in choosing “Do not use” is the least while Xixiangtang District has most proportion in choosing “Do not use”, that means the planner may need to figure out a better waterfront park plan than the current one to attract more people. Fitness Trail is popular in Qingxiu, Jiangnan, and Liangqin District; children’s playground is popular in Xingning and Liangqin District; Fishing Spot has relatively higher popularity in Yongning District. This means those districts have high demand of different facticity, which should be met when the new plan comes out.

2. The best predictors in the data set to predict frequency is age, district and time.

To predict citizen's behavior towards waterfront public open space, a simple regression model can be a good solution. I generated three models, which include different independent variables.

The Three Models:

Model 1: Dependent variable: frequency; independent variables: age gender education district income time.

Model 2: Dependent variable: frequency; independent variables: age district income time.

Model 3: Dependent variable: frequency; independent variables: age district time

In the comparison from regression models of variation in change in dependent variables (table5 in Appendix I), model 3 has least independent variables while it has highest adjusted R2. Therefore, the best indicators here to predict citizens' weekly frequencies to the waterfront public open space are

age, district and time. According to the coefficient, the older a person is, the more likely he/she will go to the waterfront park; the closer a person lives from the waterfront park, the more likely he/she will go to the park.

3. The travel times from responders' home to the open space impact the frequency of visit and satisfaction towards the open space.

From the crossable of frequency and time with Chi-square test (Table 6 in Appendix I), the  $\chi^2$  associated with this table has 12 degrees of freedom and the Pearson chi2 is 78.93, the likelihood-ratio chi2 is 79.94. The observed differences are significant ( $p=0.0000$ ). This is to say; the travel times from responders' home to the open space impact the frequency of visit. Also, cross table of sufficient and time with Chi-square test (table 7 in Appendix I) shows the null hypothesis is rejected, which means the travel times from responders' home to the open space impact the satisfaction towards the open space.

### Conclusion and Limitation

After a more in-depth look at the survey results, it is reasonable to say that the citizens of Nanning residing in the different districts of the city have clear preferences towards how the current public waterfront open space can be improved. This may be a result of the current poor utilization of the waterfront

open space. If the government planners want to meet the demands of citizens in every district, they have to make a unique plan for each district and do more field observations. Also they need to consider the demographics in the district, district with higher diversity may need more ethnic design.

During my research, however, I have discovered some limitations of the survey which has hindered my ability to have a clearer understanding of the survey results. Some shortcomings can be attributed to data availability in this survey. For a city of over 1.7 million in population, the bureau has the resources to obtain more respondents and enlarge the sample size. Also, the survey has flaws in its designs, mainly the type of questions that were asked and the answer choices that were given. The bureau responsible for the survey could have done a better job in designing the survey so that it would gather more useful information.

The complete methods and statistical analysis as well as the sample questionnaire are displayed in Appendix I.

## CHAPTER 6 – RECOMMENDATIONS

Chapter 5 started out by illustrating the history of Nanning City and Yong River, as well as the general condition of waterfront. Then it moved to reveal the physical attributes of the Yong River's waterfront. It brought out the main features of each one of the five zones by highlighting the major physical transformations that took place in recent years and official development plans in the near future. The analysis of the survey aimed to contextualize the citizens' attitudes of these spaces to achieve an overall illustration of how Yong River's waterfront connected to the city. This Chapter, in its first section, 3 main issues are raised: 1. Not enough public shorelines and the waterfront shoreline lacks vitality; 2. Poor special connection between the urban city and the waterfront open space, due to the height difference of embankment; 3. Lack of water-enjoyable space. Each issue is followed by my suggested solution. The Chapter then proceeds to discuss the recommendation for each zone's planning while linking them to some of the conditions discussed earlier. Subsequently the Chapter moves into its third section to discuss the conclusions and how the results reached by this case study could conclude with some micro-scale recommendations for future planning



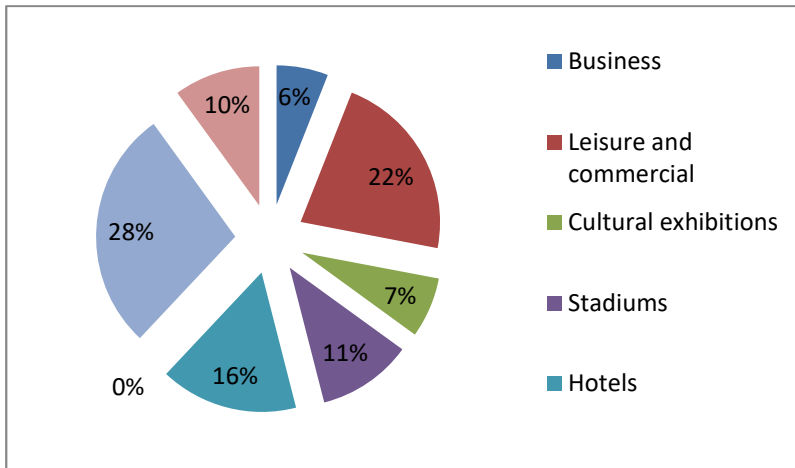
## 6.1. Three Issues with the Suggested Solutions

After exploring the case of Nanning Waterfront open space, I conclude that three issues should not be ignored and should be improved as soon as possible.

*6.1.1. Issue 1: Not enough public shorelines and the waterfront shoreline lacks vitality.*

According to numbers from the government, the public shoreline of Huangpu River accounts for 13%, and Yong River is 10%. Although these data are close, the waterfront functional structures are different:

The land-uses accounted in the public shoreline of Yong River are schools (28%), hospitals (10%), and hotels (16%) which attract fewer people to enjoy the public open space compared to parks and commercial plazas.

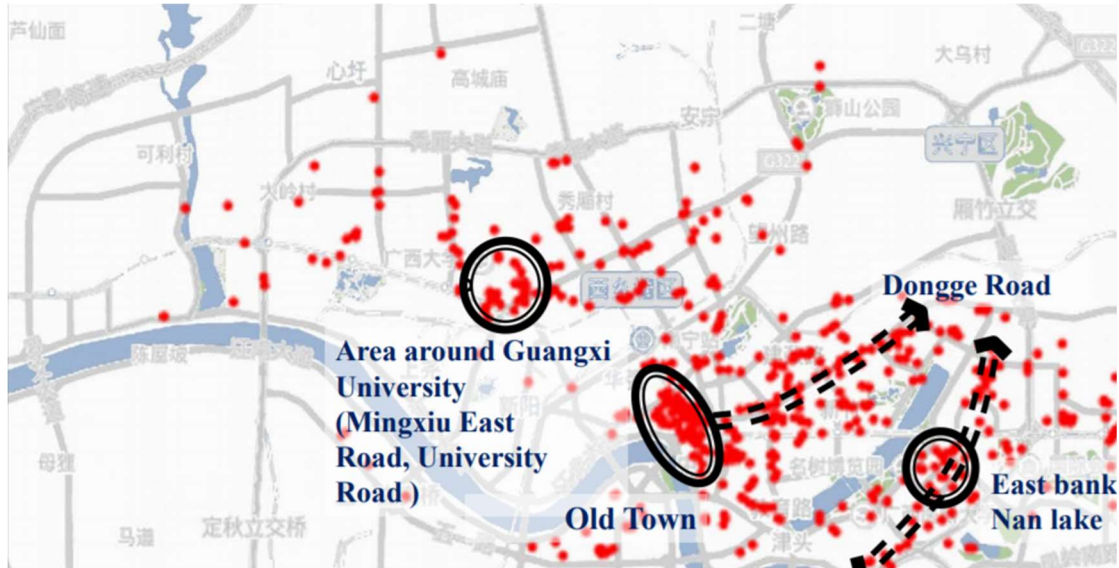


**Figure 6.1 Distribution Of 8 Major Land-Uses Along Yong River**

*Source: Nanning Urban Planning Bureau, edited by the Author*

Let me take the restaurant and catering industry as an example to describe the city's scarcity of leisure space on the waterfront. Waterfront restaurants are often popular because of beautiful waterfront views and fresh aquatic products. However, beyond my expectations, waterfront restaurants are not very common along Yong River. There are three street zones with dense points: The Old Town (Minzu Avenue Zhongshan Road) is the densest and extends to the northeast along Dongge Road; east coast of Nanhu Lake and north and south sides of Jinhua Square (Jinhua North Road, South Jinhua Road and Nation Avenue); area around Guangxi University (Mingxiu East Road to University Road). The main catering industry distribution indicates the separation between the most vigorous catering industry and waterfront

space, except the area from Yong Bridge to Taoyuan Bridge, which has lots of restaurants along the river.



**Figure 6.2 Map Of Yong River Showing Restaurant Hotspots**

*Source: Baidu Maps, edited by the Author*

### *6.1.2. Solution 1: Expand Public Shorelines in the City Center Segments*

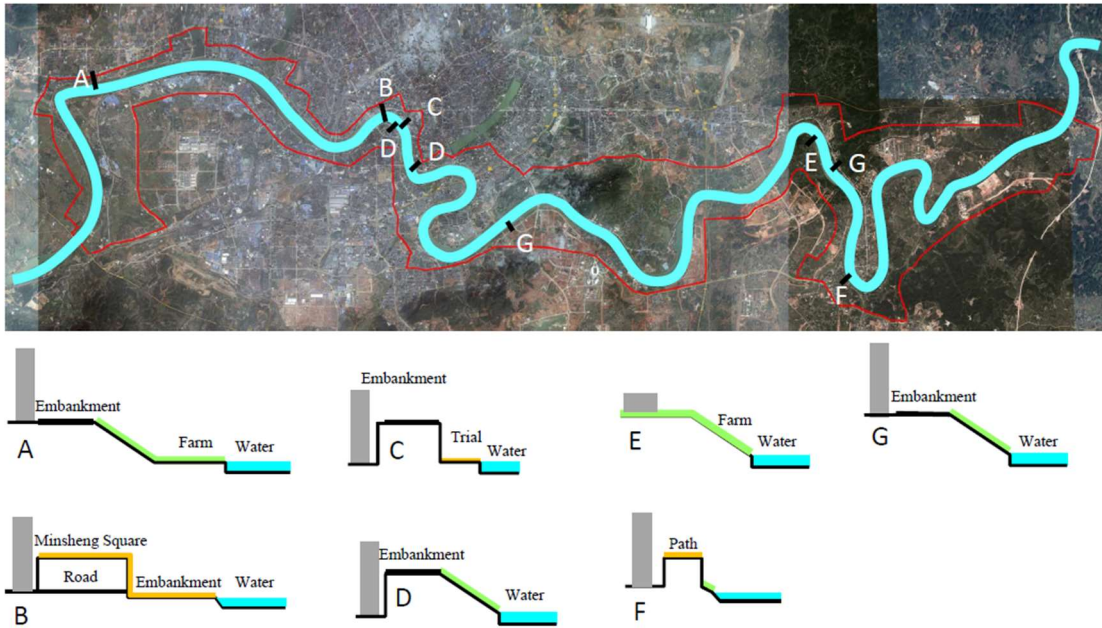
*(Zone 3), From 21% to 50%.*

As I mentioned in chapter 4, public land-use shorelines accounts for over 50% of the shoreline length in urban city center. Public shoreline proportion in London is 52% and in Shanghai is 59%. Moreover, leisure space usually forms a large part of land-use on urban center waterfronts and nowadays it is also one index of livable city standard in China. Here on Nanning's zoning map, public land-use shoreline means all kinds of public services such as parks, schools, city centers and so on. While leisure area

includes shopping malls, hotels, coffee shops, museums, art galleries and public spaces in the form of parks. To make Nanning a culturally diverse city with great international influence, planning practice in Nanning should emphasize the natural attraction of the Yong River and include the concept of riparian rights in terms of visual and physical accessibility of the water. In brief, introducing more retail and leisure properties as well as offices, exhibitions and convention centers can definitely increase people's attraction.

*6.1.3. Issue 2: Poor Special Connection Between the Urban City and the Waterfront Open Space, Due to the Height Difference of Embankment.*

Yong River's embankment is 5 meters above the water in the lower reach, including zone 1 to 4, while there are only a few waterfront parks, such as Minsheng Square, Lingtie bridge, Wuxiang waterfront Park, etc. This height difference contributes to isolated development between Nanning city and Yong River. The tall dykes built along the river block the view and restrict people's activities close to the river. In the picture below, the author selects 7 typical examples of embankment and watercourse.



**Figure 6.3 Satellite Image Of Yong River & 7 Examples Of Embankment And Watercourse Of Yong River**

*Source: Nanning Urban Planning Bureau, edited by the Author*

From those selected sample sites, examples B and C are the most people attractive design while A and E are for agricultural use and flood control; D and G are mono-functional; in the situation of site F, the path is so much higher that the water level that people might not get close sense of nature and water.

#### 6.1.4. Solution 2: Four Approaches to Address Embankment Conditions

The lack of connection between urban city and waterfront results from physical separation. Although I selected 7 examples above, the solution falls into 4 typical design plans according to the land features: suburban, general

urban, core urban and center urban. Following are the detailed design plans with design sketches.

#### 6.1.4.1. Gentle slope type

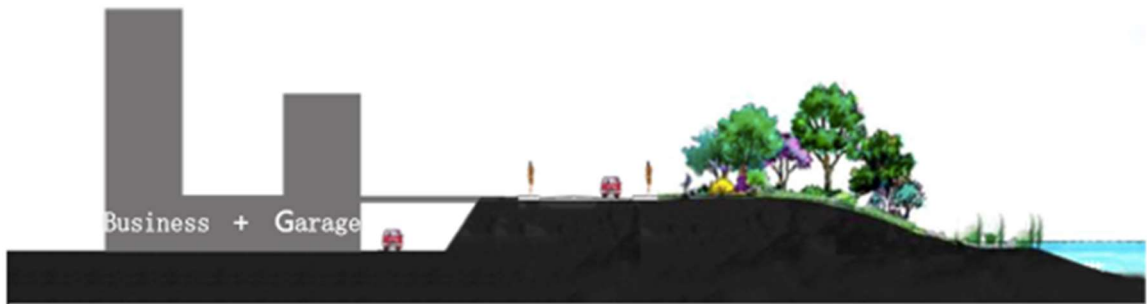
This type is designed for suburban area, mostly locate in zone 1, zone 4, and zone 5. Given that the suburban area has large undeveloped or agricultural-use space by the watercourse, we can make the embankment slope gentler and form a natural transition from the city to waterfront area. The riverside road enhances the water experience, attracting more people and traffic from both local suburban and surrounding urban. The following is my brief design plan (Figure 6.4). If farmland or village is located far from the waterfront, a riverside road or highway would draw people to the waterfront area. Bringing more cultural concepts such as sculpture and seasonal theme park, or even simply building some benches, arbors and kiosks would help attract people.



**Figure 6.4 Gentle Slope Type**

6.1.4.2. Building integrated type

This type is designed for general urban areas. The general urban area can be seen in all 5 zones, and it is the majority land type of zone 2 and zone 4. As shown in the design sketch (Figure 6.5), the part below the embankment ground can be used as garage and some mid-rise business buildings. In order to connect the waterfront open space to the inner embankment, there need to be overhead corridors/bridges with 2-3 layers' height, at the same time the ground level is open to traffic. The bridge easily draws people from the business building to the waterfront, increase the working quality of people who work in the building at the same time expand the commercial and catering industry along the river.



**Figure 6.5 Building Integrated Type**

6.1.4.3. Step-elevated type

This type is designed for core urban areas, located in zone 2, zone 3 and zone 4. The part below the embankment can be used as parking garage. Along the peripheral road there are business streets and plazas. People get access to the waterfront open space via a bridge connected to the second business building. The difference between step-elevated type and building integrated type is people get access directly from the business building (Figure 6.6) to the waterfront without a bridge (Figure 6.5). Since core urban areas in zones 2-4 have limited unzoned land, renovation will be the main work. This design type is not going to be widely used, but future waterfront development should take the idea of elevating buildings' first ground into design plans.





**Figure 6.6 Step-Elevated Type**

6.1.4.4. Embankment-used type

This type is designed for urban center area such as city center of Zone 3 and city sub-center of Zone 4. The embankment is used directly to build business and commercial buildings. Due to buildings in the center and sub-center of Nanning city being mostly developed, and there being no demolition and reconstruction plans in the near future, my design sketch demonstrates a way of utilizing the waterfront and connecting people to the waterfront with minimum construction. As shown in Figure 6.7, the buildings along the river have their backside to the waterfront. Because the main facade faces away from the waterfront and altitude differences from waterfront platform and the embankment, this part of embankment is unsuitable for commercial facilities, but more suitable for parking spaces or small roads. Some of the urban center areas have built waterfront parks and platforms and the others also have plans to construct in the future based on the government

master plan. So, the existing elevated platform remains the same in my design plan.



**Figure 6.7 Embankment-Used Type**

*6.1.5. Issue 3: Lack of water-enjoyable space.*

Nanning city's Center segment has good green areas and a pleasant ecological landscape, but as a whole it lacks water-enjoyable space and beach usage. Yong River has a beautiful environment on both shores: Qingxiu Mountain and Wuxiangling Ridge distantly facing each other and separated by Yong River; the continuous mountains lie around the east side of the city with attractive scenery. But in current condition, both shores of Yong River have very few water-enjoyable-spaces, which are scattered. There are three types of water-enjoyable spaces along Yong River, only accounting for 10% of the total shoreline:

6 waterfront parks: Minsheng square, Nanning waterfront leisure park, Yangguan pier park, Liyuan waterfront park, Wuxiang new district waterfront park, University City's waterfront Park.

1 waterfront Business district: Intersegment between Xianhu Avenue and Railway, 5 Restaurants built on the riverside.

1 walking embankment road: Located in Pumiao old town, still under construction.



**Figure 6.8 Satellite Image Of Yong River Showing Waterfront Parks And Path & 7 Photos Of Waterfront Parks And Path**

*Source: Nanning Urban Planning Bureau, Google Earth, edited by the Author*

6.1.6. *Solution 3: Add designated water access areas.*

According to citizens' activity intensity, the city needs more designated water access areas. Here are the most needed segments and recommended improvements:

1. Yonghe Bridge to Huluding Bridge segment (marked green under number 1 in figure 6.9): on the basis of existing waterfront park, build more waterfront park or water-accessible platform, to form a continuous designated water access area.

2. South of Qingxiu Mountain (marked green under number 2 in figure 6.9): add more waterfront public spaces to connect Wuxiang New District Waterfront Park and the Wanda city complex, which is under construction.

3. City periphery (marked green under number 3 in Figure 6.9): add local water-enjoyable space such as a public boathouse, boardwalks, overlooks, and designated fishing zones at Xiangsi Lake, Longgang, Xianhu Peninsula and other spots.



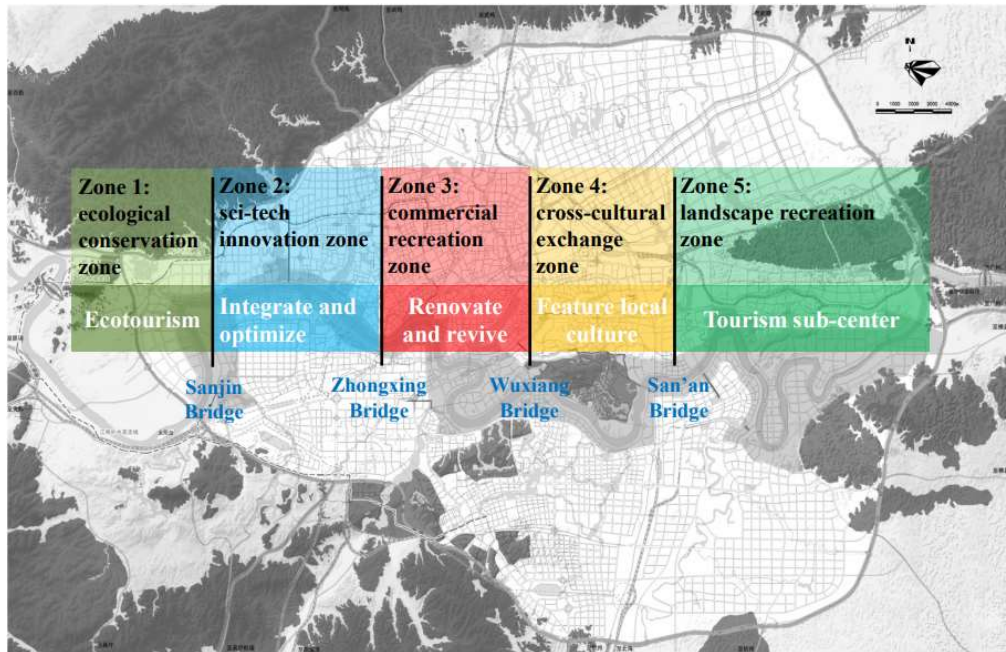
**Figure 6.9 Satellite Image Of Yong River Showing Current And Planning Waterfront Platform & 3 Photos Of Waterfront Public Open Spaces Along Yong River**

*Source: Nanning Urban Planning Bureau, Google Earth, edited by the Author*

## **6.2. Recommendations by Each Zone**

As mentioned above in chapter 5, each zone along Yong River's waterfront area has its advantages and disadvantages. Considering every zone's features, I make some specific recommendations for improvements and future research. By reviewing Yong's river physical condition and citizens' expectation of waterfront improvement, I summarize 5 reasonable ameliorated orientations for these 5 zones and rename these zones into ecological conservation zone, sci-tech innovation zone, commercial recreation zone,

cross-cultural exchange zone, and landscape recreation zone. I demonstrate the idea in Figure 6.10 below.



**Figure 6.10 Map of Yong River and Key Words of Each Zone**

Zone 1 can be transformed into an ecological conservation; the keyword is ecotourism. Located at the upstream of Yong River, this zone's ecological sensitivity is very high. Since there are a lot of un-zoned areas and agricultural/industrial land, the cost can be the lowest of 5 zones. To improve the land-use efficiency, demolishing informal residential and industrial land, make full use of existing constructions. The west bank should remain as country park, and for the east coast, government should control development intensity to keep both banks focus on ecotourism.

Zone 2 can be transformed into a sci-tech innovation zone; key words are integrate and optimize. In the course of urbanization, Zone 2, as a rural-urban fringe zone, has lots of waterfront issues such as contaminated water, destroyed riverside, disordered waterfront landscape, crowded and messy embankment. Thus, it needs to integrate space resources and to enhance regional functional capabilities. Zone 2 also has an abundance of un-zoned land, and due to its current close connection to the university district and industrial district, the improvements should be focus on a waterfront sci-tech district. This zone should make a better environment for science and technology, accelerating innovation for the city's development.

Zone 3 can be transformed into a commercial recreation zone, key words are renovate and revive, Zone 3 is composed of mainly built-up areas. The land use is mixed because both old town and new town are densely populated. The government should renovate and revive the old town and make the waterfront area a commercial and recreational public open space. As I recommended previously in this chapter, in this urban center, the proportion of public shoreline should exceed 50% in Zone 3.

Zone 4 can be transformed into a cross-cultural exchange zone, emphasizing displaying regional cultures. Zone 4 is a new urban district with good urban public space quality. On one hand, the existing space utilization in Zone 4 still needs requires optimization for its space structure; on the other hand, by combing the city's cultural resources, we can achieve diversity and spatial structure of urban cultural integration on the waterfront space. By adding the local character, the urban open space can be broadened, and citizens public activities can be aroused.

Zone 5 can be transformed into a landscape recreation zone, with the focus of integrating into a future tourism subcenter. Zone 5 is the urban fringe; there are popular urban leisure areas for citizens. Planners can focus on the Yong River and develop by using the difference of terrain to create a special landscape space that attract more citizens and tourists. The government should lower land development intensity and expand the urban recreational resort function in this area.

### **6.3. Conclusion**

I also have some micro-scale recommendations here:

#### *6.3.1. Multi-layered Accessibility of the Water.*



When designing a waterfront park, it is important to maximize the accessibility of the water, particularly the physical and visual accessibility. A multi-layered approach to the water is also vital to the design. It includes: accessibility of the waterfront space from the rest of the city (connectivity of the waterfront); accessibility of the public space from other waterfront places (continuity of the waterfront); and accessibility of the water (the design of the water's edge, the quality of the water, the quality of the adjacent submerged land). To improve the continuity of the waterfront and to maximize public access to it, I recommend establishing a new administration that is responsible for coordination, like a waterfront committee.

### *6.3.2. The Integration of Public Buildings with Waterfront Public Open Space.*

First of all, demolishing unnecessary boundary walls of public building is more economically feasible than reclaiming surrounding spaces and widening roads. Vice versa, constructing public buildings on reclaimed waterfront land is cheaper than buying up properties in a prominent place in the town. Waterfront open space and buildings accessible to the public, such as museums, theaters, and restaurants, are both public-oriented. If the public

building is accessible from the road-side, parking lot, and the waterside, the waterfront's user experience is improved on both cultural and economic levels, in terms of diversity and complexity; simultaneously, the public building user experience is enriched with the visual and physical accessibility of the water.

*6.3.3. User Control and Built-in Adaptability of the Spaces to Accommodate Demographic and Cultural Changes.*

As we all know, users of public spaces always hold diverse perceptions of it. Better waterfront accessibility involves securing access for all types of users, regardless of age, race, ethnicity, nationality, gender or disability. The design quality of public spaces and user control measures is crucial, to satisfy their specific needs when using open spaces on the waterfront. For another example, the user's attachment to their cars and their insistence to be close to them should also be taken into consideration when designing future public space.

*6.3.4. The Integration of Provided Fishing Spots and Harbors with Public Space.*

I recommend improvement of the physical condition of all the existing fishing harbors and enhancing their links with the adjacent urban and settlement areas through the planning laws and land ownership reforms.

## **CHAPTER 7 – CONCLUSION AND DISCUSSION**

This is the concluding chapter of this thesis study of waterfront public space. Chapters 1 to 4 of this thesis introduced the theoretical and conceptual framework, the methodology and prominent waterfront projects. Chapters 5 and 6 represented a case study of Nanning city's waterfront open space, by portraying its current condition physically and how to improve and renovate the waterfront public open space along Yong River. This Chapter, in its first section recapitulates the entire study by highlighting the initial research problem, the main aims and objectives, the research questions, the methodology followed and the findings for each part of the study. This is followed by the second section, which includes the conclusions reached as well as some recommendations for future research.

### **7.1. Research Findings & Conclusions**

The waterfront as a phenomenon has emerged since the 1960s, starting from North American cities. The phenomenon spread to the rest of the world and has taken place in two types of urban space: 1- derelict and abandoned port or dockland (London, Rotterdam, New York), 2- reclaimed costal land (Tokyo, Dubai, Bahrain, Singapore). No matter the kind of spatial types, most

of the resulting projects are used to facilitate and to accommodate demographic and economic growth. The waterfront became the place where the city re-creates its identity to be used as part of city marketing and international image competition. Many of these projects brought some high quality public spaces to the forefront of the waterfront; while many others resulted in the development of the waterfront.

In Nanning, the capital of Guangxi Zhuang Autonomous Region, the government and citizens have recognized that its waterfront needs to be renovated. As an important gateway to Southeast Asia for Southwestern China, Nanning is a hub, a regional center and an opening city that plays an active role in the communication between China and ASEAN countries. It is becoming a new and booming economic zone and a hotspot for foreign investment in China. With its rapid urban development, Nanning attaches great importance to improving natural environment and it enjoys the reputation of “the Green City of China” because of its best green coverage in the country. In addition, the Yong River, located in the middle of Nanning Basin is one of the most attractive images of Nanning. Investigation reveals that there are deficiencies and limitations in Yong River’s waterfront public

space. The government is keen to maximize its physiognomy and functional capacity.

Based on the above, this study aims to help build a new understanding of the waterfront public space in Nanning especially of its shortcomings. With an in-depth knowledge of the current situation, I draw the conclusion that the improvement should be approached sensitively in terms of specific planning and design.

The field observation was conducted through 2 field trips (in 2015, and 2016). The first was of an exploratory nature while the latter were more focused. The data collected on those trips, supplemented with the data collected through the archival research, were analyzed and written up this thesis. However, the approach is still limited both in the data materials themselves and in the analysis of the data collected. In addition, a few challenges arose while conducting field observation work. These varied between a lack of previous research experience about public space and the waterfront in Nanning and the denial of access to some official reports. Translating most Chinese materials into English precisely is also a challenge for me.

## **7.2. Recommendations for Policy Makers, Planners and Urban Designers**

The following are my summary of challenges Nanning is currently facing and my recommendations based on findings and conclusions of this thesis.

The case study of Nanning highlighted 3 main challenges faced by waterfront public space in cities similar to Nanning. And I will put my recommendation directly after each challenge.

First of all, there is a lack of an overall planning policy for the waterfront; therefore, the government should make specific policies to cope with the current growth of private water-dependent projects and the subsequent reduction of public space. The growth of residential and workspace on the waterfront will sacrifice public open space too, but at the same time more people flow will increase the government leaders' attention to optimizing public space. The introduction of a water-dependency approach in planning and zoning could definitely maximize the benefits of being on the waterfront. I recommend a special zoning policy for leisure spaces to improve the communication between public and private investors. Furthermore, to

properly implement the planning laws and strategies on the waterfront area, I recommend the introduction and demarcation of a waterfront zone in any city that has a waterfront.

In the second place, in past cases, slow or no action towards the improvement or protection of public space is very common. Thus, government needs to set both short-term and long-term urban growth guidelines and funding plans that govern the growth of the city and the absence of a holistic view of the multifaceted nature of waterfront accessibility.

Finally, although there is plenty of undeveloped land along Yong River, public space on the waterfront of Nanning is still limited and diminishing. The government has increasing pressure for land reclamation or rebuilding waterfront public open space. Tens of thousands of people travel to Beijing each year to lodge petitions with the authorities in the hope of finding redress for alleged corruption, land seizures and evictions. Thus, the government should be prepared to handle the various legal relations concerned in the reclamation and the compensation and resettlement for the involved people.



## **APPENDIX I**

### **A Quantitative Study on the Current and Future Status of Nanning's Waterfront Areas**

#### **A.1 Introduction**

Urban waterfront open spaces are invaluable to biodiversity and wildlife habitat and undertake essential environmental functions such as improving the quality of life in urban areas. An increasing number of people have found more ways to take delight in the waterfront. The government of Nanning, the capital city of China's Guangxi Province with nearly 7 million people, is gradually putting more emphasis on waterfront open space. A decision to convert undeveloped land, which consists of 50% of total waterfront area, into public space has been made and will result in the increase of public waterfront space from 10% to 20%. In this project, I would like to discover the attitude and expectations of Nanning's residents towards waterfront land usage by utilizing the result of a survey conducted by the government of Nanning.

The results of the questionnaire revealed the citizens' preference of current facilities in the open spaces and how they would like to improve them. However, other than description of the survey results, I did further research by using the survey data to explore the answer to three questions: first, does the fact that responders come from various districts affect their attitudes toward the improvement of current waterfront public open space? Second, what predictors from the data set can be the best ones to predict citizens' behavior towards waterfront public open space? In this paper, represented by their frequency to use the open space? Finally, does the travel time from the responders' home to the open space impact the frequency of visit and satisfaction towards the open space?

#### **A.2 Methods**

To answer the first question, I generated two tables of summary statistics to have a more comprehensive understanding. The second question can be answered by running some regressions. Simple linear regression analyses were conducted to identify which predictors were significantly correlated with the frequency of using open space ( $p < 0.05$ ). I used different combinations of dependent variables to build the three models and wanted to choose the one with the best fit. The last question can be solved by chi squared test and analysis of variance.

## Questionnaire

The survey on residents' attitudes toward urban waterfront open space was conducted by the employees from Nanning Municipal Bureau for Urban Planning. This 11-question questionnaire was designed to trace the attitude and expectations of Nanning's residents towards waterfront land. It starts with five fact questions to gather information about responder's age, gender, education, district of residence, and annual income. Then it includes four behavior questions to find out the responder's frequency of visits to a waterfront open space and which means of transportation he/she took to reach the place, as well as how much time he/she used to get there. Also, the questionnaire asks the responder to point out which facilities they used the most often. The last two questions are about responder's preferences of the waterfront open space: does he/she think the open space is sufficient and how to improve it.

### A.3 Statistical Analysis

#### Description of data

The data sample size is 136 and is composed of 21 variables. There are eight categorical variables: "age", "gender", "education", "district", "income", "frequency", "transportation" and "time ". The "facility" and "improv" series variables are dummy variables, as well as "sufficient". The government might have fixed the data set already before they publish it, thus there is no missing variable in the data set. It is interesting that no responder ever chooses the option of "others" in the questionnaire. Chinese people usually do not tend to raise different ideas when they are doing anonymous survey. I ran the Pearson correlation coefficient table (see appendix1) to discover the relationship with the data set. There is some significant correlation between the variables recording responder's background information: "age" and "education", "age" and "income", "education" and "income". These facts variables making good correlation means the data set is a good one— it follows the trend of social statistics. The variable "age" has significant correlation with "frequency", "facility2", and "facility3". The variable "time" has significant correlation with "frequency", "sufficient" and all "facility" series. The variable "frequency" has significant correlation with all "facility" series and "sufficient". The "facility" series has correlation with each other, which means

when people use one kind of facility in the waterfront park, they more or less tend to use the others. Also, “education” and “sufficient” are positively related.

Table 1 Summary of statistics

Variable	Variable Description	N	Mean	SD	Median	Max	Min
age	In 7 categories	136	3.882	1.530	4	7	1
gender	=1 if female	136	1.507	0.502	2	2	1
education	In 6 categories	135	3.637	1.176	4	6	1
district	Living District	136	3.250	1.645	3	6	1
income	Annual in 8 categories	136	4.272	1.401	4	8	1
frequency	Weekly frequency to waterfront park	136	2.169	0.830	2	4	1
transportation	Means to reach the park	136	1.743	0.644	2	3	1
time	Time spent to reach the park	136	2.316	0.925	2	5	1
facility 1	=1 if use fitness trail	136	0.706	0.457	1	1	0
facility 2	=1 if use children’s playground	136	0.382	0.488	0	1	0
facility 3	=1 if use fishing spot	136	0.147	0.355	0	1	0
facility 4	=1 if use none of above	135	0.237	0.427	0	1	0
facility 5	=1 if use other facility	136	0	0	0	0	0
sufficient	=1 if sufficient	136	0.500	0.502	0.500	1	0
improv 1	=1 if chosen Southeast Asian Style	136	0.412	0.494	0	1	0
improv 2	=1 if chosen Country style	136	0.529	0.501	1	1	0
improv 3	=1 if chosen Garden Town style	136	0.551	0.499	1	1	0
improv 4	=1 if chosen Eco-technological style	136	0.743	0.439	1	1	0
improv 5	=1 if chosen cultural innovative style	136	0.588	0.494	1	1	0
improv 6	=1 if choose Zhuang-cultural style	136	0.397	0.491	0	1	0
improv 7	=1 if chosen others	136	0	0	0	0	0

## Results

1. Citizens from each district have preferences towards the improvement of current waterfront public open space, as well as the preference of current facility usage. But citizens’ attitudes are not statistically significant across districts.

As shown in table 2, there are clear preferences with residents from different districts. For instance, people living in Xingning District tend to choose more improvements than others when they filled the questionnaire; in addition, they have highest percentage of responders choosing improvement 2, 4, and 6,

which are country style, eco-technological style, and Zhuang style. In Qingxiu District, a higher proportion of residents favor improvement 5, Cultural innovative style, over the other possible improvements. In Liangqin District, all six improvements were chosen by over half of the respondents. This could indicate that Liangqin District has a lot of potential for improvements. The planner could consider this result to design the develop plan.

Table 2 District improvement distribution

District (# of responders)	improv_1			improv_2			improv_3		
	n	prop.	share	n	prop.	share	n	prop.	share
Xingning (18)	6	33%	4.41	11	61%	8.09	12	67%	8.82
Qingxiu (42)	19	45%	9.36	21	50%	15.44	24	57%	17.56
Jiangnan (20)	3	15%	2.21	10	50%	7.35	8	40%	5.88
Xixiangtang (18)	8	44%	5.88	8	44%	4.41	5	28%	3.68
Liangqin (20)	13	65%	9.56	12	60%	6.62	11	55%	8.09
Yongning (20)	7	35%	5.15	10	50%	7.35	15	75%	11.03
Total	56		41.18	72		52.94	75		55.15
	improv_4			improv_5			improv_6		
	n	prop.	share	n	prop.	share	n	prop.	share
Xingning (18)	15	83%	11.03	12	67%	8.82	10	56%	7.35
Qingxiu (42)	32	76%	23.53	29	69%	21.32	15	36%	11.03
Jiangnan (20)	12	60%	8.82	9	45%	6.62	9	45%	6.62
Xixiangtang (18)	15	83%	11.03	10	56%	7.35	7	39%	5.15
Liangqin (20)	12	60%	10.29	11	55%	8.09	10	50%	7.25
Yongning (20)	12	60%	9.56	9	45%	6.62	3	15%	2.21
Total	101		74.26	80		58.82	54		39.71

proportion is calculated by the number of responses divided by the number of responders in this district;

Share is calculated by the number of responses divided by the number of all 136 responders (1 out of 100)

When I calculated the District facility distribution (table3), people living in Xingning District tends to use facilities most as the proportion in choosing “Do not use” is the least while Xixiangtang District has most proportion in choosing “Do not use”, that means the planner may need to figure out a better waterfront park plan than the current one to attract more people. Fitness Trail is popular in Qingxiu, Jiangnan, and Liangqin District; children’s playground is popular in

Xingning and Liangqin District; Fishing Spot has relatively higher popularity in Yongning District. This means those districts has high demand of different facticity, which should be met when the new plan comes out.

Table3 District facility distribution

Districts (# of responders)	Fitness Trail			Playground			Fishing Spot			Do not use		
	n	prop	share	n	prop	share	n	prop	share	n	prop	share
Xingning (18)	10	56%	7.35	9	50%	6.62	3	17%	2.21	3	17%	2.22
Qingxiu (42)	31	74%	22.79	12	29%	8.82	4	10%	2.94	10	24%	7.41
Jiangnan (20)	15	75%	1.03	8	40%	5.88	3	15%	2.21	4	20%	2.96
Xixiangtang (18)	10	56%	7.35	6	33%	4.41	2	11%	1.47	7	39%	5.19
Liangqin (20)	16	80%	11.76	9	45%	6.62	3	15%	2.21	4	20%	2.96
Yongning (20)	14	70%	10.29	8	40%	5.88	5	25%	3.68	4	20%	2.96
Total	96		70.59	52		38.24	20		14.71	32		23.7

proportion is calculated by the number of responses divided by the number of responders in this district; share is calculated by the number of responses divided by the number of all 136 responders (1 out of 100).

However, we cannot make a conclusion without a statistics test. After running an ANOVA test, we can see from table5 that the F-value of 1.270 has a significance of 0.280, and therefore we do not reject the Null Hypothesis. That is to say, there is no significant difference between the 6 district groups in terms of their frequency to the open space.

Table4 Analysis of variance (ANOVA) of frequency and district

Summary of frequency			
District	Mean	Std.Dev.	Freq.
1	2.500	1.043	18
2	2.214	0.871	42
3	2.150	0.745	20
4	1.833	0.707	18
5	2.200	0.768	20
6	2.056	0.725	18
Total	2.169	0.830	136

Analysis of Variance					
Source	SS	df	MS	F	Prob>F
Between groups	4.344	5	0.869	1.270	0.280
Within groups	88.77	130	0.683		

Total	93.11	135	0.690
Bartlett's test for equal variances $\chi^2(5) = 4.170$			Prob> $\chi^2 = 0.525$

2. The best predictors in the data set to predict frequency is age, district and time.

To predict citizen's behavior towards waterfront public open space, a simple regression model can be a good solution. I generated three models, which include different independent variables.

The Three Models:

Model 1: Dependent variable: frequency; independent variables: age gender education district income time.

Model 2: Dependent variable: frequency; independent variables: age district income time.

Model 3: Dependent variable: frequency; independent variables: age district time

In the comparison shown in table5, model 3 has least independent variables while it has highest adjusted  $R^2$ . Therefore, the best indicators here to predict citizens' weekly frequencies to the waterfront public open space are age, district and time. According to the coefficient, the older a person is, the more likely he/she will go to the waterfront park; the closer a person lives from the waterfront park, the more likely he/she will go to the park.

Table5 Regression models of variation in change in dependent variables.

Variables	Model 1			Model 2			Model 3		
	Coef.	t-stat	Sig.	Coef.	t-stat	Sig.	Coef.	t-stat	Sig.
Age	.094	2.36	.040	.092	2.37	.039	.097	2.55	.038
Gender	.126	1.05	.119						
Education	-.011	-.19	.060						
District	-.067	-1.84	.036	-.068	-1.92	.036	-.070	-1.98	.035
Income	.027	.54	.050	.024	.57	.043			
Time	-.497	-7.69	.065	-.490	-7.77	.063	-.489	-7.77	.063
Constant	2.91	8.73	.333	3.063	10.62	.288	3.15	13.00	.242

**Summary Statistics**

N	135	136	136
Adjusted $R^2$	.321	.336	.339
F	11.55	18.04	24.07
$p$	<.000	<.000	<.000

3. The travel times from responders' home to the open space impact the frequency of visit and satisfaction towards the open space.

At the bottom of Table 6, the  $\chi^2$  associated with this table has 12 degrees of freedom and the Pearson chi2 is 78.93, the likelihood-ratio chi2 is 79.94. The observed differences are significant ( $p=0.0000$ ). This is to say; the travel times from responders' home to the open space impact the frequency of visit. Also, table 7 shows the null hypothesis is rejected, which means the travel times from responders' home to the open space impact the satisfaction towards the open space.

Table 6 Crosstable of frequency and time with Chi-square test

Frequency	Time					Total
	1	2	3	4	5	
1	0	2	10	15	1	28
2	11	44	8	3	0	66
3	7	18	8	0	0	33
4	4	5	0	0	0	9
Total	22	69	26	18	1	136

Pearson chi2(12) = 78.93 Pr = 0.0000  
 likelihood-ratio chi2(12) = 79.94 Pr = 0.0000  
 Cramer's V = 0.440  
 gamma = -0.641 ASE = 0.0770  
 Kendall's tau-b = -0.466 ASE = 0.0640

Table 7 Cross table of sufficient and time with Chi-square test

Sufficient	Time					Total
	1	2	3	4	5	
0	12	42	12	2	0	68
1	10	27	14	16	1	68

Total	22	69	26	18	1	136
Pearson chi2(4) = 15.49		Pr = 0.00400				
likelihood-ratio chi2(4) = 17.40		Pr = 0.00200				
Cramir's V = 0.337						
Gamma = 0.391		ASE = 0.123				
Kendall's tau-b = 0.233		ASE = 0.0760				

#### A.4 Conclusion and Limitation

After a more in-depth look at the survey results, it is reasonable to say that the citizens of Nanning residing in the different districts of the city have clear preferences towards how the current public waterfront open space can be improved. This may be a result of the current poor utilization of the waterfront open space. If the government planners want to meet the demands of citizens in every district, they have to make a unique plan for each district and do more field observations. Also, they need to consider the demographics in the district, district with higher diversity may need more ethic design.

During my research, however, I have discovered some limitations of the survey which has hindered my ability to have a clearer understanding of the survey results. Some shortcomings can be attributed to data availability in this survey. For a city of over 1.7 million in population, the bureau has the resources to obtain more respondents and enlarge the sample size. Also, the survey has flaws in its designs, mainly the type of questions that were asked and the answer choices that were given. The bureau responsible for the survey could have done a better job in designing the survey so that it would gather more useful information.



## APPENDIX II

### Translation of the Questionnaire

Q1. Age

1.1-9 2. 10-19 3.20-29 4.30-39 5.40-49 6. 50-59 7. over 60

Q2. Gender

1.female 2. male

Q3. Education

1. Primary school 2. Middle school 3. High school 4. Bachelor's degree 5. Master's Degree 6. PhD. MD or other advanced degree

Q4. Living district

1. Xingning District 2. Qingxiu District 3. Jiangnan District 4. Xixiangtang District 5. Liangqin District 6. Yongning District

Q5. Annual income 1.0-5000 2.5000-9999 3.10000-19999 4. 20000-29999 5. 30000—39999 6.40000-49999 7.50000-59999 8 over 60000

Q6. The frequency to use the waterfront public space

1. 0 time per week 2. 1-2 times per week 3. 3-5 times per week 4.6 or more times per week

Q7. The most frequently used mode of transportation

1. Walking or bicycle 2. Bus 3. Car

Q8. How much time do you usually cost to get to the waterfront public area?

1.less than 5 min 2.5-15 min 3.16-30 min 4.31-60 min 5. over 60min

Q9. What's the facility do you use in the public open space?

1.Fitness trail 2. Children's playground 3. Fishing spot 4. Do not use 5. Other

Q10. Do you think the waterfront public area is sufficient?

1 Yes 2 No

Q11. If the government would like to expand the waterfront public space, which aspect do you wish to be enhanced?

1. Southeast Asian Style
2. Country Style
3. Garden Town style
4. Eco-technological style
5. Cultural innovative style
6. Zhuang-cultural style
7. others

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