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The Sustainable Development Based on the Protection of the Grand Canal of China As a World Heritage and a Cultural Route

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ABSTRACT

The Grand Canal of China was listed as a World Heritage site in 2014, which brought the protection work to a new stage, that is, the Canal should preserve its own characteristics as a transportation canal, and at the same time, preserve the outstanding universal value in the worldwide heritage platform.

The research mainly focused on the preservation and sustainable development of the Grand Canal as a living cultural route. Due to its unique features, it is important to continue its functions and economic value as well as its cultural and historical value. With the development of tourism, there are many challenges, problems and also opportunities that can be foreseen.

On the other hand, as a popular topic in recent years, the concept of large-scale complex heritage and culture route system also brought new thoughts to the Grand Canal heritage preservation.

What this project explores and what we would like to discuss in this paper is the intervention strategies to revitalize the fragments along the Canal and preserve them as a whole heritage through historical research and case studies.

KEYWORDS

Grand Canal, World Heritage, Cultural Route, Preservation Strategies, Tourism

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CHAPTER 1. INTRODUCTION

1.1. Project Primary Objective

The Grand Canal of China was inscribed in the World Heritage List in 2014, which introduced the unique historical and cultural values of the Canal to the whole world, and brought the protection work to a new stage.

According to the experience of protection projects during these two years since being world heritage site, it is necessary and important to develop a updating protection and development system in a higher, deeper level, as well as in a wider range. On the basis of current situation analysis and research, the system can be proposed to protect the Canal as a complete human engineering and a human living environment, providing reference and experience for the comprehensive protection management and policy formulation.

Through the study and research of both historical and cultural aspects, outstanding universal value and uniqueness as world heritage site, the further protection of the Canal should pay attention to its unique features to display the history and culture value of its static heritage, and at the same time, promote the sustainable development of the Canal as a living heritage.

1.2. Research Question

The research mainly focused on the preservation and sustainable development of the Grand Canal as a living cultural route. Therefore, the research process can be logically listed as below:

- (1) clarify that the Grand Canal is a living heritage and keeping developing along the history;
- (2) identify the outstanding values of the Canal which express the feature of living;
- (3) seek the potential value as a heritage canal and as a cultural route;
- (4) analysis the existing situation and problems in the preservation and development process;
- (5) study the general strategies to have a sustainable development based on protection and preservation.

1.3. Summary of seminal academic references

The direct research materials comes from the descriptions, reports and working documents of UNESCO World Heritage Committee(WHC), including The Operational Guidelines, the conventions, and other research made by ICOMOS, ICCROM, and IUCN, etc.

The WHC and other advisory bodies focusing on world heritages provide accurate criteria and evaluations to the properties on the world heritage lists. The operational guidelines is still updated by years to meet the requirements of protection and preservation.

To have the clear impression of the preservation theories, the references also includes the history of Architectural Conservation. Many organizations and scholars from different cultural background already published their own opinions

and research on different directions. They stated and discussed the strategies and opportunities for the heritage preservation under globalization.

For the Grand Canal, a series of essays and research organized by the Protection Authority of the Grand Canal of China to collect the basic data and set the general guidelines have already been published during the nomination of the Canal of the World Heritage List.

Considering the importance of the value analysis of the Grand Canal, the references were extended to the historical evolution documents and other reports on intangible cultural heritage linking to the Grand Canal setting areas. There were also some essays and even concept design projects proposed and discussed the possible developing structures and urban contexts of the protected area along the Canal, which brought new ideas to the urban planning strategies and architecture design.

1.4. Description of Case Studies

The case studies was expected to give references from three aspects, the value of the heritage, the preservation of the heritage, and the guiding strategies system of the preservation and development of the heritage.

The objects of case studies can be divided into two main categories, the heritage canals and the cultural routes in World Heritage Lists. For example, Canal du Midi and Rideau Canal as heritage canals cases, and the Silk Roads, the Silver Routes, and the Andean Road System as cultural routes cases.

The studies based on these cases included two parts: the OUV analysis and comparisons; the laws to protect the heritage and the guidelines of preservation. The OUV analysis paid more attention to the similar world heritage, the examples mentioned in the last paragraph. While the guidelines studies focused more on the building of the protection system, which means, not a single heritage, but the national platform to provide protection resources. For example, American National Parks, the protection system in Italy and in Spain.

For the first part, the case studies analyzed the outstanding sites around the world, compared their values to identify the unique characters of the Grand Canal. The definition of OUV of the Grand Canal would be the core value and guideline of the preservation.

For the second part, on the basis of the value research, the case studies compared the existing laws and regulations of those sites. The analysis of the framework of the preservation law in several countries would provide references for the further planning of the Grand Canal.

1.5. Research Methods

1.5.1. The Analysis of the Materials

(1) Textual Research

After collecting basic information from the original documents and other academic research, the first step was the collation, in order to clarify the cause, the process and result of the affair. It is important to put a description into the relating background to understand better how the ideas were built and what outcome the former research had made.

(2) Comparison

The main method of the analysis of the historical materials and references was comparison. Through the comparison of the similar features and the differences, the unique values could be found. Besides the lateral connections in different properties, vertical linkages in time could also discover the connections between historical facts, predicting further changes.

1.5.2. The Conclusion of the Ideas

The main method to have a conclusion based on the integration of macro and micro. On a micro scale, all the single heritage elements should be protected and preserved properly. And each of them had their own unique features and values. While on a macro scale, all the strategies and planning should consider the Canal as a whole element to be protected and developed as a integrated cultural route.

The relationship of macro and micro can also be seen in the different value of the Canal in universal level and in regional local level.

1.6. Expected Outcomes

The general vision of the analysis was to help developing a living cultural route with series of cultural heritage sites and landscape, developing a sustainable tourism and owning its own cultural brand to preserve the heritage. The focus point lied on the expression of the living feature, and the proposal strategies to maintain this living characteristic.

The expected outcomes can be considered as below:

- (1) the collation of historical documents, complete the history of the general development of the Canal, in order to emphasize the relating value;
- (2) proposing guidelines and strategies considering the existing problems and the forecast problems in the future protection;
- (3) proposing a scheme design with the concept concluded from the former analysis.

CHAPTER 2. GENERAL INFORMATION

2.1. Basic Introduction

The Grand Canal of China is the longest and earliest manual-canal in the world. It owns a total length of 2700 kilometers, and 1011 kilometers of the canal is Heritage River. This giant canal is consist of Sui-Tang Grand Canal (Wei Canal, Tongji Canal), Beijing-Hangzhou Canal (Tonghui Canal, North Canal, South Canal, Huitong Canal, Middle Canal, Huaiyang Canal, Jiangnan Canal) and Zhedong Canal, involving 27 river sections and 58 heritage points of 31 heritage areas of 8 provinces along the river. The Grand Canal of China is listed as the most influential canal by TICCIH (The International Committee for the Conservation of the Industrial Heritage) in <The International Canal Monuments List >. The construction of the Grand Canal began in the Eastern Zhou Dynasties (772BC-256BC), and ended up in the Sui Dynasty (581-618). It was thrived in Tang (618-907) and Song (960-1279) Dynasties, and enhanced in the Yuan Dynasty (1279-1368). Finally, it was dredged in the Ming (1368-1644) and the Qing (1644-1911) Dynasties. From the beginning to the end, this construction covered a time span of 1779 years. Its digging process started in 486 BC, and the canal was completely open to navigation in the year of 1293. The Grand Canal of China connects the five major river systems which are Haihe River, Yellow River, Huaihe River, Yangtze River and Qiantang River. The area that it flows through is more than 31 million square kilometers which accounting for 3.2% of the total China territory area. Although in such a small area, the GDP of the 35 cities that are along the Grand Canal accounted for 25.08% of the national total GDP (2010 data). In June 22, 2014, the Grand Canal of China was authorized to be listed in The World Heritage List in the 38th session of The World Heritage Committee, and became the 46th world heritage project in China.

The Grand Canal runs through the north and south of the China. It makes up for lack of natural rivers. It shortens the distance between different systems of rivers and lakes. It promotes the convergence and integration of river basin civilization. It promotes the prosperity and unity of the country. It contributes to the exchanges and co-prosperity of culture and civilization. There are many local changes in the Grand Canal, but the important position in Tang (618-907), Song (960-1279), Yuan (1279-1368), Ming (1368-1644) and Qing (1644-1911) dynasties has not changed.

The great historical role of the Grand Canal of China can summarized as five aspects:

First, it was a guarantee of the reunification of the country. After the Grand Canal opened to navigation, it had the functions of military mobilization, food transportation, all kinds of goods and personnel communication and government documents' exchanges. The transportation condition of the canal was closely related to the political situation of the country. When the grand Canal smooth and prosperous, the country must be unity, stability and prosperous. Conversely, when the Grand Canal obstructed, interrupted or abandoned, the country must be divided, separated and declined.

Second, it was a great artery of economic communication. From the Grand

Canal opened to navigation, it became the economic connection between the capital and economically prosperous regions. The Grand Canal linked North and South of China together, combined with ocean shipping and could reach most parts of China. People could also get to other places of Asia and Europe through the "Maritime Silk Road".

Third, it was the main connection of cultural integration. Historically speaking, the Grand Canal communicated multiple cultural regions such as Yan, Zhao, Qi, Lu, Huai, Wu and so on; geographically speaking, the Grand Canal connected the five major river systems together which are Haihe River, Yellow River, Huaihe River, Yangtze River and Qiantang River. Due to diversity of natural conditions about geography, climate, environment and different political and historical background, the cultural differences between different regions were formed. After the Grand Canal opened to navigation, it promoted the social development of surrounding areas. It also promoted and derived cultural exchanges of most parts of China. It accelerated the integration and evolution of Chinese culture. This kind of evolution and integration could be seen everywhere from productivity to production, from economic base to superstructure. The Grand Canal had played an important role for the formation and development of extensive, inclusive, communion and other characteristics of Chinese culture; for Convergence and protection of customs, habits, beliefs, values and other aspects of most areas of China; for the absorption of the world's traditions and maintains their national characteristics.

Fourth, it was the mother river of the cities along. The best birthplace of cities was the place along the rivers and canals. The opening of the canal, a large number of people gathered and the exchanges of personnel and material promoted the formation of the city. In the Eastern Zhou Dynasties (772BC-256BC) period, the excavation of Hangou Canal not only connected the Yangtze River to Huaihe River but also promoted two famous city Yangzhou and Huai'an which located at the ends of Hangou Canal. It was not an accident that all the cities along the Grand Canal formed as "point line uniform distribution". Thanked to the Grand Canal, the cities along could became continued prosperity. In ancient time which was highly dependent on water transportation, where the canal was unimpeded, the city was prosperous; where the canal was obstructed, the city was declining. It could be said that where the canal flowed through caused all ships, docks and people gathering was the place that cities rise up.

Fifth, it was an open river of Foreign economic and cultural exchanges with the outside world. The Grand Canal of China was closed to the sea and basically parallels to the coastline, so there were a number of convenient accesses to the sea. In history, the Grand Canal flowed through Chang'an and Luoyang which were the starting points of "Silk Road" on land. The easternmost of the Grand Canal connected many commercial ports which linked to "Maritime Silk Road" arriving at Asia and Europe. The Grand Canal exported a large number of silk, paper, porcelain, tea, traditional Chinese medicine and handcrafts meanwhile it imported gems, coral, agate, spices, medicine and animals and plants from Persia, East Africa, Southeast Asia though land and sea. The Grand Canal was the main line of foreign culture and material exchange. Early propagation of

Islam, Christianity, and Catholicism also draw support from the Grand Canal. The Hui nationality is a minority with a large population in China. They are good at doing business. They settled down and built mosques at the place where had prosperous trades. Therefore, the mosque could be seen all over the city and countryside along the Grand Canal.

To sum up, the Grand Canal not only gave birth to the great Chinese civilization, furthermore it was an important part of the Chinese civilization and attractive cultural landscape.

2.2 The Process Of Applying For World Cultural Heritage Of The Grand Canal Of China

In December 2005, three canal experts signed a letter to 18 mayors of city that along the Grand Canal. They urged with using innovative ideas to speed up the declaration process of the two major heritage areas of culture and intangible culture of the Grand Canal. This action began the process of protecting and applying for world cultural heritage of the Grand Canal of China.

During China's "two sessions"(National People's Congress and Chinese People's Political Consultative Conference) in 2006, 58 CPPCC(Chinese People's Political Consultative Conference) members jointly submitted the proposal of great importance should be attach to the process of protecting and applying for world cultural heritage of the Grand Canal of China, called for immediately start the rescue work to protect the Grand Canal and should declare for world cultural heritage at the appropriate time. In June of the same year, the Grand Canal of China was announced by the State Council as the Sixth Batch of the country's important cultural relic protection units. In December, the Grand Canal was included in Chinese World Heritage tentative list released by the State Administration of cultural heritage, the Grand Canal declared world cultural heritage work officially started.

In September 2007, the office of “the Grand Canal declaration for the world cultural heritage” was formally established.

In March 2008, the State Administration of cultural heritage held the first working conference of protecting and applying for world cultural heritage of the Grand Canal of China. This conference had been clear about the programmer of work for applying for world cultural heritage of the Grand Canal of China and decided to declare the world cultural heritage as one in the form of urban alliances. All the work was officially started. Since then until the Grand Canal application success, the conference of protecting and applying for world cultural heritage of the Grand Canal of China was held every year. In order to promote the city culture and promote their sustainable developments eight provinces which along the Grand Canal devoted all their efforts to the work of applying for World Heritage.

In April 2009, the State Council led the work of applying for world cultural heritage of the Grand Canal of China. The provincial inter-ministerial consultation group and provincial inter-ministerial consultation mechanism were formally established which was jointly made up of 8 provinces and 13

ministries. It was a sign that the work of applying for world cultural heritage of the Grand Canal rose up to national will and action. Since then until the Grand Canal application success, the conference of provincial inter-ministerial consultation group was held every year for deployment of major issues of the Grand Canal's protection and application in next year. Under the great support of the nation, the cities along the Grand Canal had launched preparation of municipal conservation planning and began to proceed with the provincial level protection planning of the Grand Canal on the basis. At the same time, started environmental renovation, ontology repair and other infrastructure works such as protection signs, protection zoning, protection management agencies and Heritage Archives.

In May 2011, The State Cultural Relics Bureau issued notice of accelerating the Grand Canal protection and application work to propose the countdown work programmer of protecting and applying for world cultural heritage of the Grand Canal of China. The program required all localities to strengthen not only propaganda and guidance but also organization and coordination, to strengthen supervision to complete the planning and approval. It comprehensively promoted the heritage point protection and improves the heritage management.

2012-2013 action plans of the Grand Canal protection and application, reiterated the countdown table and orderly promoted the process of protecting and applying for world cultural heritage of the Grand Canal explicitly according to the time node.

management agencies and Heritage Archives had been completed. This work identified the core content of the first batch of the Grand Canal application range and declaration text.

In July 2012, governments of eight provinces promulgated and implemented provincial protection planning of the Grand Canal Heritage and urged the local municipal governments to complete the municipal promulgation and implementation works.

In September 2012, the State Administration of cultural heritage guided "city alliance of protecting and applying for world cultural heritage of the Grand Canal" to coordinate the relevant municipal governments and signed a joint agreement of protection of the Grand Canal Heritage. The Ministry of Culture promulgated and implemented Departmental rules the Grand Canal heritage preservation measures. The Ministry of culture, the State Bureau of cultural resliced together with the members of the unit reported to the State Council promulgated and implemented general protection and management planning of the Grand Canal heritage and then submitted the draft report to UNSECO for preliminary investigation.

In January 2013, a formal declaration was sent to the World Heritage Center.

In June 2013, completed ontology heritage protection, environmental remediation, water resources protection and ecological management projects, established a state detection system of the Grand Canal Heritage, established

provincial and municipal inspection system of the Grand Canal Heritage and completed the demonstration project of the Grand Canal heritage points and sections. At the Grand Canal heritage area or related museums, exhibited about the value, history and other important information of Grand Canal.

In September 2013, The Grand Canal of China welcomed international experts to inspect and evaluate.

In June 2014, the 38th World Heritage committee decided to include the Grand Canal of China in the World Heritage List by voting.

CHAPTER 3. EXCAVATION AND TRANSFORMATION

3.1. The history of the Grand Canal

Natural water system in the Grand Canal area

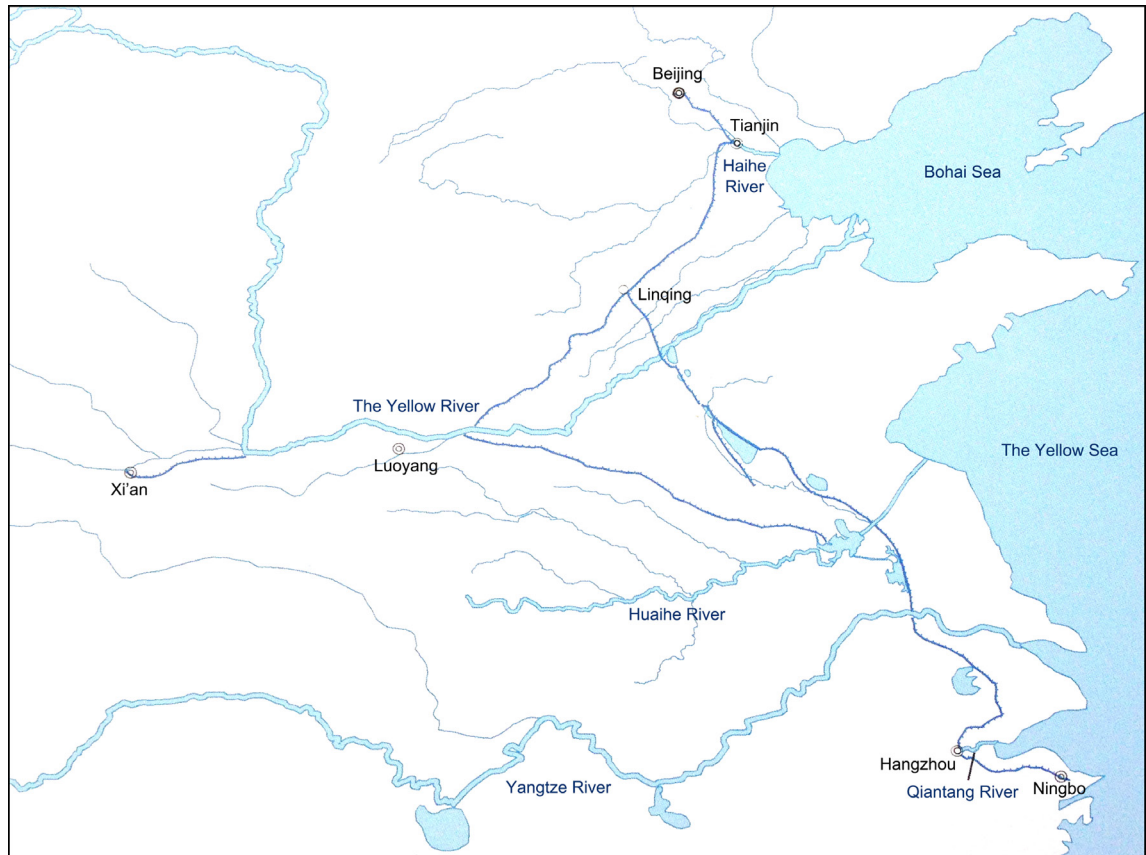


Fig. Geographic Location Map of main natural water system in the Grand Canal area

China's terrain is decreasing from west to east. Natural river systems generally flow into the sea from west to east. Five water systems located in the Middle East of China from North to South which are Haihe River, Yellow River, Huaihe River, Yangtze River and Qiantang River. This situation of separating water system becomes the natural background of the Beijing-Hangzhou Grand Canal.

Human beings have been accustomed to living close to the water since ancient times. With the improvement of human productivity, people continue to get a breakthrough in the understanding of water and the use of water. The Grand Canal runs through the water system of Haihe River, Yellow River, Huaihe River, Yangtze River and Qiantang River. The Grand Canal is a water system that runs through the North and South of China by artificial dredging, digging new river and communicating these natural water systems together.

3.1.1. Excavation and Transformation of the North-South Grand Canal in Sui, Tang and Song Dynasties

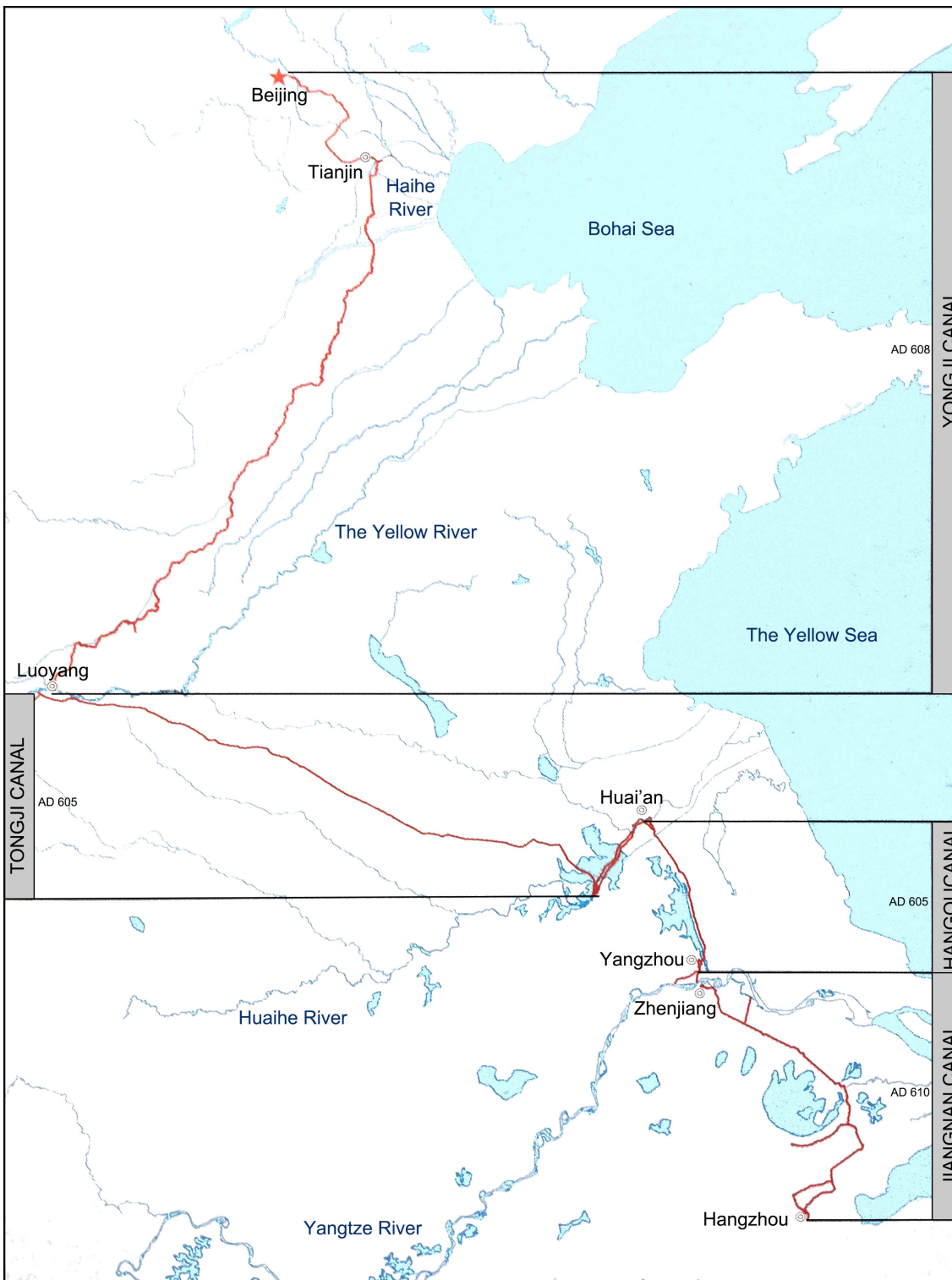


Fig. Geographic Location Map of the North-South Grand Canal in Sui, Tang and Song Dynasties

Sui (581-618) and Tang (618-907) Dynasties was a period which had important significance in the history of China's artificial canal. It changed the situation that mainly excavated regional canals before Sui Dynasty. Excavation of the Grand Canal continuously connected from South to North of China. A canal system

was formed with the center of Luoyang, west to Guanzhong Basin, north to Hebei Plain, south to Qiantang River, flowed through nine provinces with a total length of more than 2700 kilometers, known to history as the North-South Grand Canal (according to the historical time order of Tongji Canal, Hangou Canal, Yongji Canal and Jiangnan Canal).

3.1.1.1. Tongji Canal

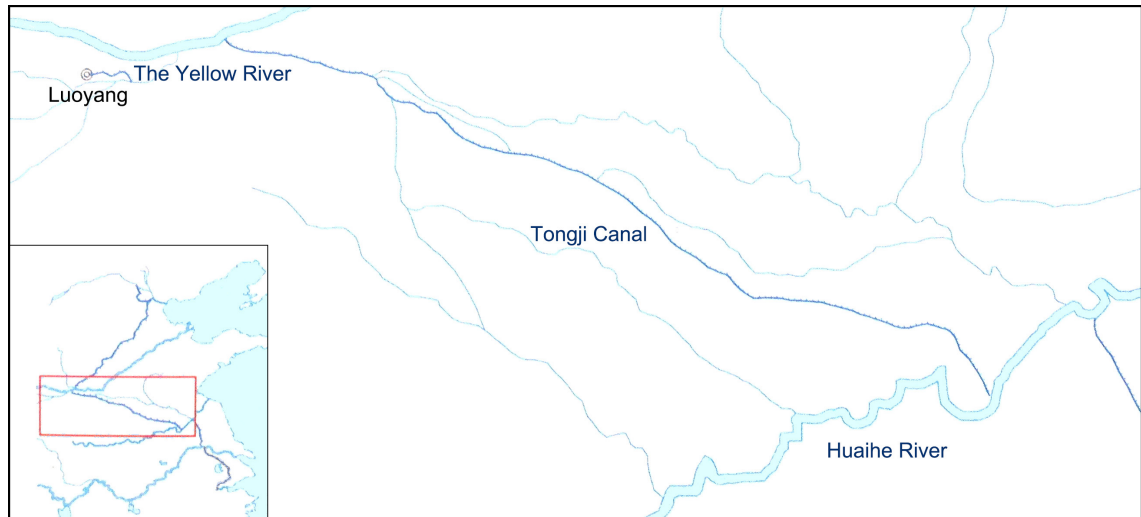


Fig. Geographic Location Map of Tongji Canal in the North-South Grand Canal

In many canals which excavated after the Emperor Yang of Sui Dynasty (581-618) succeeded to the throne, Tongji canal was the earliest one. It was a section of the North-South Canal to link Huaihe River and the Yellow River with a total length of about 650 kilometers. To excavate Tongji Canal, the Emperor made full use of previous regional canal and existing water systems. Tongji Canal could be divided into two sections which were the western part from Luoyang to the Yellow River and the eastern part from the Yellow River to Huaihe River. Tongji Canal was unified survey and design to replace another existing twisty canal which linked the Yellow River and Huaihe River during the design process of the north-South Grand Canal. Tongji Canal was a waterway from the Central Plain to the region of Huaihe River and Yangtze River. In terms of water sources, the eastern part not only had the Yellow River water as the main source but also had tributaries of northern Huaihe River as a supplement and adjustment the amount of water.

Tongji Canal flowed from northwest to Southeast, just coinciding with the local terrain that sloping from the northwest to the southeast slightly downward. It flowed smoothly and fast that convenient for the Emperor to ride the dragon boat parade. In addition, Tongji Canal used more for water transport of grain. Food resources from the area of Huaihe River and Yangtze River delivered though Tongji Canal to Luoyang. The Emperor Yang set barns in order to save food around Luoyang. The barns that had been excavated in the Sui Dynasty had large scale, standardized management and special terminal transport docks. It provided the first empirical evidence for later generations to understand the canal, water transport of grain, grain storage and grain storage protection technology. Continual supplies to the capital, Luoyang, had brought unprecedented prosperity. The busy water transport of grain also promoted

coastal development.

With a total length of 650 kilometers, Tongji Canal had such a huge amount of workload but completed less than a year. The canal labors worked day and night. Canal officials urged labors. The workers who exhausted or died were probably tens of thousands. This fully showed that excavating canal brought heavy burden and even disaster to people at that time. This was also the great negative effect of canal excavation. However, Tongji Canal played an important role for the water transport of grain and the country's economic, political stability in the Tang (618-907) and Song (960-1279) Dynasties.

Tongji Canal renamed Bian Canal in the Tang Dynasty (618-907). Bian Canal had been heeded in the Tang Dynasty. It was the most important section of the North-South Canal that rulers of the Tang Dynasty regarded it as the lifeline. Because the Tang Dynasty relied on Bian Canal's water transportation, large quantities of food from south to middle of China supplied capital Chang'an. It could be said guaranteeing the Bian Canal water transport of grain was the most important issue for the Tang Dynasty. Therefore, the Tang Dynasty made every effort on dredging, renovation and expansion of Bian Canal. A lot of improvements had been made on the ends of the canal.

In the Song Dynasty (960-1279), the Bian Canal was the most important canal. The country and capital residents living consumption relied mostly on Bian Canal's input from the Southeast of China. It was a busy time of water transport of grain. Beside water transport and water conservancy irrigation function, the canal in the Song Dynasty made a contribution to improving the urban living conditions and creating urban landscape. The drawing of < Riverside Scene at Qing Ming Festival > by the Northern Song Dynasty (960-1127) painter Zhang Zeduan was art treasure in the history of Chinese painting. It was also a realistic masterpiece of the capital city and canal, depicting daily life scene in the capital city on the banks of canal from the countryside to the city. It showed the commercial development of the Northern Song Dynasty.

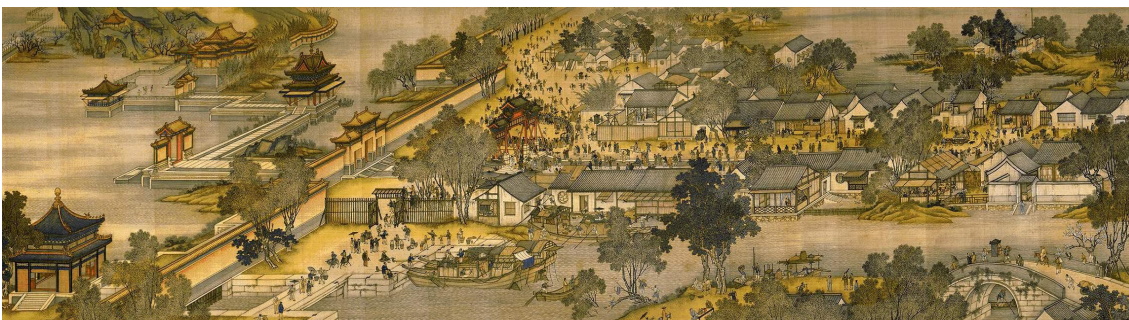


Fig. A section of < Riverside Scene at Qing Ming Festival >

The Northern Song Dynasty (960-1127) gained a real convenience from Tongji canal, so paid great attention to maintain the canal. But at the end of the Southern Song Dynasty (1127-1279), Tongji canal had been abandoned. Until Yuan Dynasty (1279-1368), it was entirely silted up. Tongji Canal was open to navigation of 720 years from the Sui Dynasty (581-618) to Yuan Dynasty (1279-1368).

3.1.1.2. Hangou Canal

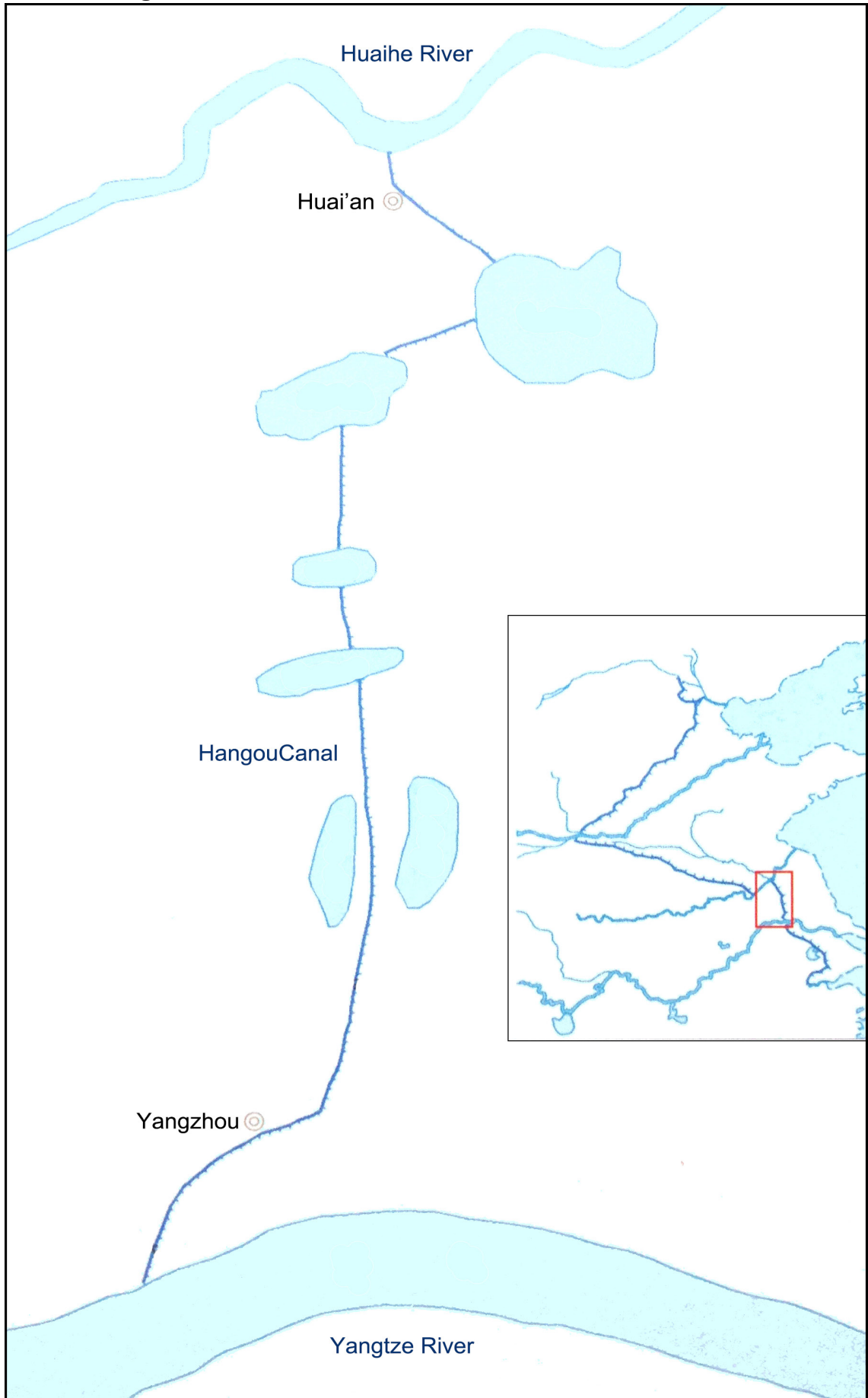


Fig. Geographic Location Map of Hangou Canal in the North-South Grand Canal

Hangou Canal was the second canal that opened by the Emperor Yang after Tongji canal. It connected Huaihe River and Yangtze River with a total length of 185 kilometers. Hangou Canal was the first artificial canal which had clear records in the history of China. The history of excavation could be traced back to the Eastern Zhou Dynasty (772BC-256BC). With reconstruction and maintenance by future generations, the Hangou canal re-opened by the Emperor Yang on the basis.

During the Eastern Zhou Dynasties (486 BC), the State of Wu organized manpower to build a military castle at their capital. And then they excavated northward a canal for military transport which was Hangou Canal to communicate with Yangtze River and Huaihe River. With the expansion and reconstruction of Hangou Canal at the end of the Eastern Han Dynasty (around 200), the transportation efficiency and economic value had greatly improved. However due to the war, the canal failed to get the effective management and maintenance. Its situation had become worse.

Because of the important military position and good water transport conditions of Hangou Canal, the surrounding grain and salt were in priority. So from the Eastern Zhou Dynasties (772BC-256BC), each dynasty all paid attention to widening and maintenance of Hangou Canal. The Sui Dynasty (581-618) was no exception. After the Emperor Yang succeeded to the throne, he kept trying to connect the capital Luoyang with southeast economic developed region. The Tongji Canal could only connect to Huaihe River but not the region of Yangtze River. At 605 AD as the same time as building Tongji Canal, he ordered the excavation of the Hangou Canal which connected Huaihe River and Yangtze River. After a large-scale transformation, Hangou Canal could pass transport ship and dragon boat. It became an important section of the North-South Canal and economic communication link of the Central Plain and the region of the Yangtze River. At that time, it also meted this Emperor's aspiration of the Yangzhou parade.

In the Tang Dynasty (618-907), Hangou Canal played an important role in the water transport of grain between North and South of China. The food and supplies from the southern parts of China were concentrated in Yangzhou's and shipped to Luoyang and Chang'an by Hangou Canal. In Tang Dynasty, Hangou Canal had been upgraded to national canal. It could be seen that the country paid lots of attention to it at that time. The biggest problem of Hangou Canal in the Tang Dynasty (618-907) was insufficient water. In order to ensure the navigation of Hangou Canal, the channel was widened, the aqueduct was excavated. The traffic situation was greatly improved.

In the Northern Song Dynasty (960-1127), the name of Hangou Canal had changed. Because the southern section of Hangou Canal ended up at Hangou and the northern part ended up at Chuzhou. So during the Northern Song Dynasty, it became Chuyang Canal, also known as Chuzhou Canal or Huaiyang Canal. In the Northern Song Dynasty, Chuyang Canal was an important line of water transport of grain. All the food and supplies from the Jiangnan Canal were transported by the Yangtze River to Yangzhou and then were transported by the Chuyang Canal to the capital of Northern Song Dynasty. Therefore, the Northern

Song Dynasty attached great importance to the navigation situation of Chuyang Canal. It had reformed and regulated for many times.

By re-opening in the Sui Dynasty (581-618) and vigorously maintain in the Tang (618-907) and Song (960-1279) Dynasties, the old Hangou Canal still played a role in the Grand Canal of Yuan Dynasty(1279-1368).

3.1.1.3. Yongji Canal

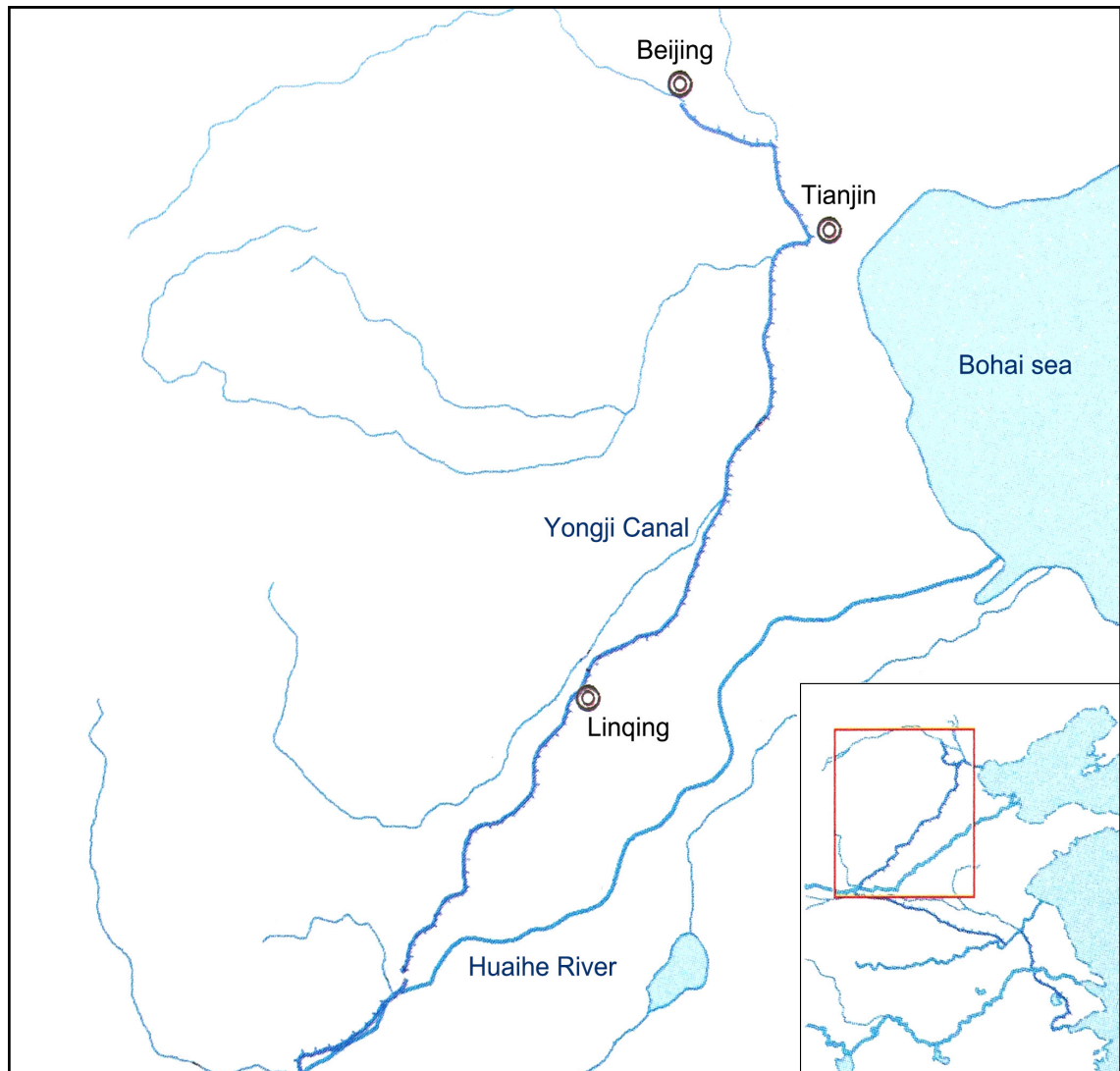


Fig. Geographic Location Map of Yongji Canal in the North-South Grand Canal

Yongji Canal was the north part of the North-South Grand Canal in the Sui (581-618) Dynasty which connected the Yellow River and Haihe River. It was the main water transportation road of Hebei region with a total length of more than 1000 kilometers. The early excavated interval canals of Hebei laid firm foundations for Yongji Canal. The climax of construction of Yongji Canal was the end of Eastern Han Dynasty (220-280).

In 204, in order to transport rations, the state decided to excavate a canal at the north of the Yellow River. There was an ancient Yellow River from the Yellow River migration change. But due to lack of water sources couldn't be navigable. So a northern canal was excavated by using the ancient Yellow River. In the

following hundreds of years, some sections of the northern canal were still in use but some had been abandoned. The only law was that the canal was valued when the political and military stability; on the contrary, the canal must be blocked when wars raged on.

Tongji Canal, Hangou Canal and Jiangnan Canal that excavated by the Emperor Yang had connected the south of the Yellow River and the southeast region of Jianghuai. When taking a panoramic view of the territory, the vast north region of the Yellow River hadn't connected by any canals. From both the military and economic point of view, excavating a canal was necessary. In 608, the Yongji Canal started to excavate at the north of the Yellow River which was the north section of the North--South Canal. In the first month of 608, with the cold weather of northern China, the Emperor Yang couldn't wait to collect millions of people to excavate Yongji Canal, in order to send troops to Korea and connect the northeast water transport. The Yongji Canal was an important north channel of canal system in the Sui Dynasty (581-618). The ships could navigate from the Yangtze River to the Yellow River by Tongji Canal, and then arrived at the capital by Yongji canal. The entire canal route was up to more than 1000 kilometers. Although some ancient river was used, the project was still tremendous and eager to be used. A million workers were recruited. Heavy work and disease caused a large number of labor casualties. Excavation of Yongji Canal was required for the military, but brought a big disaster to the people. Objectively speaking, it connected the scattered water system of Haihe River together to form the water system of Haihe River again. With other canals to communicate with the Yangtze River, Huaihe River, Yellow River and Haihe River, Yongji Canal provided the conditions for the water transport and economic development of Tang (618-907) and Song (960-1279) Dynasties.

The Yongji Canal still played an important role in the military in the Tang Dynasty (618-907). Therefore, the Tang Dynasty spared no effort in management and maintenance of Yongji Canal. The Yongji Canal had three changes in the Tang Dynasty: First, change the water sources of the canal. Because the original water source was the Yellow River which had large sediment content, the channel was easy to plug. To solve this problem, the source of the Yongji Canal was moved eastward. Second, excavate distributaries and drain floods. Yongji Canal flowed through the Hebei Plain and it often affected by the flooding when flood season comes. The Tang Dynasty (618-907) adopted many flood defense measures, such as dikes, water detention. In order to discharge excess flood, a number of distributing channels were excavated in the low-lying areas of Yongji Canal, called distributary. Third, extend the Yongji Canal. Some distributaries were excavated for water transport of grain and irrigation on both sides of the plain region.

Until the Song Dynasty (960-1279), Yongji Canal was the main path to deliver food and supplies to the Hebei border garrison. It was also the main path of trade material exchange between Song and Liao. By the influence of the Yellow River moved northward, the Northern Song Dynasty (960-1127) dredged it repeatedly to maintain navigation until the demise of the Northern Song Dynasty. When excavating the Grand Canal from Beijing to Hangzhou in the Yuan Dynasty (1279-1368), the north section of Yongji Canal became part of the

South canal and the south section became the nourishment source of the South Canal.

3.1.1.4. Jiangnan Canal

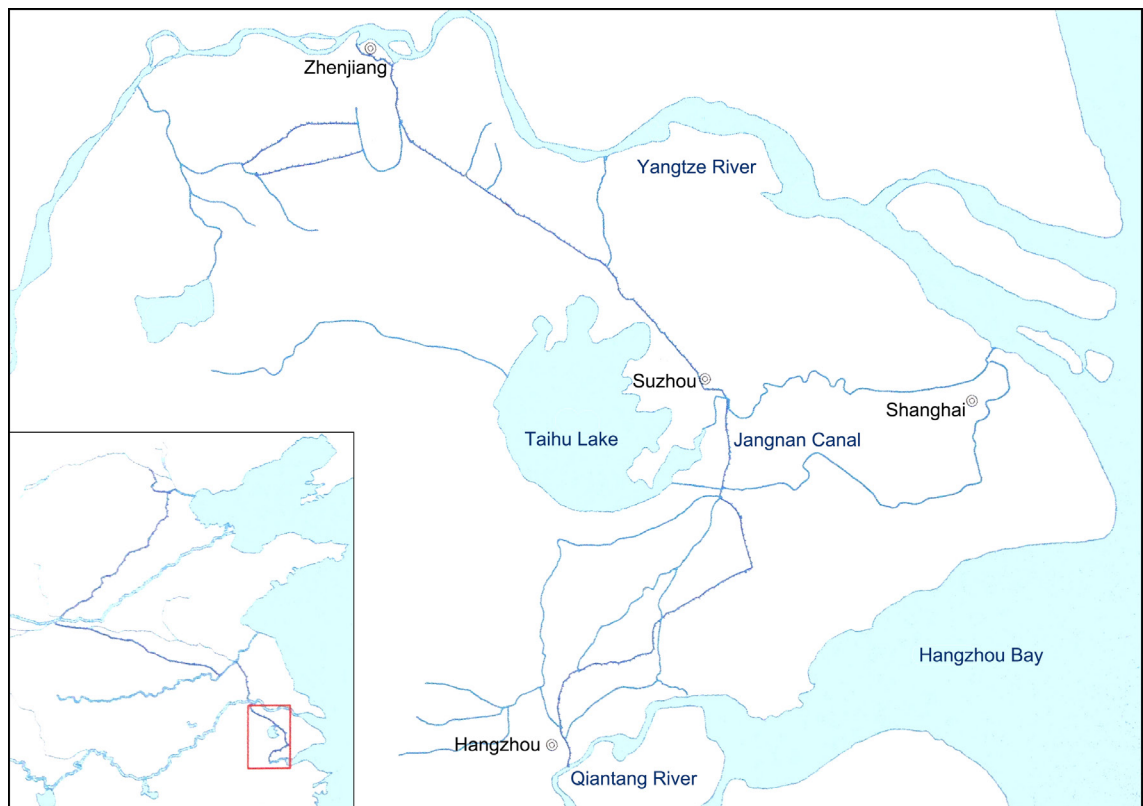


Fig. Geographic Location Map of Jiangnan Canal in the North-South Grand Canal

Jiangnan Canal was an early section of the North-South Grand Canal. Northernmost began at Zhenjiang nearby the Yangtze River. Southernmost ended up at Hangzhou next to the Qiantang River. It had a total length of about 340 kilometers throughout the whole region from the Yangtze River to the Qiantang River. For thousands of years, sufficient water of Jiangnan canal basin facilitated the farmland irrigation and shipping. Jiangnan Canal played a great role for the socio-economic and cultural development in the south region of the Yangtze River.

Jiangnan Canal located in the rich region of Southern Yangtze River. As the center as water system of Taihu Lake, south reached to the Qiantang River and north connected with the Yangtze River. Natural waterways cross together so it was rich in water resources. Jiangnan Canal experienced a long historical process. It was gradually developed from many artificial waterways. The history of construction could be traced back to the Eastern Zhou Dynasty (772BC-256BC).

In 491 BC, for military use, the king of Wu ordered to excavate channels at the north and the south of the Yangtze River. One of it was the Hangou Canal that mentioned above, the other one was the ancient Jiangnan Canal which was excavated before or at the same time as Hangou Canal.

From the Eastern Jin Dynasty (317-420) to the Southern Dynasty (420-589), the Regions south of the Yangtze River was always the dominion center as a result that the economy had been developed well. At the beginning at Sui Dynasty (581-618), Regions south of the Yangtze River was very rich. It was the main supply place of food and supplies of the court of Sui Dynasty. One of the main reasons of excavating the Grand Canal was to connect the political center of Chang'an and Luoyang with Jiangnan affluent regions. The Emperor Yang decided to excavate the Jiangnan Canal five years after excavating the Tongji Canal and Hangou Canal. This was because the Taihu Plain located between the Yangtze River and the Qiantang River. There were a large number of rivers and lakes since ancient times. Since the Eastern Zhou Dynasties (772BC-256BC) to the Sui Dynasty (581-618), water conservancy project of this region continued to move forward by using local abundant water resources. The interval canals had been excavated continually. Until the Sui Dynasty these channels had never be interrupted. So after Tongji Canal and Hangou Canal the Emperor Yang naturally arrived at Regions south of the Yangtze River so that he didn't eager to excavate Jiangnan Canal as the first two canals. Actually these interval canals didn't form a unified standard, for his dragon boat, it was still difficult to access. This was a reason of re-excavating Jiangnan Canal.

In December 610 AD, Sui (581-618)ti ordered rebuild the canals of the southern area base on the original river. Widened and deepened the interval canal to form a certain scale of the canal. The interval canals of Jiangnan that built in each period became an important part of the Jiangnan Canal.

Jiangnan canal was the best section of the water resources condition and the natural environment in North-South Grand Canal. Jiangnan Canal ran through the Taihu Lake Basin and had many tributaries and abundant water resources. The Jiangnan Canal became national canal in the Tang Dynasty (618-907). Tang Dynasty basically relied on food and supplies provided by the southeast region. Tang Dynasty attached great importance to governance of it.

By the management and maintenance of the Tang Dynasty, the navigation of Jiangnan Canal was improved. But because of the war in the late Tang Dynasty (around 900), some section of the Jiangnan Canal appeared the water shortage and navigation difficult again. Therefore, Song Dynasty (960-1279) did many efforts to maintain the navigation. The Grand Canal played an important role in the Yuan Dynasty (1279-1368) as well.

3.1.2. Excavation and Transformation of Beijing-Hangzhou Grand Canal in Yuan, Ming and Qing Dynasties

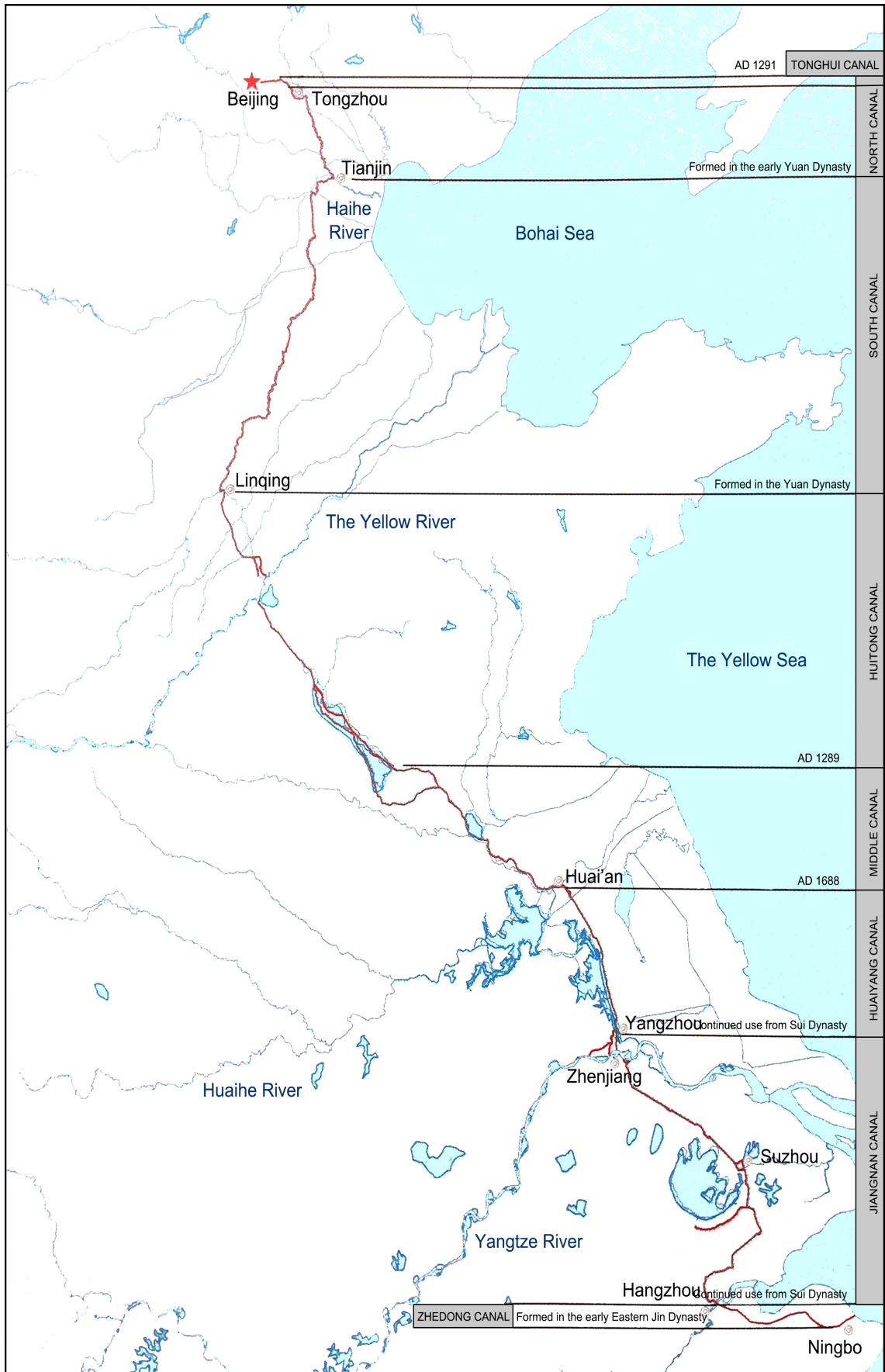


Fig. Geographic Location Map of Beijing-Hangzhou Grand Canal

The North-South Canal of Sui (581-618) and Tang (618-907) Dynasties communicated five major river systems of Qiantang River, Yangtze River, Huaihe River, the Yellow River and Haihe River and closely connected the Central Plain area, Jianghuai area and Hebei area. It promoted the prosperity and development of the country. During the Yuan Dynasty (1279-1368), the political center of the country moved to Beijing. In order to strengthen the control and economic connect with the South of China and shorten the distance from Beijing to Hangzhou via Luoyang, the original meandering canal was turned into a straight line. The line from Beijing to Luoyang then to Hangzhou turned to the line from Beijing directly to Hangzhou and formed of Beijing-Hangzhou Grand Canal. The distance shortened more than 900 kilometers. By management and maintenance of the Ming (1368-1644) and Qing (1644-1911) Dynasties, the Beijing-Hangzhou Grand Canal finally was shaped. The Grand Canal of Yuan Dynasty (1279-1368) developed from the North-South Canal of Sui (581-618), Tang (618-907) and Song (960-1279) Dynasties. From the North to the South, there were Tonghui Canal, North Canal, South Canal, Huitong Canal, Middle Canal, Huaiyang Canal, Jiangnan Canal and Zhedong Canal.

Before the Yuan Dynasty established (1279-1368), the overall situation of the former North-South Canal was that northern channels had not navigable due to the continuing war of the northern region. Without management of the Yellow River and Huaihe River, disasters increased seriously. Due to the canal network has formed in the Sui (581-618) and Tang (618-907) Dynasties and the capital was built in Lin'an (now Hangzhou) in the Southern Song (1127-1279) Dynasty, the Jiangnan Canal was used and maintained as lifeline in Southern Song Dynasty. So Jiangnan Canal was still in use when the Yuan Dynasty (1279-1368) established.

3.1.2.1. The background of building and changing of the Grand Canal of China

In 1271, the Yuan Dynasty (1279-1368) established the capital in Beijing. Communicating the transportation from the South to the North became the important issue of the political and economic construction of Yuan Dynasty. In order to solve the grain transportation from the South to the North, the North-South Grand Canal as the center of Luoyang had multiple been managed to enable. But it finally abandoned due to continuous wars and floods in Haihe River and the Yellow River.

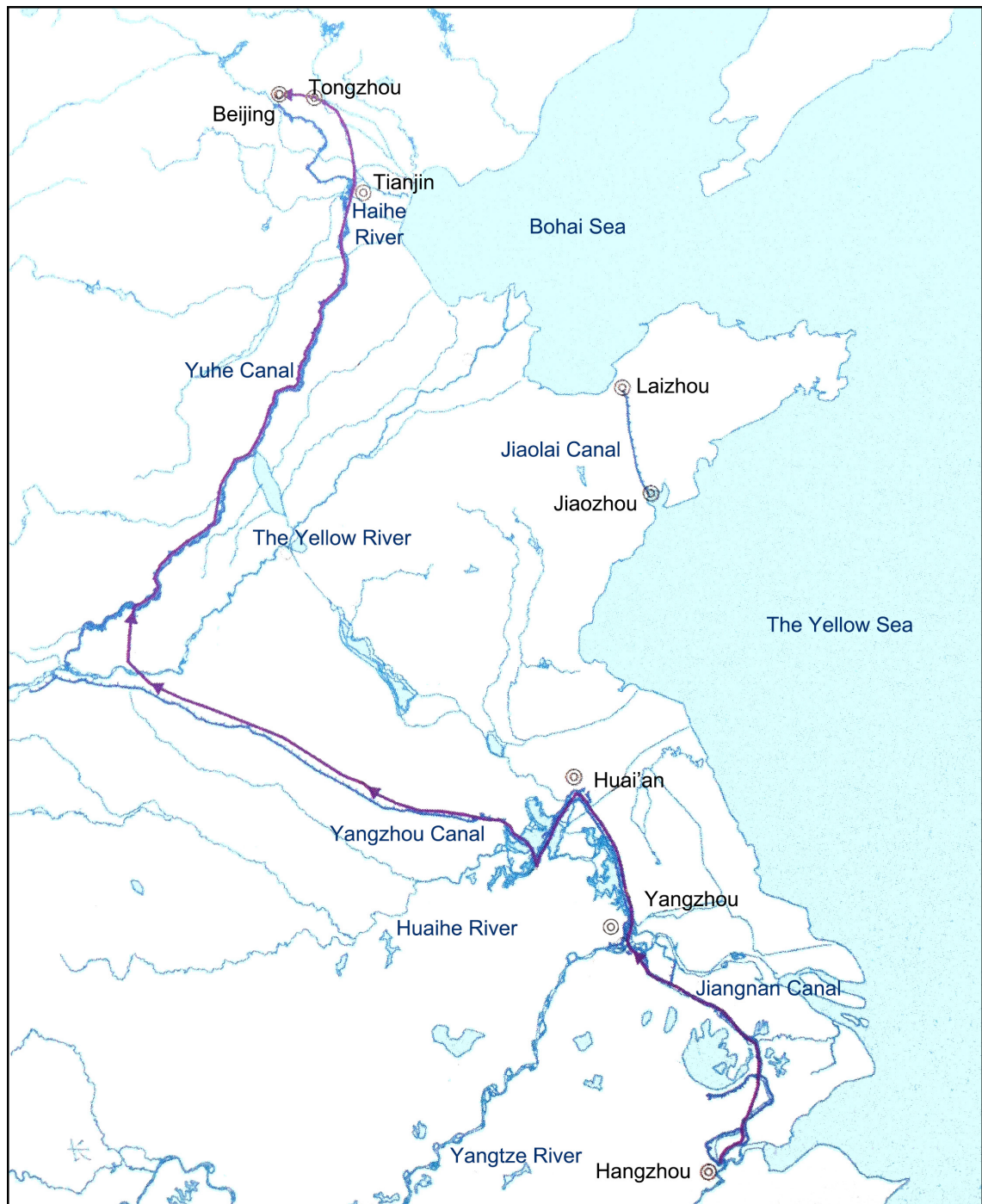


Fig. Multimodal grain transport line of water and road at the beginning of the Yuan Dynasty

Therefore, in 1276-1283, the Yuan Dynasty (1279-1368) used the multimodal grain transport line of water and road: From Jiangnan Canal crossing the Yangtze River went into Yangzhou Canal and arrived at the Yellow River. By rowing against the Yellow River turned to road transport and then passed the Weihe River to Tongzhou and transported from Tongzhou to the capital on land. This transportation route needed multimodal transport of water and road. It had to repeat loading and unloading with huge consumption and low efficiency.

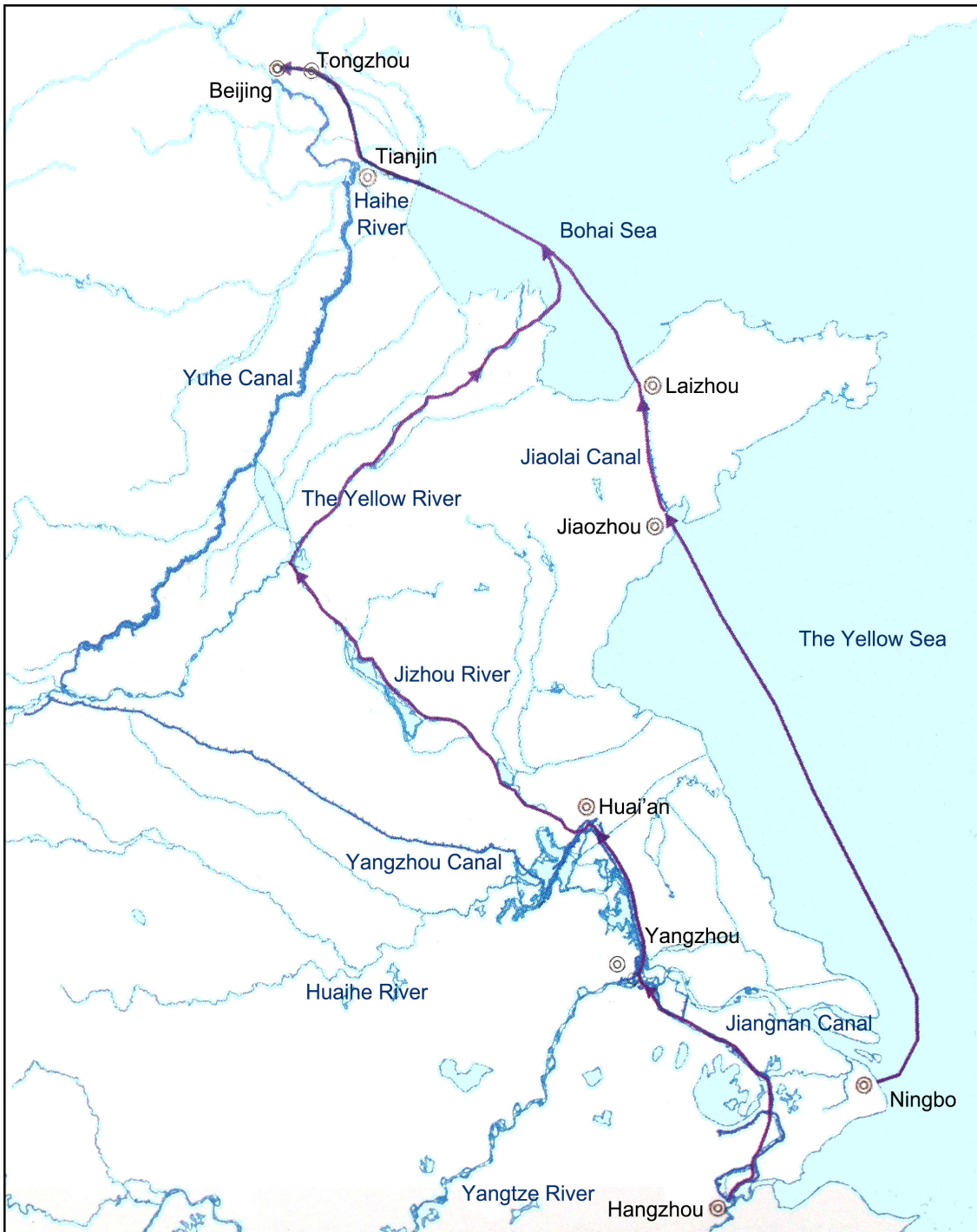


Fig. Multimodal grain transport line of sea and rivers in the Yuan Dynasty

From 1282, shipping developed and built 60 flat bottomed boats. Grains were transported to Zhigu (now Tianjin) for several months. Because of the risk of sea transportation, it hadn't been taken seriously. After investigation, the multimodal

transport route of sea and rivers was tried to use to shorten the route passing Henan Province. Therefore the Jiaolai Canal and Jizhou Canal had been built. This water transport line from Jiangnan Canal crossing the Yangtze River went into Yangzhou Canal. Arrived at the Jizhou Canal and then went to the sea. Or transported by sea to Jiaozhou and then went to the sea through Jiaolai Canal. Transported by sea to Zhigu, went to Tongzhou by river and finally arrived at the capital from Tongzhou on land. Due to traffic conditions and great expense, the multimodal transport route of sea and rivers tried a few years and then gave up.



Fig. Grain transport line of sea in the Yuan Dynasty

In 1286, because of Jiaolai Canal's transportation difficulties, a large number of foods were transported from the sea to the Great Capital once again. Although the transport route of sea was meandering and far, but the transport capacity was huge. Therefore it had been taken seriously by the Yuan Dynasty (1279-

1368). Since then, large-scale of maritime transportation began in China. The shipping route was about 6000 kilometers. The grains were delivered more than two months from the Jiangnan to the capital of Beijing with two seasons in a year. It saved a lot of money and had lasted for more than 20 years. Although there were many advantages of the maritime transportation in the Yuan Dynasty, but shipping route was long and risk. To shorten the shipping distance, the route had changed three times. Sometimes a shipwreck could lose countless food and drowned thousands of soldiers. With the corruption of maritime transportation officials, people suffered a lot from it.

Because three routes were all difficult, in 1289-1293, Huitong Canal and Tonghui Canal were built. The Beijing-Hangzhou Grand Canal that developed from the Sui-Tang Canal to the North-South Canal was finally navigable. The length of the shipping between Hangzhou and Beijing shortened from more than 2700 kilometers of the North-South Grand Canal to about 180 kilometers of the Beijing-Hangzhou Grand Canal.

3.1.2.2. Excavation and Transformation of the Tonghui Canal

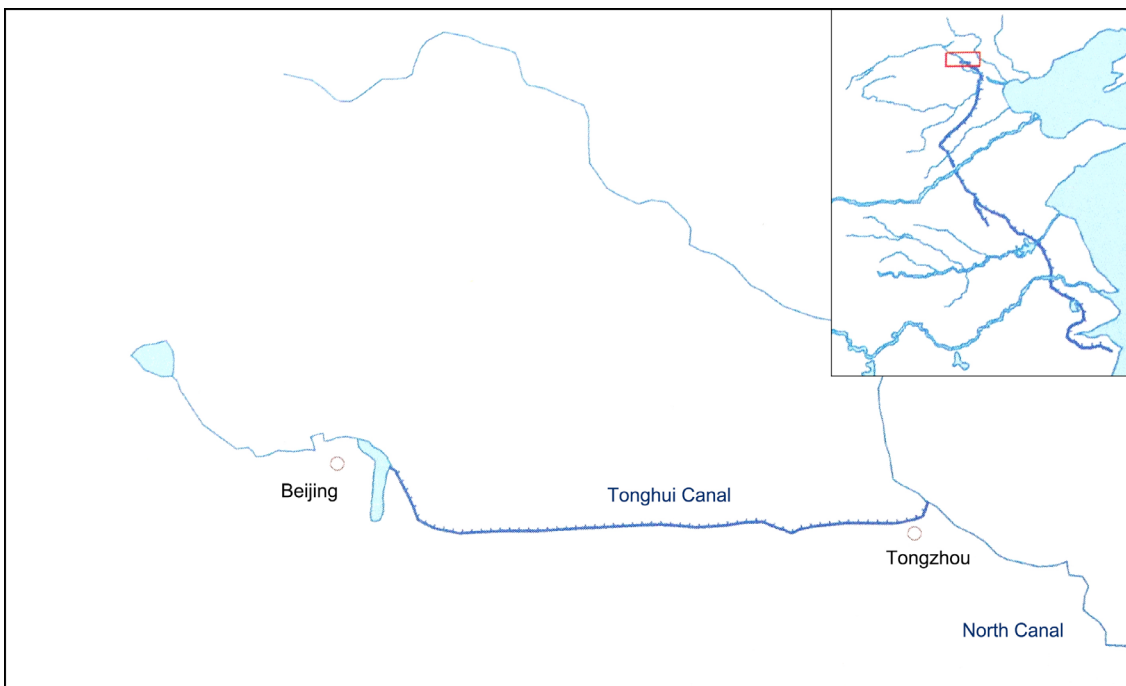


Fig. Geographic Location Map of Tonghui Canal in the Beijing-Hangzhou Grand Canal

Before the establishment of the Yuan Dynasty (1279-1368), people had tried three times to excavate the canal from Tongzhou to the Great Capital (now Beijing). But all had failed due to lack of water sources. A water expert Guo Shoujing was ordered to excavate Tonghui Canal in the Yuan Dynasty. Through his measurement of topography and river system of Beijing, he planned and designed. And by the strict construction of the migrant workers, the canal that was begun to excavate in 1292 was completed in the autumn of the following years. It took one and a half years. After the completion of the canal the grain ships could be directly arrived at the Great Capital from Tongzhou.

In the Ming Dynasty (1368-1644), the imperial city wall moved southward. North section of Tonghui Canal was included in the imperial city. The grain transport ships couldn't enter the city. The upstream section of aqueduct located nearby the Emperor Mausoleum of the Ming Dynasty. In order to avoid the destruction of geomantic omen, the aqueduct was cut off. The Ming Dynasty insisted on dredging channels to ensure the river transportation from Beijing to Tongzhou.

At the early Qing Dynasty (around 18th Century), the management of Tonghui Canal referenced to the method of the Ming Dynasty (1368-1644). In order to keep the water sources, many new floodgates were built. Until the end of the Qing Dynasty (around 1900), the scale of water transport was far worse than before. In 1901, the railway between Beijing and Tianjin was finished. The train transportation won obvious advantages. Instead of water transport of Tonghui Canal, The water transport of the Tonghui Canal in Beijing was stopped. Now the ancient river channel of Beijing is used for drainage, water storage and sightseeing.

3.1.2.3. Excavation and Transformation of the North Canal

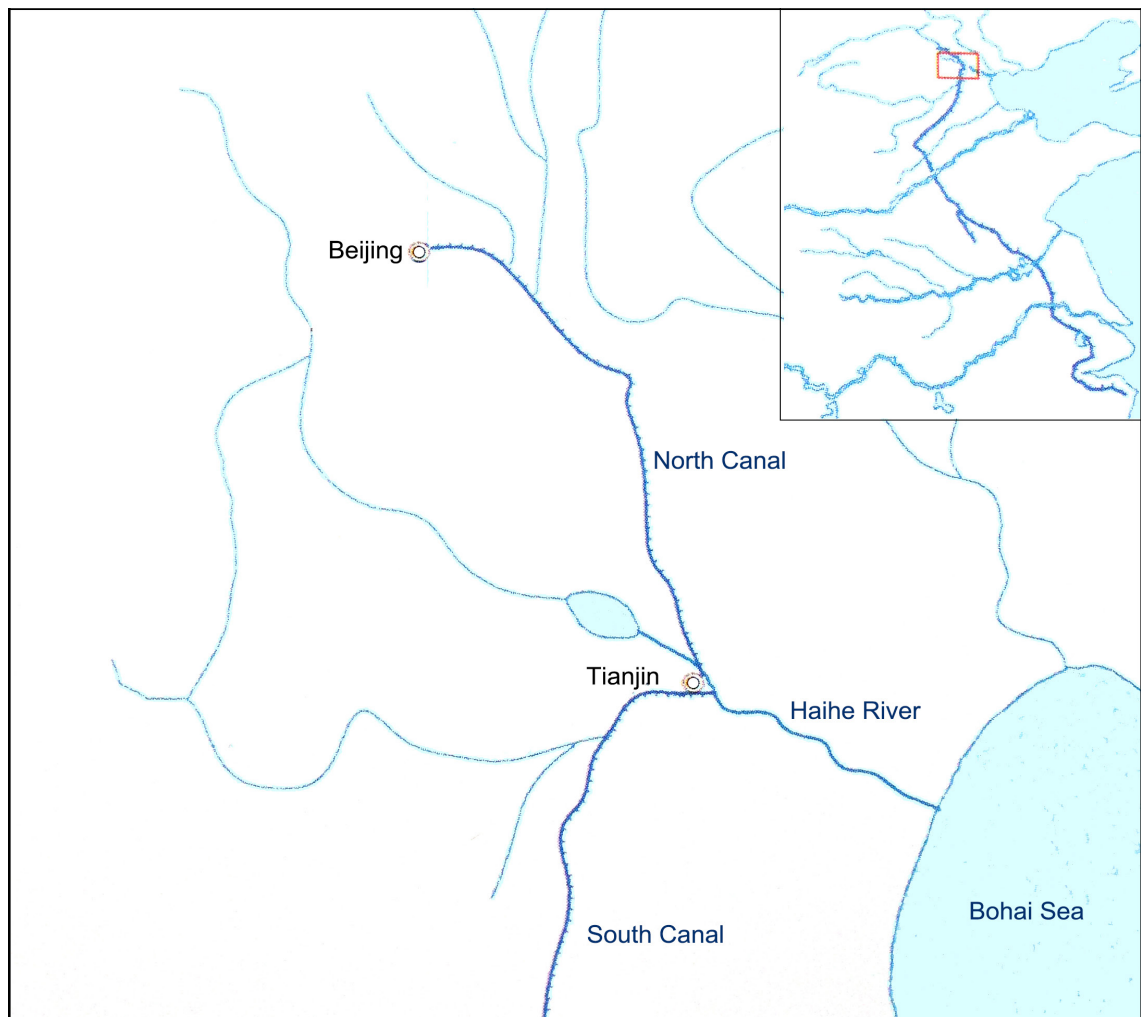


Fig. Geographic Location Map of North Canal in the Beijing-Hangzhou Grand Canal

Starting from the Tonghui Canal of Beijing, the Beijing-Hangzhou Grand Canal flowed southward via Tongzhou into the North Canal. The north of the North

Canal began at Tongzhou and connected with Haihe River and the South Canal in Tianjin with a total length of 148 kilometers. The North Canal is an important section of northern Beijing-Hangzhou Grand Canal, especially at the shipping period in the Yuan Dynasty (1279-1368). It was the main transport route to connect shipping export with Beijing.

At the beginning of the establishment of the Yuan Dynasty (1279-1368), because of waterway blockage from Beijing to Tianjin, the North Canal immediately been dredged. In 1283, the Huitong Canal began to excavate. But due to the terrain reason and lack of water, the water transport of grain mainly relied on maritime transportation. Whether the transport ships came by sea or canal, all of them had to pass through the North Canal before entering Beijing which made the North Canal very important. The North Canal often encountered floods in summers and autumns, but it was lack of water in winters and springs. To avoid these problems, the North Canal changed the river bend, repairing embankment and dredging frequently.

The North Canal played an important function on water transport of grain in the Ming Dynasty (1368-1644). Although there are many problems of the North Canal, but the Ming Dynasty tried its best to manage and maintain it. Although it couldn't completely solve the problem, but the government kept digging canal and dredging embankment. After the Qing Dynasty (1644-1911) established capital in Beijing, the government of the Qing Dynasty attached great importance to the management of the North Canal. But after the middle of the Qing Dynasty, The channel of the Grand Canal became worse. A large number of sediment deposited which accelerated the deterioration of the Grand Canal. Until the end of the Qing Dynasty, the water transport stopped at 1901. After that, shipping capacity of the North Canal had decreased due to the lack of management. It was only navigable about six months of each year. At early Republic of China (around 1912), although the civilian transport capacity was greatly reduced, it continued to play a role as a canal of civilian transport in Hebei.

3.1.2.4. Excavation and Transformation of the South Canal

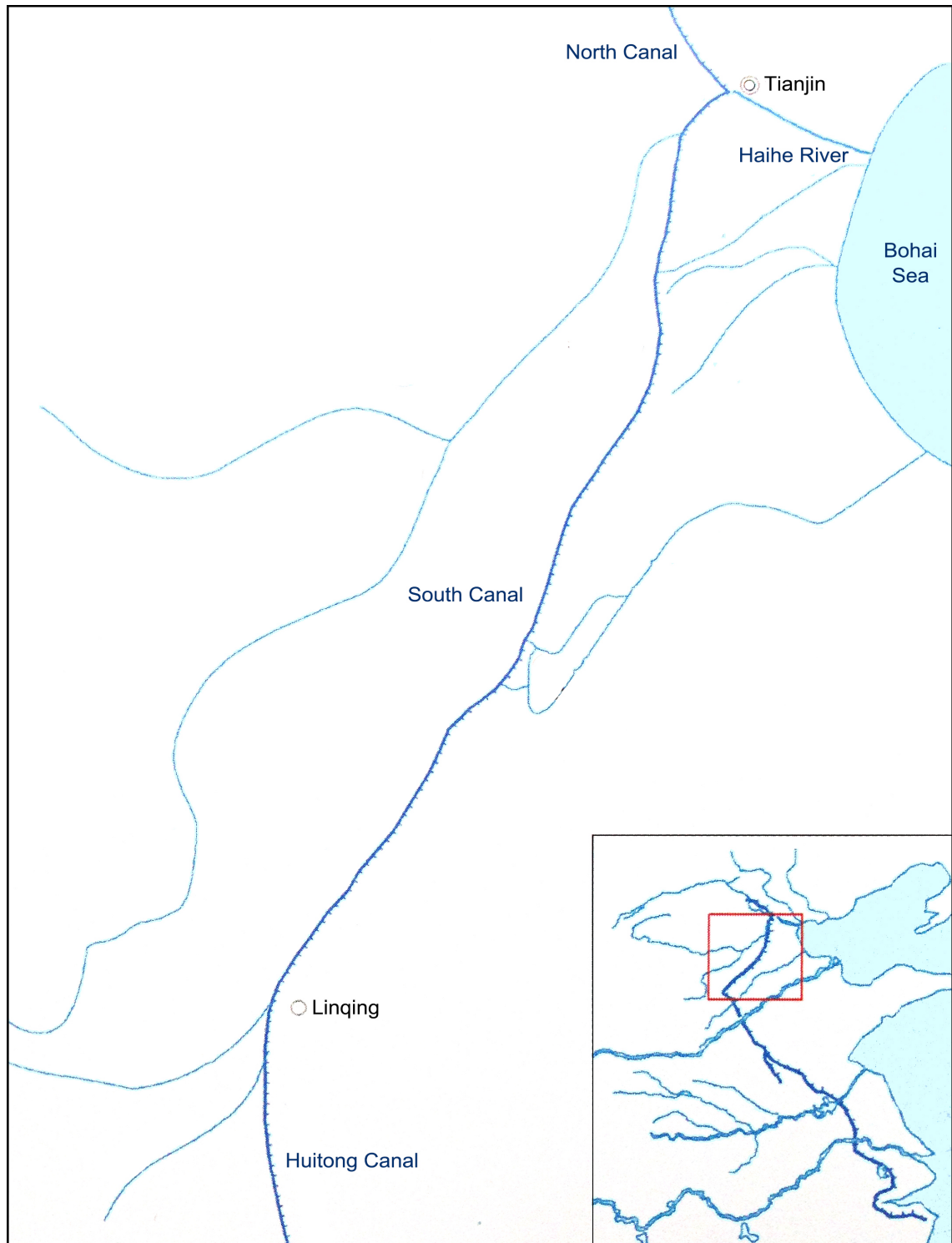


Fig. Geographic Location Map of South Canal in the Beijing-Hangzhou Grand Canal

The South Canal started from Linqing of Shandong and the main section of the canal located in Hebei province. The beginning of excavation time could be traced back to 204 BC, the end of the Eastern Han Dynasty. At that time, due to the military needs of the war, a series of artificial canal had been excavated in the North Plain. All of them could be treated as the rudiment of the South Canal. The fundamental part of the South Canal was formed in Yongji Canal during the

Sui (581-618) and Tang (618-907) Dynasties. In the Yuan Dynasty (1279-1368), the Beijing-Hangzhou Grand Canal officially formed, the northern Yongji Canal hasn't changed much in North of Linqing. Before the formation of the South Canal in the Yuan Dynasty, the building process of the South Canal experienced the following stages:

- (1) In the end of the Eastern Han Dynasty (around 3th Century), several regional canals were excavated that laid the foundation for the Yongji canal in the Sui Dynasty (581-618).
- (2) In the Sui Dynasty (581-618), the Yongji canal had been excavated by the Emperor Yang, with a total length of more than 1000kilometers. The Hebei section occupied the main part of it.
- (3) In Tang Dynasty (618-907), the section of Yongji Canal in Hebei province didn't changed much. The channels were dredged and regulated for enriching water sources.
- (4) In the Five Dynasties and Ten States (around 10th Century), the local government did a series of dredging and regulation for the Yongji Canal in a certain period, mainly including building riverbanks and dredging channels.
- (5) In the Northern Song Dynasty (960-1127), the Yongji Canal was called the Yuhe River. It mainly influenced by the Yellow River movement and the impact of floods. The Song Dynasty carried out remediation.
- (6) The Southern Song Dynasty (1127-1279) moved to the southeast of China, Yuhe River belonged to the territory of Jin State. The Jin State vigorously developed the water transport of grain in Hebei and dredged through the channel of the ancient Yellow River to Tongzhou.

In the Yuan Dynasty (1279-1368), the Yuhe River from Tianjin to Linqing had become the true sense of the South Canal in the system of Beijing-Hangzhou Grand Canal. It inherited the north section of the Yongji Canal and Yuhe River. The Hebei section of the south canal of in the Yuan Dynasty was different from the Yongji Canal in the Sui (581-618) and Tang (618-907) Dynasties. At that time, the South Canal was only a regional canal of downstream of the Yongji Canal. But in the Yuan Dynasty, it directly connected with the Huitong Canal from Tianjin to Linqing, no longer detoured Luoyang. The main problem of the South Canal was water sources. In the flood seasons, water was too much to wash out the dike; in the dry seasons, water was shortage. The main measures were taken not only taking defense but also building distributary in the flood seasons; in the dry seasons, controlled the upstream irrigation and took other measures to ensure the canal water. The method to solve the water problem of the south canal in the Yuan Dynasty (1279-1368) provided a good case for the Ming (1368-1644) and Qing (1644-1911) Dynasties. It became the precedent of excavating distributary for the South Canal.

After the Ming Dynasty (1368-1644) moved the capital to Beijing, the Huitong Canal was re-excavated. The water transport ships could enter Weihe River in Linqing and went upstream to Tianjin. The South Canal began to play a role in the Ming Dynasty. In the Qing Dynasty (1644-1911), the desilting project of the South Canal was taken. This project successively dredged original distributaries of the South Canal to strengthen their flood discharge capacity.

In the end of the Qing Dynasty (around 1900), the water transport of grain stopped. The food of Henan and Shandong was still dependent on the South

Canal to delivery to Tianjin. In 1860, Tianjin became an open port and the foreign steamships entered the sea area of Tianjin. The marine transportation began to develop. After 20th Century, railway and highway transportation has gradually replaced the ship. The effect of the South Canal gradually weakened.

3.1.2.5. Excavation and Transformation of the Huitong Canal

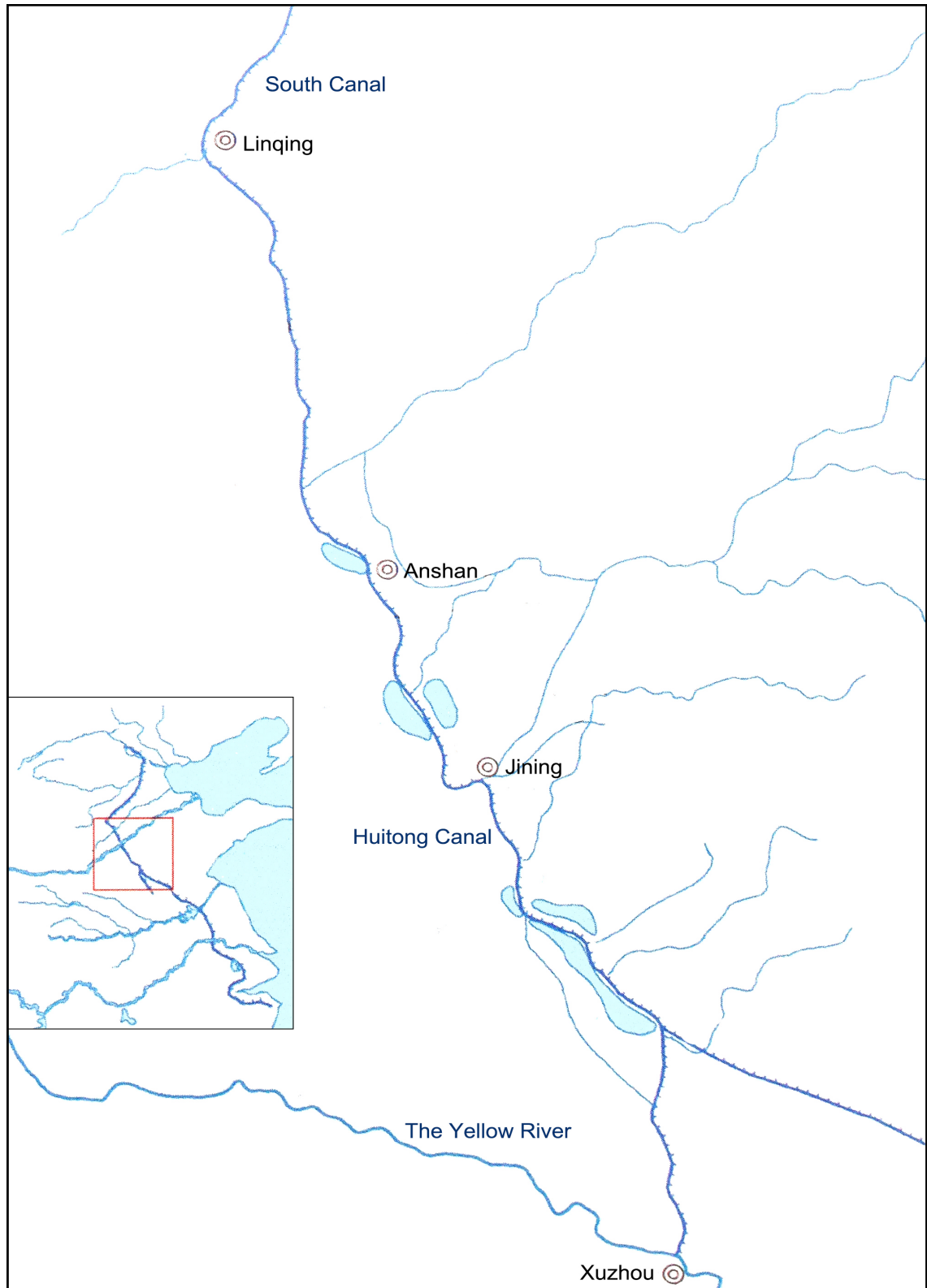


Fig. Geographic Location Map of Huitong Canal in the Beijing-Hangzhou Grand Canal

The Huitong Canal has taken shape in the Yuan Dynasty (1279-1368), its excavation history can be traced back to 482 BC when there were chaos caused by wars among the dukes or princes of the states during the Warring States period (475BC-221BC), out of the needs of wars, several regional canals had been excavated on the land of Shandong, their excavation laid the early form of the Huitong Canal. Thereafter the interval canals excavated in Shandong region during the Eastern Jin (317-420), Sui (581-618), Tang (618-907) and Song (960-1279) Dynasties also laid a foundation for the excavation of the Canal in Shandong during the Yuan Dynasty (1279-1368).

The excavation of the Huitong Canal during the Yuan Dynasty was divided into two parts: one part is bounded by Anshan from Jizhou (now Jining) to Anshan Township, which is Jizhou Canal excavated in the Yuan Dynasty, with a length of about 75 kilometers; the other part is from Anshan to LinQing, with a length of about 125 kilometers. Later the two canals were collectively called Huitong Canal. To effectively utilize the water resources of the Huitong Canal, dam engineering was conducted following the canal excavation to solve the problem of water diversion of the Huitong Canal.

In the late Yuan Dynasty (around 1350), due to political corruption, the maintenance of the Huitong Canal had been worse than it was before, additionally, the Yellow River repeatedly burst, which often destroyed the channel of the Huitong Canal. In the Ming Dynasty (1368-1644), the Huitong Canal was not only re-excavated; and due to the impact of the Yellow River floods, the channel of the Canal had also been changed constantly, the general trend was to take shape around the surrounding four lakes, the channel of the Canal was shifted from the west to the east of the lakes and basically took shape during the Ming Dynasty. For this, a lot of attempts had been made during the Ming Dynasty in order to solve the problem of water source of the Huitong Canal, for example, constructing major water diversion hubs.

The dredging and construction projects of the Huitong Canal during the Ming Dynasty laid a good foundation for the Qing Dynasty (1644-1911), the Huitong Canal also undertook heavy tribute grain transportation task during the Qing Dynasty. The Huitong Canal in the Qing Dynasty still continued the system inherited from the Ming Dynasty, little changes had been made to its channel on the basis of the Ming Dynasty, nor larger projects had been constructed. During the boom of tribute grain transportation development in the Qing Dynasty, the Huitong Canal had often been maintained and repaired.

Before the founding of People's Republic of China (1949), the Huitong Canal had basically become an abandoned river for it had not been repaired for many years, resulting in serious silting of the channel.

3.1.2.6. Formation of the Middle Canal

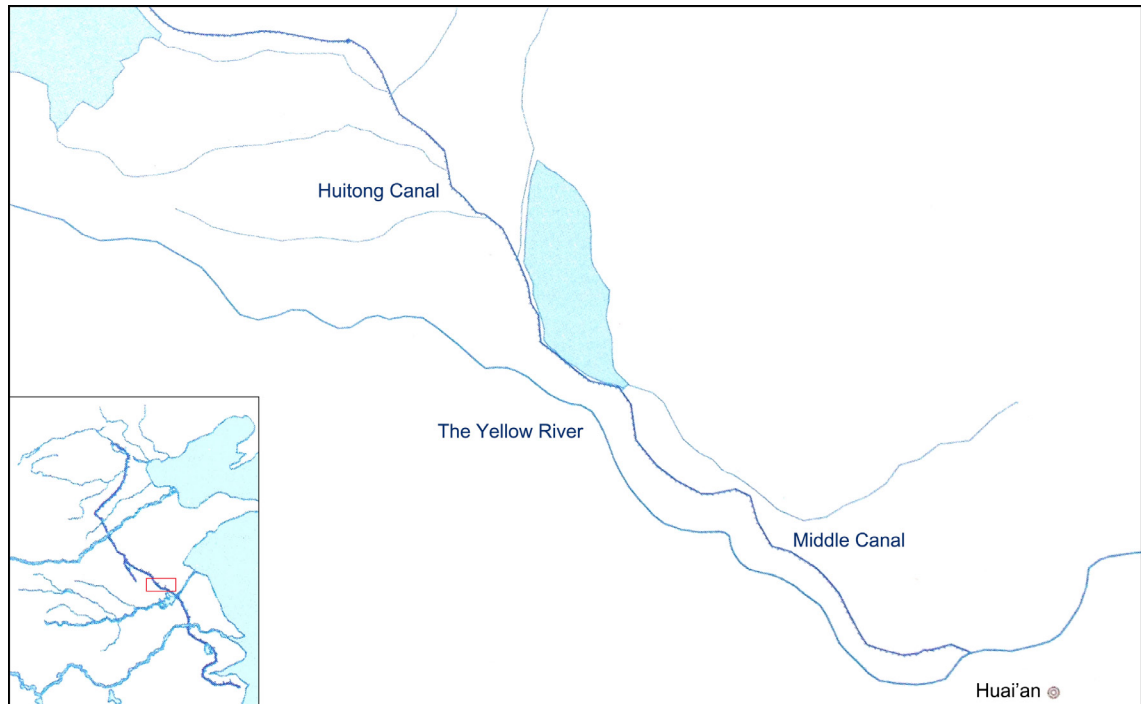


Fig. Geographical Location Map of Middle Canal in the Beijing-Hangzhou Grand Canal

Before the Yuan Dynasty (1279-1368), the earliest canal flowing through the Middle Canal region was Tongji Canal excavated in the Sui Dynasty (581-618). During the Southern Song Dynasty (1127-1279), the downstream channel of the Yellow River flowed southward and the Tongji Canal was gradually silted up under the influence of the Yellow River. When the Beijing-Hangzhou Grand Canal was excavated in the Yuan Dynasty, to let tribute grain be transported to the Great Capital by water as soon as possible, the natural channel of the Yellow River was utilized as the transportation channel from Xuzhou to Huai'an, but the Yellow River was also a huge hidden trouble for the Canal, for the tribute grain transportation by the Canal was often interrupted due to the intrusion of the Yellow River, this section of the Canal via the Yellow River had become the focus of channel improvement in all dynasties.

In the early Ming Dynasty (around 15th Century), the overflow of the Yellow River mostly happened in the surrounding areas, often washing off canal levee or causing canal silting, however, the traffic could be guaranteed. In the middle of Ming Dynasty (around 16th Century), the overflow of the Yellow River mostly happened in the main channel areas, causing great impact on canal navigation. Thereupon, two sections of artificial interval canals were excavated to separate the part of the Canal from the Yellow River.

After the excavation of two sections of artificial canals in the Ming Dynasty (1368-1644), there were still 100 kilometers of transportation channel passing through the Yellow River, fully loaded ships used for tribute grain transportation retrograded against the wind, while this section of the Yellow River course was characterized by strong wind and dangerous waves, plus constantly changed channel, the navigation became very dangerous. In order to avoid the

influence of the Yellow River on the Canal, the Middle Canal was excavated to completely separate the Canal from the Yellow River. The excavation of the Middle Canal ended the history of the Beijing-Hangzhou Grand Canal passing through the Yellow River course since the Yuan (1279-1368) and Ming (1368-1644) Dynasties, both the ships used for tribute grain transportation and those used for carrying passengers experienced the safety and convenience of their navigation.

The Middle Canal was the last one to form among all reaches of the Beijing-Hangzhou Grand Canal, for it has officially taken shape in the Qing Dynasty (1644-1911). The formation of the Middle Canal reflects the change in dealing with the relationship between the Yellow River and the Canal, that is, changing from navigation via the Yellow River to navigation by bypassing the Yellow River, the excavation of the Middle Canal enabled the Beijing-Hangzhou Grand Canal to completely get rid of the Yellow River and finally take shape.

3.1.2.7. Continuation and Change of the Huaiyang Canal

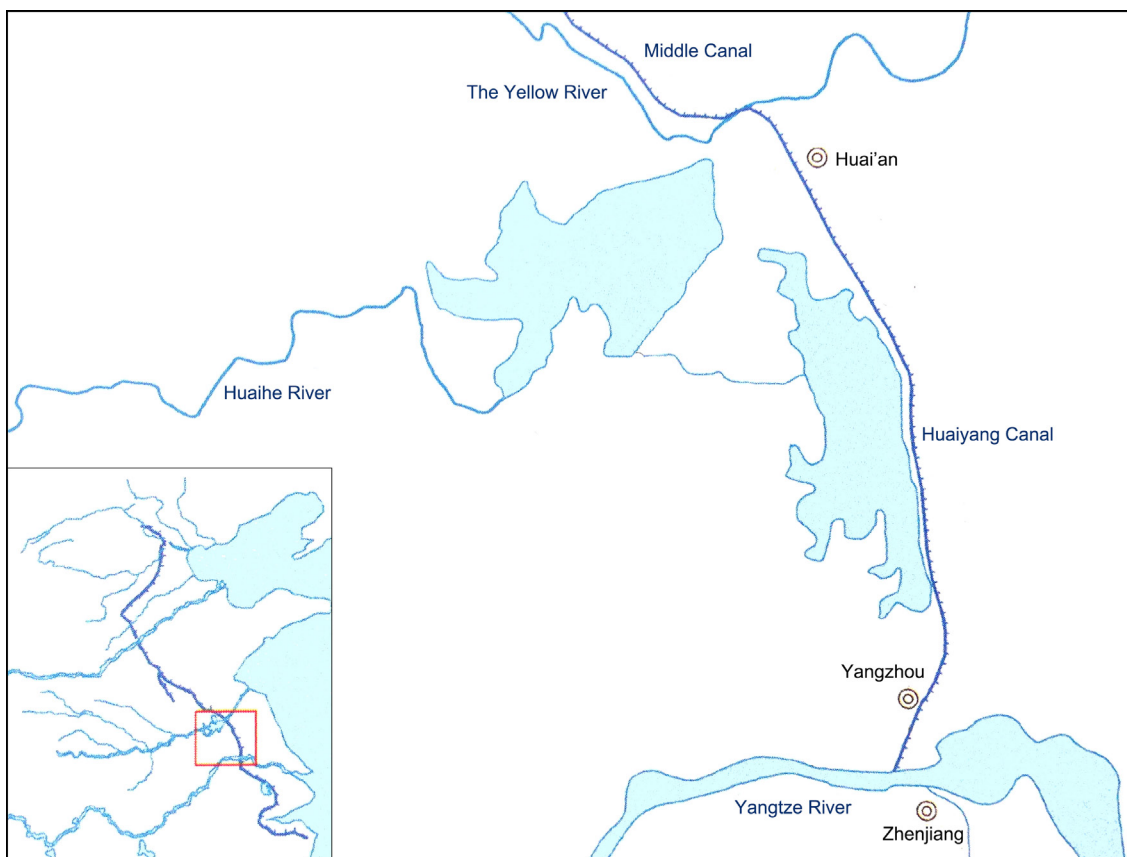


Fig. Geographical Location Map of Huaiyang Canal in the Beijing-Hangzhou Grand Canal

The total length of the Huaiyang Canal is about 197 kilometers and has evolved from the ancient Hangou Canal. It is the earliest in the excavation history of the Beijing-Hangzhou Grand Canal. After the formation of its basic pattern in the Sui Dynasty (581-618), the Huaiyang Canal had been treated in both Tang (618-907) and Song (960-1279) Dynasties, but had no significant diversion. In the Yuan Dynasty (1279-1368), tribute grain transportation was given priority to sea transportation, so there were few historical records in the treatment of

the Huaiyang Canal. After the Southern Song Dynasty (1127-1279), the Yellow River started to divert southward into the Huaihe River in seven hundred years, bringing enormous influence to the Huaiyang Canal in two aspects.

On the one hand, the Yellow River was characterized by great water volume and strong water potential, it blocked the Huaihe River with small water volume and weak water potential eastward, resulting in the lower reach of the Huaihe River flowed into several big lakes; water could only be retained by constructing dam to protect the downstream region of the Huaihe River east of the lakes. After the repair and maintenance by later generations, the 180-kilometer canal levee from Yangzhou in the south to Huai'an in the north had been completed.

On the other hand, with the convergence of the Yellow River and the Huaihe River, the river overflowed into the Canal, both the Huaihe River and the Canal were silted up by the Yellow River, as a result, their river beds were rising, forcing the Huaihe River flowing southward or flowing into the Yangtze River via the lakes west of the Canal. There was only the Yellow River no the Huaihe River within the territory of Huai'an, which changed the original terrain of being higher in the south and lower in the north between the Yangtze River and the Huaihe River, instead, the terrain was presented as being higher in the north and lower in the south. Before that, the canal had few floods between the Yangtze River and the Huaihe River; after that, due to the interference of the Yellow River, floods occurred more frequent. The water regime at the northern end the Huaiyang Canal was changeable. The renovation of the Huaiyang Canal mainly consisted of two aspects: the dredging of river shoal, river channel and river bed and the construction of dam and water gate. Through the management during the Ming (1368-1644) and Qing (1644-1911) Dynasties, the treatment of the Huaiyang Canal had gradually been perfected.

The Huaiyang Canal was called "Hucao" in the Ming Dynasty (1368-1644) for there were many lakes along the way. The water level of the Huaiyang Canal was higher than that of the Huaihe River, to prevent the water of the Canal from flowing into the Huaihe River, a water diversion dam was once built at the access of the Canal to the Huaihe River. In the Yuan Dynasty (1279-1368), tribute grain transportation was given priority to sea transportation, the treatment of the Canal didn't receive much attention, as a result, the dam did no longer exist in the Ming Dynasty. River transportation had gradually been restored in the Ming Dynasty, the treatment efforts on the canal had been greatly strengthened, and the Huaiyang Canal had been effectively renovated in the Ming Dynasty (1368-1644).

The treatment of the Huaiyang Canal had received much attention in the early Qing Dynasty (around 1700), but later it had received little attention due to the decline of national strength. In 1885, the burst of the Yellow River again occurred, the mainstream of the Yellow River passed through the Canal and flowed into the sea via another river, ending over 661 years of history that the Yellow River had flowed into the sea via the Huaihe River. The Huaiyang Canal could directly connect to the Middle Canal and was no longer subject to the influence of the Yellow River. From the last years of the Qing Dynasty (around 20th Century) when the tribute grain transportation by canal was abolished to

the period of the Republic of China (1912-1949), the Huaiyang Canal was still in navigation, it was still the section with better navigation condition along the course of the Beijing-Hangzhou Grand Canal, a water transport artery in the northern Jiangsu region and also a main channel for saltworks of Huainan and Huaibei areas conveying edible salt.

3.1.2.8. Continuation and Change of the Jiangnan Canal

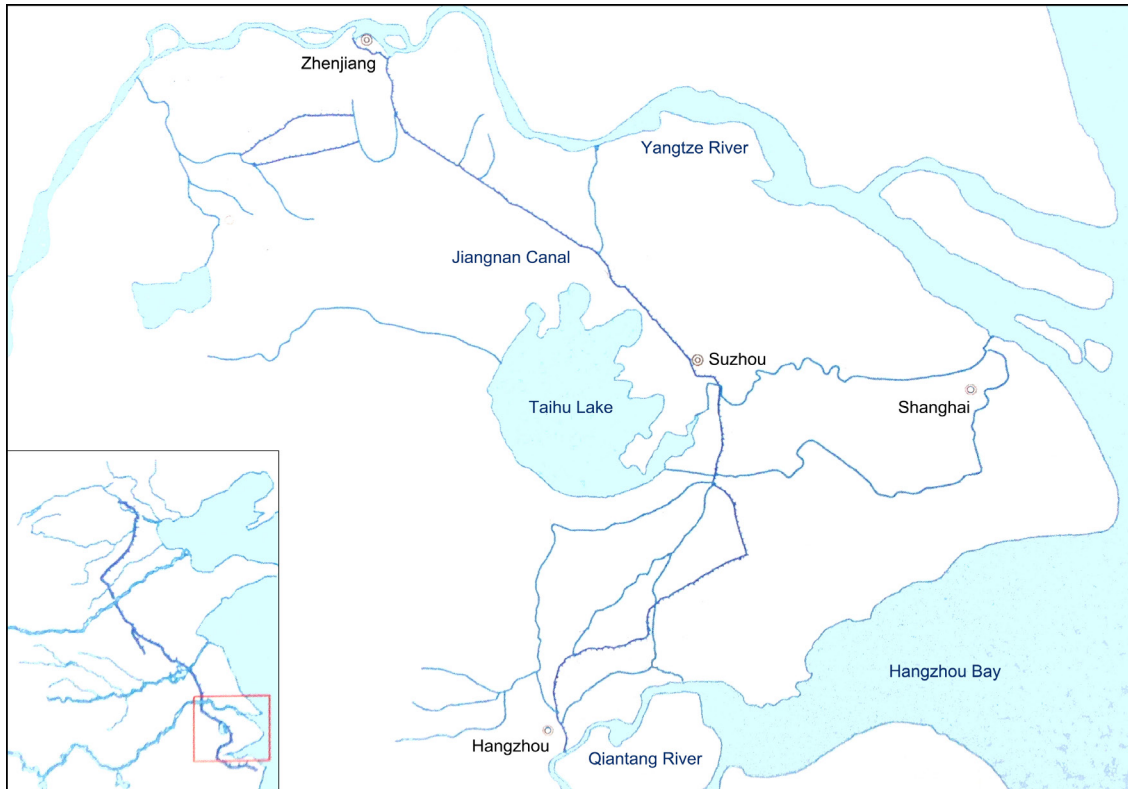


Fig. Geographic Location Map of Jiangnan Canal in the Beijing-Hangzhou Grand Canal

The Jiangnan Canal has a long history, as with the Huaiyang Canal, its excavation history can be traced back to the Eastern Zhou Dynasties (772BC-256BC) and had been developed generation after generation. It was not until the North-South Grand Canal was excavated under the reign of the Emperor Yang Guang that the Jiangnan Canal had become a part of it. The regions south of the Yangtze River had flourishing agricultural industry, a place responsible for the supply of tribute grain over the past dynasties, and through the treatment and development during the Tang (618-907) and Song (960-1279) Dynasties until the cut-through of the Beijing-Hangzhou Grand Canal in the Yuan (1279-1368) Dynasty, it was still an important part of it, meanwhile, it was also the starting point for conveying grains from the South to the North.

The history of the Jiangnan Canal can be traced back to as early as the 11th century BC. Starting from the Zhou Dynasty (1046BC-256BC) and prior to the Sui Dynasty (581-618), a lot of interval canals had been excavated in the south of Yangtze River to expand the canal system there, meanwhile, large-scale tribute grain transportation had been occurred. The Emperor Yang Guang of the Sui Dynasty (581-618) dredged and deeply excavated original canal in the south

of Yangtze River according to unified standards, as a result, the Jiangnan Canal took shape and the North-South Grand Canal finally ran through the whole course. The Jiangnan Canal was characterized by wide channel, abundant and stable water sources, its maintenance work was relatively easier compared with other sections, during the Tang (618-907) and Song (960-1279) Dynasties, the original channel of the Jiangnan Canal had been partially diverted and dredged. The lower reaches of the Yangtze River by virtue of its flourishing economy became the main source of central fiscal revenue, while the Jiangnan Canal undertook important task of tribute grain transportation, making great contribution to the development of the Tang (618-907) and Song (960-1279) Dynasties and continuing to play a key role in the Beijing-Hangzhou Grand Canal excavated in the Yuan Dynasty (1279-1368).

The Jiangnan Canal had good water transportation condition, so no big changes were made to this navigation channel when excavating the Beijing-Hangzhou Grand Canal in the Yuan Dynasty. The biggest change of the Jiangnan Canal occurred in late Yuan Dynasty (around 1350), during which the southernmost channel of the Jiangnan Canal was diverted and the new channel has been used to this day.

After making Beijing the capital, the rulers in the Ming Dynasty (1368-1644) restored the grain transportation of the Beijing-Hangzhou Grand Canal, with the Jiangnan Canal directly managed by the central government. The southern section of the Jiangnan Canal, through diversion and treatment in Tang (618-907), Song (960-1279) and Yuan (1279-1368) Dynasties, had basically taken shape with abundant water quantity and convenient navigation. The treatment of the Jiangnan Canal in the Ming Dynasty focused on the northern section. To ensure water sources and unobstructed channel, some dredging and maintenance work had been done. In addition to this, at the beginning of the founding of the Ming Dynasty, the surrounding natural river channels had also been excavated and treated to expand the Jiangnan Canal system.

The Jiangnan Canal had good navigation condition in the Qing Dynasty (1644-1911). Zhenjiang port of the Jiangnan Canal was managed by the governor of water control in south of the Yangtze River, other river reaches were mainly managed by local authorities. The problems of the Jiangnan Canal mainly concentrated in the middle of the Canal, due to tidal water of the Yangtze River carrying sediments to the canal and causing silting, it required dredging and maintenance on a regular basis. The good navigation condition of the southern section also brought about another development climax for the areas along the canal.

The prosperity of the Jiangnan Canal intermitted with the decline of the Qing Dynasty (1644-1911), the inhabitants of the Taihu Lake Basin took refuge in Shanghai. In the late stage of the Qing Dynasty (around 1900), river transportation had gradually been replaced by sea transportation, tribute grains in Suzhou, Hangzhou and other places were transported northward to Tianjin via Shanghai. After the abolition of grain transportation by canal, the Jiangnan Canal had rarely been treated since then.

3.1.2.9. Formation and Change of the Zhedong Canal



Fig. Geographical Location Map of Zhedong Canal in the Beijing-Hangzhou Grand Canal

The Beijing-Hangzhou Grand Canal runs straight to Hangzhou in the south from Beijing in the north, but Hangzhou is not the southernmost point of the Grand Canal of China. There is another canal existing for about 1,000 years within the territory of Zhejiang Province - Zhedong Canal. The Zhedong Canal is the extension of the Beijing-Hangzhou Grand Canal, running from Hangzhou and entering into the sea eastward via Ningbo. The Zhedong Canal is the endpoint of the Grand Canal of China in southeast direction and the link between inland waterway and open sea. The end point of Zhedong Canal is also important starting point of the ancient maritime Silk Road. The full excavation of the Zhedong Canal began in the Western Jin (265-316) and Eastern Jin (317-420) Dynasties, used for farmland irrigation and grain transportation, with a total length of 252 kilometers, providing a convenient access to the sea for the ancient canal of a thousand years. The Zhedong Canal has an earlier construction time and longer service life, with its own unique characteristics.

The Zhedong Canal is located in Zhejiang Province, the shoreside of the QianTang River in Zhejiang Province is just the birthplace of the State of Yue during the Warring States period (475BC-221BC). The State of Yue faced the sea to the east and bordered the QianTang River to the north, with good natural water conservancy conditions for waterways crisscrossing the region and lakes scattered all over like stars in the sky. These streams and rivers were favorable to farmland irrigation within the territory, yet extremely unfavorable to the east-west transportation, under such circumstance, the State of Yue excavated Shanyin Old Canal, mainly used to treat natural river courses. The total length of the Shanyin Old Canal was more than 25 kilometers, making it an east-west water transportation artery traversing Shanhuai Plain, this watercourse was also connected to and intersected with north-south streams along the way, greatly improving waterway transportation within the State of Yue and playing a positive role in its economic development and national strength enhancement. Some experts believe that the Shanyin Old Canal had not only the function of water transportation, but also the function of defending against tide attacks, as well as

the development of waterways to facilitate production. This Shanyin Old Canal had been gradually changed after the State of Yue moved the capital, however, it had not been abandoned, but become the predecessor of the western section of the Zhedong Canal. During the period from the late Eastern Han Dynasty (around 200) to the Northern and Southern Dynasties (420-589), the inhabitants of the Central Plains Area migrated to the south on a large scale to avoid conflicts and wars, the population in Zhejiang region increased consequently and had gradually developed here, so that water conservancy projects for the Canal could be constructed.

In the late Western Jin Dynasty and the early Eastern Jin Dynasty (around 317), in order to irrigate the farmland, the original channel was repaired and dredged and new canal was excavated, the excavation of this section of new canal was of great significance, the Zhedong Canal thus entered a new historical period, it marked the early form of the Zhedong Canal basically took shape. While this section of the canal is only the western section of the Zhedong Canal, yet the one with the longest excavation time among sections of the Zhedong Canal. This section of the canal had been used until the 1960s. While the eastern section relying on natural river channel has been used for navigation after renovation and reconstruction by later generations and has become part of the Zhedong Canal. The Zhedong Canal had already been in full navigation in the early Eastern Jin Dynasty and consisted of both artificial watercourse and natural channel.

For thousands of years, the direction of the Zhedong Canal has been basically the same and treated by all previous generations. The Emperor Yang Guang excavated the North-South Grand Canal, and the Zhedong Canal was an extension of the Jiangnan Canal in Zhejiang region, the navigation of the Zhedong Canal stretched to the Central Plains via the Jiangnan Canal. The Emperor Yang Guang also renovated the Zhedong Canal to make it connected to the North-South Grand Canal more unimpeded. The Zhedong Canal had been dredged, deeply excavated and constructed for many times and the channels and ditches of the plains on both banks of the Canal had been renovated in the Tang Dynasty (618-907), with the dikes for the transportation channel being built to regulate the water volume of the Canal.

The Zhedong Canal received more attention during the Song Dynasties (960-1279), with increased frequency of dredging and maintenance, the Song Dynasty is a period for the improvement of the Zhedong Canal, characterized by more engineering works on the Canal and much improved administration system. The complete water transportation system of the Zhedong Canal had been formed. In the Ming Dynasty (1368-1644), the Zhedong Canal was the main channel going northward to the Yangtze River and the Huaihe River, there were many barrages built along the banks of the Canal to regulate water volume and control water level difference so as to guarantee unobstructed channel and solve the water level difference when different rivers bordered with each other. What's more, the Zhedong Canal also solved the problems of typhoon, sea tide and tidal bore. During the Ming (1368-1644) Dynasty, river channels and river levees had been built on the Zhedong Canal on a large scale, which facilitated water and land transportation along the Canal. From the end of the 19th century

to early 20th century, internal combustion engine powered ships sailed into China, the Port of Ningbo had gradually entered into the era of steamship port from the era of sailing boat port; while the Zhedong Canal as an important inland waterway for the Ningbo Port has still played a key role in connecting the economy of the regions south of the Yangtze River and continued to the contemporary era.

3.1.3. Treatment Of The Beijing-Hangzhou Grand Canal In Recent 100 Years

The Beijing-Hangzhou Grand Canal had played an important role in the economy and society of ancient China and created brilliant and splendid grain transportation industry in ancient China. However, in the last years of the Qing dynasty (1644-1911), China was faced with domestic strife and foreign aggression, the corruption of court politics and the decline of national strength. Since 1850, the war lasting for more than ten years involved large parts of the central and eastern region, which were exactly the main areas flowing through by the Grand Canal, as a result, the Grand Canal was significantly damaged. During the corresponding period, the industrial revolution occurred in Europe, making the world enter the industrial age; steamships entered into China and promoted the rise of sea transportation by steamships, with transport efficiency being greatly increased. Meanwhile, railway and road traffic had got rapid development. It's difficult for the Beijing-Hangzhou Grand Canal to undertake the task of grain transportation due to years of neglect, channel silting and deficiency of water capacity and eventually replaced by sea transportation and land transportation. Since the founding of People's Republic of China in 1949, the government has attached great importance to the treatment of the Beijing-Hangzhou Grand Canal.

The treatment of the Tonghui Canal mainly concentrated in Tongzhou, with gardens, cultural squares, wharfs and forest parks being built along the banks, in 2008, the Tongzhou section of the Tonghui Canal was formally open to navigation; flood control management for the upstream of the North Grand Canal was strengthened, while four theme parks were constructed in the downstream, undertaking important tasks of flood control, navigation, water diversion and water delivery and also as a place for travel, sightseeing, leisure and entertainment; the South Grand Canal was an area suffering severe flood, so a tributary was excavated for this purpose, when Tianjin suffers water shortage, the South Grand Canal can be used as a water delivery channel to guide the water of Yellow River into Tianjin; the Huitong Canal after treatment is mainly used for farmland irrigation as well as coal and material transportation. Some of the old channels have been replaced by newly constructed canals, gradually silted up and become farmland, part of the sections after renovation were open to navigation again; the Middle Canal has become an important channel to transport coal from the North to the South and thus facilitated the economic development along the canal; the Huaiyang Canal after treatment has still been used as a canal; the Jiangnan Canal is a section of the modern Beijing-Hangzhou Grand Canal with the largest transportation volume and the highest density of ships, in excess of both the Yangtze River and the Rhine River in Germany; the Zhedong Canal improved navigation capacity, in

conjunction with the Beijing-Hangzhou Grand Canal to become backbone routes in waterway network at the access of the Yangtze River to the sea.

Over nearly 60 years, the treatment results of the Grand Canal has played positive role in many aspects in the development of national economy and achieved obvious economic, social and ecological benefits. After large-scale renovation, expansion and reconstruction, the navigation conditions of the Beijing-Hangzhou Grand Canal have been significantly improved to form a 900-kilometer unobstructed channel from Jining in Shandong Province to Hangzhou in Zhejiang Province. The Beijing-Hangzhou Grand Canal has again become a grand waterway to connect the North and the South and as a logistics artery for conveying coal from the North to the South, diverting water from the South to the North and guaranteeing resources circulation along the Canal.

3.2. Cities Along The Canal

Oswald Arnold Gottfried Spengler said in *Decline of the West* that the history of the world is the history of the cities. A majestic history of canal is also the history of urban development along both banks of the canal. The cities spread along the veins of the canal in the vast space, while the genes of canal civilization permeate into each of the cities' nerve endings along the flowing river, to make each city deeply branded with the mark of the canal from social structure, economic form, folk customs to the city's character and temperament. The Grand Canal and the cities along the Canal are closely related and mutually dependent, while such close interaction between the canal and the city can be roughly divided into three types.

The first type is the cities as political center, that is, the capital. The capital was the heart of a nation. To feed huge population including members of the royal family, the central bureaucracy and a standing army, it was far from enough to rely only on food production of the capital itself, let alone these cities themselves were not located in the most developed area of agriculture, it thus required a stable and sustainable food supply system. While tribute grain transportation by water was almost the optimal solution to solve food problem. On the one hand, access to grain by river channel was the most convenient form of transportation due to its low cost and large carrying capacity; on the other hand, only a highly centralized government had the ability to construct the canal of such large scale and organize such long-distance transportation. More than that, the canal system could even affect the capital's location selection and construction. A main reason the Emperor Yang Guang built the east capital Luoyang is because the grain in the regions south of Yangtze River could be accessed more easily relative to Chang'an located in the hinterland of the Central Shaanxi Plain; and later in the whole Tang Dynasty (618-907), the emperors still needed to lead civil and military officials to Luoyang to get food in case of a lean year. The Northern Song Dynasty (960-1127) locating its capital in Kaifeng was more influenced by canal.

The canal has become an important source of materials for the capital, while the capital has in turn affected the form of the canal, such bi-directional interaction

between the capital and the canal is especially prominent in the construction of Beijing City in the Yuan (1279-1368), Ming (1368-1644) and Qing (1644-1911) Dynasties. After the capital was moved to Beijing in the Yuan Dynasty, the focus of grain transportation had been shifted from the northwest to the northeast. The canal had undergone significant changes accordingly, for the ships no longer needed to sail northward after bypassing Luoyang via Bianhe River, but went straight from Huai'an and by utilizing water brought about by the Yellow River diverted southward, passed through northern Jiangsu Province and western Shandong Province and sailed into the old course of the Yellow River after arriving LinQing and then entered into Beijing via Tongzhou after passing through Dezhou, Cangzhou and Tianjin. Old Beijing people said that Beijing City floated from the canal. From the Great Capital of the Yuan (1279-1368) Dynasty to Beijing City in the Ming (1368-1644) and Qing (1644-1911) Dynasties, wood, brick, stone and other building materials required for city construction were all transported along the canal northward. Good woods were from remote mountains in the South, tributary bricks for the construction of imperial palaces were mainly from LinQing City in Shandong Province. The soil in LinQing has fine and smooth quality, the harness after burnt into bricks is even greater than some stones. Today, some villages located in the southern part of Tongzhou are just the places used to store building materials transported from the Grand Canal in those years. After the completion of the construction of Beijing City, the food and daily provisions for hundreds of thousands of soldiers and civilians in the City still relied on the Grand Canal. Without the Grand Canal, there would be no resplendent and magnificent towers and palaces in Beijing, and no thriving and prosperous Beijing in the history.

The second type is the cities as economic center. Now that the excavation of the canal was mainly for the purpose of meeting the demand of the capital for goods, political center and economic center must be linked together. In 608 AD, all sections of the Grand Canal had been joined up, since then, fertile agricultural production and inexhaustible business prosperity of eastern cities had begun to make offerings to the capital in the north. Represented by today's Hangzhou, Suzhou and Yangzhou located along the north shore of the Yangtze River, together with adjacent Zhenjiang, Changzhou, Wuxi and Jiaxing, to the Tang (618-907) and Song (960-1279) Dynasties, the city agglomeration in the lower reaches of Yangtze River had become the most developed economic zone in China and formed the concept of today's "Jiangnan" in cultural sense. Whether the dynasties after the Tang Dynasty could succeed in unifying China more and more deeply depended on whether they could effectively utilize this fertile land and continuously conveyed this region's economic resources via the Grand Canal to North China where the capital is usually located.

The superior natural conditions in the lower reaches of Yangtze River laid the foundation for agricultural and economic development. Before the Qin (221BC-206BC) and Han (206BC-220) Dynasties, the concept of Jiangnan was remote and broad; since the chaos caused by wars in the late Eastern Han Dynasty (around 200) and the migration of a large number of population from the North to the South, the development of this region surpassed that of the North due to a relatively stable political environment, with its productivity quickly catching up the North. In the Tang Dynasty (618-907) when the Grand Canal

was headed for prosperity, Yangzhou was a world-famous metropolis, with merchants gathered together from all directions and stores opened closely side by side, selling goods from high-end jewelries and silks to daily necessities, everything that one expected to find. Commercial prosperity was backed by strong agricultural production and superb handicraft techniques in the regions south of the Yangtze River. At that time, the growing method of double cropping rice had got promotion in the regions, plus the government had attached great importance to water conservancy construction between the Yangtze River and the Huaihe River, with production tools being improved too. After the middle and late Tang dynasty (around 9th and 10th Century), the city also lifted the curfew, no matter day or night, the life in Yangzhou was always full of busy and bustling atmosphere.

The excavation of the canal was like the icing on the cake for cities in South China represented by Yangzhou. Without the canal, Yangzhou might not become a gathering place for salt merchants and their most richly courtyards and mansions; mountings, embroideries, print books, woven seats, jade carvings and food processing in Suzhou might not quickly and smoothly flow to the markets nationwide; and Hangzhou's prosperity might also be compromised. Yet this region's prosperity had its grounds, this starting point of the canal conveying goods and materials has been maintaining its position as the economic center, neither migrating due to political turmoil like the capital nor being frequently plagued by channel silting and raging water of the Yellow River like canal cities in the North.

In addition to political centers and economic centers, there is a more general city type along the canal. The location selection of this type of canal city, besides political radiation and defense issue which were considered by most of the ancient Chinese cities, also needed to solve the problem of transshipment in grain transportation by water, thus the cities tended to be constructed at waterway throat. Before the excavation of the canal, they might be administrative centers at state level, or counties of normal size, or fairs at which people from surrounding areas traded with one another, or just a small wharf, after the excavation of the canal, they directly completed their "urbanization", quickly becoming big cities of considerable size or with center significance. Their fate was so closely tied to the ups and downs of the canal, the unobstructed canal meant the prosperity of the city, while the silted canal meant the decline of the city, "canal city" seems a title tailor-made for them. Tianjin, Linqing in Shandong Province, Huai'an in Jiangsu Province all are representatives of this type of city.

Even if all cities were enjoying business opportunities brought about by the canal, each city's location selection, construction, development and the trajectory of its decline also had subtle difference. Tianjin used to be a coastal wasteland, the rules of the Ming Dynasty (1368-1644) set three garrisons in this place with cramped area and unfavorable conditions for city construction: Tianjin Garrison, Left Tianjin Garrison and Right Tianjin Garrison and then constructed Tianjin City. This city has a low-lying terrain and has been destroyed by rush of water for many times, however, whether grain transportation by sea or by river, this was the only way which must be passed when entering into Beijing. The

construction of Tianjin was due to its strategic position as Beijing's throat, while the city's continuation and prosperity out of ceaseless floods is inseparable from the feeding of the canal. As compared with Tianjin, Linqing has no such strong military color, the city's location selection was more dependent on convenient transportation provided by the canal. Before the excavation of the Grand Canal, Linqing had been prefecture and county, the seat of local government had been constantly migrated, and there were no city walls to defend. As the node of canal cutoff, Linqing City had been gradually settled at the intersection of Yuhe River, Weihe River and Huitong Canal and rapidly escalated from county to state, witnessing dramatically increased scale and population expansion, it was the largest commodity distribution and trade center for cotton, silk, food and other goods in North China. The earliest Linqing City constructed was not to defend city residents and buildings but supplies and grain depots; later the City expanded was laid out along the canal, commonly known as Jade Belt City, with no square and structured appearance of those traditional northern cities at all. Linqing City, with its unique city pattern and leap-forward economic development, was completely a wonderful flower blooming on the vines of the canal, it was so heavily dependent on the canal, with the passing of seasonal grain transportation, the city immediately became bleak and stagnant; once the canal was abolished or diverted, the city would decline at a more alarming speed. While the situation of Huai'an City located at the intersection of the canal and the Huaihe River is between Linqing and Tianjin. Huai'an guarded the strategic position of the Huaihe River, except in the times of north-south split, it was not a special military city, so it had more freedom on location selection - in case of watercourse shift or serious flood, the City could be built in another place. The initial motivation for the construction of Huai'an City came from the intersection of the Huaihe River and the Hangou Canal, due to the existence of natural waterway, the restriction of city development by the canal was not as strong as Linqing. As a canal city, its rise and fall would naturally be affected by ups and downs of the canal, but had certain path to follow. The city form presented by Huai'an City is also between Tianjin and Linqing, that is, the city of Huai'an with solid defense guarding the intersection of the Huaihe River and the canal on the one hand; and the town freely developed along with the excavation of new canal for grain transportation on the other hand, the two centers of the city have developed in parallel without mutual interference.

Canal cities like Tianjin, Linqing and Huai'an have neither political importance on a par with the capital nor solid economic foundation as the cities in South China, they have developed almost entirely relying on convenient transportation brought about by their own location and the canal. Canal cities as important nodes of grain transportation by water were stationed with a large number of officials responsible for grain transportation, technicians, laborers working on river engineering projects and boatmen, the consumption of these population promoted the development of accommodation, catering and brothels, but did not bring real industry to the city. To a certain extent, the Grand Canal has long been a seemingly thriving yet actually deformed prosperity.

The word "city" contains two meanings. The original meaning of "Cheng" is city wall, the main purpose of which is defense. While "Shi" is the place where people are engaged in trading activities. For most of the cities in ancient China,

defense was an important reason for and basic function of city construction, as dominated by natural economy, the city's trading function was not so prominent. While the excavation of the canal broke such rigid situation and promoted the circulation and communication within the city and among the cities. The Grand Canal was actually a super banded market shared by canal cities, this super market stimulated the city's commodity economy and was the river of wealth.

Cultural and technical exchanges are behind commodity exchange. The canals excavated in the early Tang Dynasty (around 8th Century) greatly promoted the communication of advanced production technology and culture from the North to the South. In the Ming (1368-1644) and Qing (1644-1911) Dynasties, the technologies, life style and cultural fashion in the regions south of the Yangtze River were flowed to the North along with the commodities, which had not only been pursued by the royals, but also gradually affected every aspect of life of ordinary people. Not only that, the Grand Canal connected "silk road" on the land and "silk road" on the sea, canal cities were an important window for cultural exchanges between China and the world in addition to coastal ports. Marco Polo held an official position in Yangzhou for three years, he also had been to Suzhou, Hangzhou and gone northward to Dongping and the Great Capital, the orient's richness and prosperity impressed the Europeans of his age deeply through his spreading. During the reign of Emperor Yongle of the Ming (1368-1644) Dynasty, The King of Sulu from the Philippine Islands traveled far away across the sea with his family and followers to arrive the Great Capital after they landed in Hangzhou and went northward along the Grand Canal and received warm hospitality by the emperor of China. On their way back, the King of Sulu fell ill and never recovered in Dezhou, not only his bones were kept in Dezhou, part of the royal descendants have lived there so far, which has become a much-told story about friendly exchanges between China and foreign countries.

From commodities, technologies and cultures, what should not be ignored are great changes brought about by the canal to a city's construction mode and operation mechanism as well as the ideology of city residents. The primary function of China's traditional political center city is to radiate and stabilize the reign of empire, while the cities in the modern sense are characterized by the exchange of goods. This is not only the difference between ancient China and modern China, for the cities along both banks of the canal, this is also the difference between the South and the North. Canal economy had given rise to a group of cities and towns no longer with administration and defense as the first priority but giving priority to the development of commercial and service sectors like Linqing, bringing business tradition from the South to the North, which undoubtedly contributed to the transformation of Chinese cities to the cities in the true sense. City life was no longer closed, preservative and self-sufficient as it was in agricultural society, but full of openness and diversity, people's idea had also been gradually changed, they no longer believed that going into business and the pursuit of profit was a kind of deal serving personal interests through trickery, doing business had been seen as an enviable career making a fortune by relying on one's diligence and wisdom and even securing an official position. Businessmen possessed natural resources and human resources as much as possible and expanded the scale of production as far as possible so as to create

more material wealth as possible, such “restless” Faustian spirit is actually the main embodiment of vitality and creativity in city. In this regard, canal cities by relying on their own vast geographical advantages had made great contribution to the development of the society in ancient China.

Along with canal cities, the Grand Canal is not only a lifeline for resource flow, a bridge for cultural exchange, but also an organism for closer communication in the broader dimension. In the early years after the Emperor Yang Guang ascended the throne, China had just been reunified after long-term north-south split, a grand idea brewing in the mind of this canal builder was to let each of the provinces under his rule be reached by waterway and to achieve grand unification of the empire in the true sense both formally and spiritually. Today, when evaluating the Emperor Yang Guang’s merits, this original ideal of his should not be neglected, this ideal has finally become a reality from all aspects from basic necessities of life to the nerve endings of thinking in the operation of the canal and canal cities by later generations over one thousand years.

3.2.1. Beijing city

Located in the northernmost of the Beijing-Hangzhou Grand Canal, Beijing is the national capital with a founding history of more than 860 years. The development history of Beijing City can be traced back to Ji City, the capital of Yan State of the Western Zhou Dynasty in 1046 BC, with more than 3,000 years of history so far, it had been a place of strategic importance in North China and the capital of local authorities since the Qin (221BC-206BC) and Han (206BC-220) Dynasties; Its history as national capital can be counted from the establishment of Middle Capital of Jin (1115-1234) in 1153, with a founding history of 860 years so far, the city construction and waterway construction of all periods had mutually promoted and complemented each other.

In additional to relying on Beijing’s natural geographical advantage and landscape environment, the emperors of different dynasties also carefully carried out the planning and construction of artificial environment. The Grand Canal excavated was directly connected to Beijing and became the lifeline of the capital for grain transportation, with urban construction and channel construction being developed in parallel, advanced water conservancy technique, systematic water management ability and magnificent urban planning practice were integrated in a comprehensive way, the Grand Canal and the City’s water system led to the prosperity along the Canal, with landscape system and water system existed in parallel. Through hundreds of years of accumulation, this capital model characterized by profound royal culture and beautiful landscape environment has finally come into being, which was praised by the American planner Edmund Bacon as “the greatest single work of human being on earth” and also called by the Chinese architect Liang Sicheng as “great masterpiece of urban planning” ..

3.2.1.1. The Grand Canal and the Consolidation of Beijing’s Position as Political Center

Before the Sui (581-618) and Tang (618-907) Dynasties, the canals excavated

in Beijing and North China were used for military expansion and as water channel for grain and soldier transportation. After the Jin (1115-1234) and Yuan (1279-1368) Dynasties, the traffic and water conservancy system of the North and South Canal had become an important backing for northern regime to gain a firm foothold in Beijing and to march into the Central Plains. Since the Jin Dynasty moved the capital to Beijing, large population, huge bureaucracy and luxury palace life required multiplied goods and materials to be transported there, every year, millions of dans of grains and various materials were continuously collected and shipped to Beijing from South China and the regions south of the Yangtze River. Under the historical condition at that time, water transportation was the way more convenient and labor-saving than land transportation. During the Jin Dynasty, Zhahe River was once excavated to connect Touzhou and Middle Capital of Jin, in the early years of the Yuan Dynasty, Bahe River and Jinkou River were also utilized for grain transportation, however, due to the restriction of water source, these transportation channels gradually could not meet the increasing transportation needs. In 1293, designed and led by Guo Shoujing, the famous Tonghui Canal was excavated in the Yuan Dynasty (1279-1368), which not only brought unprecedented water sources to the Great Capital, but also made all sections of the North-South Grand Canal from Hangzhou to Beijing joined up. Since then, the ships used for grain transportation from the regions south of the Yangtze River could reach directly to the capital by going upstream via Tongzhou.

Thereafter, Beijing as the capital of the Ming (1368-1644) and Qing (1644-1911) Dynasties was still dependent on the supply of this Canal, just because of water source reduction and water system pattern change, the end terminal was moved out of the City. That is to say, starting from the Jin (1115-1234) and Yuan (1279-1368) Dynasties, the water source in Beijing area should satisfy a new function - water transportation of grain to the capital. Water transportation of grain to the capital was Beijing's top priority, which sustained Beijing's economic lifeline. With this lifeline, the stability of the City and normal exertion of Beijing's political function could be reliably guaranteed, otherwise, the consequences would be severe. As recorded by the Memoir of Ming Dynasty, in June 1470, severe flood occurred around Beijing area, refugees poured into Beijing to earn a living. Water transportation of grain to the capital was interrupted due to the flood, which further exacerbated the rising of grain prices in Beijing, forcing the court to repeatedly put grain reserves into the market to stabilize commodity prices, crack down the grain hoarding of profiteering merchants for speculation and punish corrupt officials for their inefficient relief. Part of students were given days off, military forces from Middle District, East District, West District, South District and North District were sent to expel tens of thousands of wandering monks to their native places in order to reduce grain consumption by the population in Beijing. Material support was just the foundation of social stability, the excavation of the Canal further enhanced the communication of imperial decrees and the control over the whole country, and was also a new channel to reflect the political influence of the government on the areas along the Canal. The capitals of the Yuan (1279-1368), Ming (1368-1644) and Qing (1644-1911) Dynasties with vast territory were all located in northeast China, and with the Grand Canal, there would be a channel to strengthen north-south link and timely control social dynamics in the regions south of the Yangtze River.

3.2.1.2. Role of the Grand Canal in Shaping the Cultural Center of Beijing

The role of the Grand Canal to the cultural center of Beijing is mainly reflected in promoting the external dissemination of Beijing culture through the Grand Canal as well as cultural exchanges with southern scholars in Beijing, boosting the formation of Beijing's cohesion and communication capacity of Chinese culture and shaping Beijing's geographical and cultural characteristics. The Grand Canal is not only a bond to strengthen the country's political unity and economic ties, but is also a cultural bridge among the five major river systems in China. Through it, such things are made possible as a wide range of personnel exchange, books circulation, promotion of production technology, dissemination of art and ideas, and interaction and fusion lifestyles and social practices, which helps spread the capital culture throughout the country and also makes Beijing absorb local cultural elements, thereby making Beijing a cultural center leading cultural trends and radiating its cultural influence across the country. There are numerous examples in this regard.

In the Yuan (1279-1368), Ming (1368-1644) and Qing (1644-1911) Dynasties, Beijing was both the site of the national highest-level educational institutions, but is also the place where the metropolitan examination of the imperial examination system was held. It's a best opportunity for common scholars and intellectuals from the South China to make success in career by sitting for the examination at the capital city. A lot of them went northward to Beijing along the Grand Canal and produced a good many gorgeous travel notes and poems during their journeys. For example, as a famous historian of the late Ming and early Qing Dynasties (around 1644) and the author of *Guo Que* (the Book on History of Ming Dynasty), Tan Qian in 1653 went to Hangzhou from Jiaying Zhejiang in his capacity of an assistant to a ranking official, and then left Hangzhou for Beijing by boat along the Grand Canal. In 1656 when returning to Hangzhou, he still took the boat along the Grand Canal. *North Tour Notes* recording the journey of Tan Qian depicts the geographical scenery along the Canal, his visits to books collectors in Beijing, the study of the historical relics, and exchanges with the local gentry and literati, which serves as the valuable information for the people today to explore the local conditions and customs both along the Canal and in Beijing during the Ming (1368-1644) and Qing (1644-1911) Dynasties, and is also like a mirror to reflect the cultural life of the capital at that time. Historically, there were countless writers and scholars like Tan Qian coming and going frequently along the Grand Canal, who had produced innumerable cultural works about the Canal and Beijing and have played an immeasurable role in spreading and influencing the culture. In the Yuan, Ming and Qing Dynasties, a number of government officials and scholars, especially influential officials going to the Capital from the south, loved to build private gardens at southern Capital City, thus resulting in the rise of the flower industry at the southern Capital City. This is attributable to the opening of the Beijing-Hangzhou Grand Canal to some extent, for it's more convenient to transport potted bonsais, timbers and building stones. As a result, the lifestyle and environment of southerners can also be copied from onboard.

3.2.1.3. Influence of the Canal Culture on Beijing Regional Culture

As the north-south axis connecting local cities with China's political and economic center, the Beijing-Hangzhou Grand Canal has given birth to numerous world-famous cultural attractions and unique cultural customs, which is a unique belt-shaped or linear cultural system of Chinese civilization. With the huge, complex cross-regional water projects as the carrier, it's the fruit resulting from the combined interaction of social, economic and natural environment and other factors. It varies with the different flowing regions, thus marked with different geographical characteristics, which also takes on the appropriate characteristics of the corresponding industries due to the impact of the industry factors. The canal culture can be divided into tangible culture and intangible cultural in the two parts: the tangible culture includes the canal waterways, docks, transport ships, warehouse field, dams, government offices, towns and so on; the intangible cultural includes the names of drainage canals, names of related places, water transport system and its management methods, water conservancy technology and previous experience and intelligence, related historical figures and historical documents, customs, slangs, folk art, folk legends and stories and so on. The formation and development of Beijing Canal Culture is closely linked with the opening and prosperity of the Beijing-Hangzhou Grand Canal. As early as in the Yuan Dynasty (1279-1368), with the construction of Tonghui River and Haizi Pier, the places at the both sides of the Canal became the economic and cultural center of the Great Capital. In addition, there appeared business streets and cultural scene with quite distinctive blending between the north and south cultures with the waterway characteristics. The traditional commercial pattern at the area from Tiananmen Square to Gulou, and the style of the wharfs and waterfront marketplaces neighboring Shichahai have still remained today.

The prosperity of water transport led to the development of numerous cities and towns along the Grand Canal. As the water transport hub and the gateway to Beijing, Tongzhou was particularly typical of the canal culture. In the Ming Dynasty (1368-1644), Tongzhou City was expanded with brickwork exteriorly and clay interiorly, which included the West Warehouse and Southwest Warehouse of the Grand Canal, where the troops were also stationed for guarding purpose. Tongzhou City in the Qing Dynasty (1644-1911) appeared more majestic, where there were more than 20 government office buildings of all sizes, including the provincial-level government office, the government office of warehouse governor, the government office of Tongshuidao, the government office of provisions and funds for the troops under the Ministry of Revenue, the government office of water transport and the Grand Canal warehouses supervision office. Moreover, it's full of shops and stores at the main streets and small alleys. As a member of British mission visiting China in the 18th century, Staunton made the description as follows: "for a lot of the houses in Tongzhou, the front parts of the houses were used as shops and workshops while the back parts were used for living rooms; the business there was especially booming"; the street shops were marked with colorful signs, where there were extremely rich varieties of goods, including tea, textiles and porcelains from the south, fur products from Mongolia, traditional Chinese herbs from the Northeast and even cloth from the western countries..... The Korean called Pak chi-

won (Pu Zheyuan) arrived in China over the same period and described the Tongzhou then as follows: "when disembarking and going ashore, the road was crowded with carriages and horses, and so the walkers had difficulty in stepping forward.... there were tens of thousands of wheelbarrows at the 5-li-long street from East Gate to West Gate, with little space left... in terms of magnificence and complexness it's obviously superior to Shengjing (Mukden) and Shanhaiguan. The people just walked forward little by little with great effort. There was a plaque of the gate, reading Wansouyunji (ten thousand of sailing ships gathered here) and there was one two-storied building on the main street, whose plaque read Shengweijiutian (the reputation is far-reaching). Outside the city there were three granaries looking like a castle. "In the Ming (1368-1644) and Qing (1644-1911) Dynasties, in addition to the regular expansion and renovation of waterways, docks and other facilities, a complete water transport system was also established, including water transport governor (another name is Cao Tai called in the Qing Dynasty), water transport organization, the tribute rice system and grain storage system, to further improve and play the roles of the Canal. The grand sight of numerous sails gathering there like clouds in the sky on Tonghui Canal, and the lively scenes of Datongqiao Wharf and Tongzhou Wharf were once an important symbol of the capita culture.

The rise of the railway transport in the late Qing Dynasty (around 1900) replaced the role of the Canal, but also led to the downturn of some cities and towns along the Canal. Despite this, the Grand Canal flourishing in the Yuan (1279-1368), Ming (1368-1644) and Qing (1644-1911) Dynasties, has also left Beijing a rich historical and cultural heritage and also added some distinct characteristics to Beijing's regional culture. For example, the renowned historical monuments and traditional street pattern at the neighborhood of Shichahai at Xicheng District, and the remaining storehouse sites, dams and docks along Tonghui River at Dongcheng District and Chaoyang District are all the important carriers of the canal culture since the Yuan Dynasty (1279-1368). The numerous storehouses of all sizes once arranged along the Canal have become the precious tourism resources of Beijing. Although some only remain in the names of the streets or alleys, they have still become invisible footnotes to the history of Beijing.

As the northernmost point of the Grand Canal, Beijing has not only provided a driving force for the formation of the canal culture, but has also incorporated many elements of the canal culture in its own development, thus shaping an inclusive, accessible, open and gathering urban style. Today, though the Canal is no longer an important player in transport, as a history gallery of Beijing it still continues to play a huge role in the cultural arteries and is well worthy of being cherished and protected.

3.2.2. Huai'an City

Of the many cities along the Beijing-Hangzhou Grand Canal, Huai'an City is known as the "Capital of the Canal." It is the starting point of the ancient Hangou River and has the world's oldest navigation lock. In the Ming Dynasty (1368-1644), the officials harnessed the rivers here and invented the world's leading river-harnessing technology in advance of 300 years. This is also the

site of the Palaces of Water Transport Governor and River Governor in the Ming (1368-1644) and Qing (1644-1911) dynasties. In addition, the Qing Emperor once personally directed how to tame the rivers at the city for several times on his southern tour. As an important line of water transport and salt transport, Huai'an is the national command center of water transport, the river-taming center, food storage and transportation center, salt tax center and transport ship manufacturing center, which is jointly known as "Four Major Cities along the Canal", together with Yangzhou, Suzhou and Hangzhou.

Huai'an is located in the hinterland of North Jiangsu and the downstream of Huaihe River, and the Huaihe River dividing North and South Parts runs through the city. To the west, there is the domestic fourth largest freshwater Lake of Hongze Lake, to the south Gaoyou Lake, to the east it's near the Yellow Sea, and to the North it's connected to Suqian and Lianyungang Cities. Here the Sishui River flows into Huaihe River. It's marked with the dense waterway network and crossing of rivers and lakes. Here is the intersection of Beijing-Hangzhou Grand Canal with Huai River running through the city. With the unique geographical location and abundant rich water resources, Huai'an is destined to be a canal-born city. As an important node in the Grand Canal application for the list of world heritage, Huai'an City boasts two heritage areas, 1 river section and 5 heritage spots included in the application.

3.2.3. Yangzhou City

Located at the southern end of Jianghuai Plain and at the north of the Yangtze River, Yangzhou City is the communications hub connecting the Grand Canal to the Yangtze River. Yangzhou is China's famous historical and cultural city, and is also the most representative canal city along the Beijing-Hangzhou Grand Canal. Possibly, it cannot be verified where is the starting point of the Great Wall. However, there is no doubt that the first excavation shovel of the 1,800-kilometer-long Grand Canal is made in Yangzhou. In this sense, Yangzhou is a city having the same age with the Grand Canal and is the historical origin of the Grand Canal.

As early as in the Eastern Zhou Dynasties (772BC-256BC), the canal even began to be constructed in Yangzhou. At that time, one emperor hoped to defeat another state in the downstream of the Yellow River, but he needed to solve the problem of transporting troops and army provisions, so he ordered the excavation of Hangou River – an important waterway linking the Yangtze River to Huaihe River. Although Hangou River was originally excavated only for the political and military purposes, it plays a significant role in promoting the economic development of Jianghuai Region. Before the excavation of Hangou River, the ships from the Yangtze River basin to the Huaihe River and Yellow River basins could only sail across the seas. But there were often huge waves which could capsize ships, leaving passengers and sailors dead and the goods drown; so, Hangou River is a good solution to this problem. Of course, as for the level of technology in the Spring and Autumn and Qin and Han Periods, there were still such problems as insufficient water source and some sharp and dangerous beaches. But with the waterway transformation in the subsequent dynasties, these problems were solved gradually, and especially after the Song

(960-1279) and Yuan (1279-1368) Dynasties, the economic role of the Canal was played to the maximum extent. Therefore, in the Ming (1368-1644) and Qing (1644-1911) Dynasties the spectacular prosperity of Yangzhou was closely tied to the economic contribution of the Canal.

In the China Grand Canal Application for the List of World Heritage, the 31 heritage zones presents a total of 27 river sections and 58 heritage spots, of which a total of 6 river sections and 10 heritage spots on the Yangzhou Part of the Huai'an-Yangzhou Canal are included in the Application.

3.2.4. Suzhou City

Today, Suzhou Part of the Grand Canal belongs to the Jiangnan section of the Canal and accounts for 4.5% of the total length of the Grand Canal and 24% of the total length of the Jiangnan Canal. Suzhou Section of the Grand Canal was first excavated in the 6th century BC, which came with the establishment of the city of Suzhou. When then built, the city set up 8 water and land walls respectively, with the moat outside and the waterways inside, and the Watergate is the gateway switch to link and control the inside and outside waterways. The outside river to link the inside waterways through the Watergate is the earliest predecessor of the Canal. In 495 AD, for the sake of seeking the hegemony of the north China, the emperor then ordered the construction of Jiangnan Canal ranging from Suzhou to the Yangtze River, with a total length of 170 kilometers, which is the oldest digging part of the Jiangnan Canal of the Grand Canal.

The old town river section of Suzhou was formally incorporated into the Grand Canal system 1,000 years later. In the early 7th century, the Emperor Yang of Sui Dynasty (581-618) ordered the digging of Jiangnan Canal through the full use of the existing river built from the Eastern Zhou Dynasty (772BC-256BC) to the Qin (221BC-206BC) and Han (206BC-220) Dynasties. The 30-meter-wide Canal stretched over 400 kilometers from Zhenjiang City to Hangzhou City. As an important part of the Jiangnan Canal, the Old Town River Section of Suzhou was then formally incorporated into the Grand Canal system.

The Suzhou-affiliated Jiangnan (the region south of the Yangtze River) has always been a powerhouse of grain, and the food and water transport needs relying on the Suzhou's dense waterway network, which has also made Suzhou become the food storage and transshipment hub: the produced food is first shipped to Suzhou granary for storage and then is transported to the northern places. So, Suzhou has become an important national center of food gathering, storage and shipment.

The Grand Canal not only promotes the regional economic development, but also becomes a river of history. After millions of years of accumulation, Suzhou Section of the Grand Canal has retained numerous cultural relics, which is rare even in the world in terms of the quantity, the types and high-value of such relics. Of them, the nine gardens are included on the World Heritage List and the six projects are inscribed on the Directory of World Intangible Cultural Heritage. Moreover, up to 690 tangible cultural heritages and 118 intangible cultural heritages there are under the National Registration and protection,

which are among the best in the country. These historical and cultural sites and relics are closely linked with the Grand Canal.

3.2.5. Hangzhou City

Hangzhou is located at the Qiantang River estuary, the west end of Hangzhou Bay, the south wing of the Yangtze River Delta, the southern edge of the Taihu Lake Basin, the southern end of the Grand Canal and the starting point of Zhedong Canal. Looking back to 2000-year-old history of its development path, Hangzhou City is always closely tied to water, which can be described as ‘the building by water and the flourishing through water’. Before the opening of the Sui-Tang Grand Canal, Hangzhou had achieved the economic and cultural development to a certain extent, but its position was not prominent. With the opening of the North-South Grand Canal and the formation of the Zhedong Canal and Zhexi Canal, Hangzhou started to make fast and diverse economic and cultural exchanges. As a result, Hangzhou’s political and economic status began to rise rapidly; At the same time, by means of Hangzhou the Grand Canal also rapidly extended its influence to the Yangtze River region and the wider south China, eventually making Hangzhou become a very important canal city with the dual function of being a river port and sea harbor, and the most beautiful ending of the Grand Canal flowing south from Beijing.

Hangzhou has a long canal-digging history and dates back to 10th Century, which is one of the earliest canal-digging regions in ancient China. Since the ancient times, the Hangzhou-affiliated Taihu Lake Basin has been always full of small and medium-sized lakes and dense water networks, thus resulting in very convenient water transportation. Since the Eastern Zhou Dynasties (772BC-256BC), the people in Yue State were passively familiar with such aquatic life. Moreover, the people in Yue State and Wu State began to transform the rivers actively and build canals in Taihu Lake basin as the transportation corridors between Wu and Yue States, perhaps because of the lacking north-south natural waterways in the region, perhaps for the purpose of transporting salt, grain, and other goods, perhaps for the sake of balancing the water volumes between Taihu Lake and other waterways, or more possibly out of the feudal hegemony and political demands.

1400 years ago when Emperor Yang of Sui Dynasty (581-618) succeeded to the throne, the Tongji Canal, the Hangou Canal, the Yongji Canal and the Jiangnan Canal were excavated one after another, and the South-North Grand Canal was thereby formed, with the east capital of Luoyang as the center, ranging from Zhuojun in the north to Hangzhou in the south. As a result, as a starting point of the Zhedong Canal, Hangzhou also became the south starting point of the South-North Grand Canal, of which the traffic was more convenient and the geographical position was more important. In a wider region, Hangzhou established a link with Taihu Lake, Yangtze, Huaihe and Yellow River Basins and even had more convenient exchanges with overseas countries. As a result of such convenient transportation and economic development, Hangzhou's political status was also improved and consolidated. Since the Tang Dynasty (618-907) and to this day, the Grand Canal has always been maintaining the stability and prosperity of Hangzhou City, making the regional administration

center of Hangzhou remain unchanged.

The Grand Canal was built and connected in the Sui Dynasty (581-618) and actually generated benefits in the Tang Dynasty (618-907). In the Tang Dynasty, Hangzhou Section of the Grand Canal was further improved: at that time the canal management system was established, and the docks, bridges and other facilities along the Canal were further improved, which also made the Grand Canal flow long and unobstructed in the territory of Hangzhou. The unobstructed Canal in turn played a big role in ensuring the driving sustainability of the social and economic development. In the Tang Dynasty, Hangzhou City achieved further prosperity: the waterway transportation in Hangzhou City was under progressive development, the majority of the residents lived by the Canal and its tributaries, the local population was expanding, the water transport and traffic-related industries were gradually developing, and the porcelain, silk, shipbuilding and other handicrafts sectors were growing fast, thus making the local business in full swing. At that time, overseas merchants landed from Ningbo and then reached Hangzhou by means of the Zhedong Canal. In this way the overseas trade had also achieved the initial development.

In 1281, the Yuan Government launched the renovation project of the Grand Canal by digging the Jizhou Canal, the Huitong Canal and the Tonghui Canal, and dredging the existing the North Canal, the South Canal, the Huaiyang Canal and the Jiangnan Canal, to contribute to the formation of the Beijing-Hangzhou Grand Canal linking the Great Capital in the north to Hangzhou in the south directly, thus shortening the distance of more than 700 kilometers from Hangzhou to capital. Because of the shortened sailing distance, more goods and long-distance transport needed the transit shipment of Hangzhou. Therefore, Hangzhou became the famous port then, and was gradually well-known to the people abroad. For example, the famous Italian traveler Marco Polo praised Hangzhou as "the most beautiful and luxurious city in the world" and a lot of Arabs also regarded Hangzhou as the world's most beautiful, prosperous and magical city.

The canal system of Hangzhou in Ming (1368-1644) and Qing (1644-1911) Dynasties basically followed the pattern of the Yuan (1279-1368) Dynasty. Although then Hangzhou was caught up by its neighbors such as Nanjing, Suzhou and Yangzhou, Hangzhou was still a key city in Southeast China. Hangzhou maintained the steady expansion of the city and its economy, where the trade and commerce became a tradition of the city. Trade and commerce spawned the development of handicrafts, such as silk as one of Hangzhou specialties. In the modern times, the technological innovations of the handicraft industry gave birth to the national capitalism industry. In the period of the Republic of China (1912-1949), Hangzhou already became a significant city centering on the light and textile industries, with the combination of handicrafts industry and commerce, where a group of the modern factories emerged at the both banks of the ancient Canal, showing a fresh thriving look of the Canal.

3.3. Intangible Cultural Heritage

In 1985, China joined the Convention Concerning the Protection of the World Cultural and Natural Heritage. From then on, China has strictly fulfilled the obligations and responsibilities set forth in the Convention, and accepted the constraints and protection under the Convention. In 1999, China was elected as a member of World Heritage Committee. Between 1987 and 2016, China had 50 world-class heritages selected into World Heritage List, including 35 cultural heritages (containing one shared by Kyrgyzstan and Kazakhstan), 11 natural heritages, and four cultural and natural heritages. In terms of the total number of heritages, China ranks second in the world, and is second only to Italy (51 heritages) and the country with the largest number of heritages worldwide, the highest protection strength and fruitful protection achievements.

Intangible cultural heritages are a very important component of the world heritages, and refer to a culture form that exists in a non-material state, is closely related to people's lives, and has undergone long-term and effective inheritance. As people-oriented living cultural heritages, they specially emphasize the dominant role of intangible elements, such as human skills, experiences and spirits, in cultural heritages. In addition, they are also living and changing cultural heritages.

3.3.1. General Description of Intangible Cultural Heritages

3.3.1.1. Definition and Classification of Intangible Cultural Heritages

The “intangible cultural heritage” means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity. For the purposes of this Convention, consideration will be given solely to such intangible cultural heritage as is compatible with existing international human rights instruments, as well as with the requirements of mutual respect among communities, groups and individuals, and of sustainable development.

The “intangible cultural heritage” is manifested inter alia in the following domains:

- (a) Oral traditions and expressions, including language as a vehicle of the intangible cultural heritage;
- (b) Performing arts;
- (c) Social practices, rituals and festive events;
- (d) Knowledge and practices concerning nature and the universe;
- (e) Traditional craftsmanship.

3.3.1.2. Intangible Cultural Heritages and Chinese Cultural System

China covers 960 square kilometers of territory, and spans across climatic zones—tropical, temperate and frigid climate zone, with multiple climatic characteristics of oceanic climate, inland climate, plateau climate, grassland climate and desert climate. During the long historical development process, it has formed differential and diverse cultures with distinct characteristics. China is a populous country, multi-ethnic nation and one of the four great ancient civilizations and countries with the richest cultural heritages in the world, with a 5,000-year recorded history of civilization.

In May 2001, UNESCO announced the first batch of “representative works of human oral and intangible heritage” in Paris, France, which contains China's art of Kunqu Opera. By 2013, China had 30 items selected in “the list of representative works of human oral and intangible heritage” by UNESCO, and seven Chinese items, including traditional Chinese timber arch bridge construction technique, selected in the “list of intangible cultural heritage under emergency protection”, thus becoming the country with the largest number of selected items in the world.

The profound and brilliant traditional Chinese culture boasts world natural and cultural heritages, such as Great Wall, Mausoleum of the First Qin Emperor, imperial palaces and imperial mausoleums of the Ming (1368-1644) and Qing (1644-1911) Dynasties, three major Buddhist grottoes, Suzhou gardens, Huangshan Mountain, Taishan Mountain, West Lake, and Summer Palace, Quintessence arts, like Kunqu Opera, Guqin and Peking Opera, as well as intangible cultural heritage essences, such as silk weaving, porcelain firing, Dragon Boat Festival customs and Goddess Matsu customs. In fact, China's intangible cultural heritages and tangible cultural heritages, like meridians and parallels, are interwoven together into a rich and colorful Chinese culture, and vividly portray a giant image of China as an oriental ancient civilization.

3.3.1.3. Intangible Cultural Heritage of Beijing-Hangzhou Grand Canal

China's Beijing-Hangzhou Grand Canal, just like the Great Wall, is reputed as one of the most magnificent top four ancient projects in China. In “Canal Age” with heyday of China's agricultural civilization, Beijing-Hangzhou Grand Canal, as a security line for national unification, economic and traffic artery, main link for cultural fusion, mother river for coastal cities and open river for foreign economic and cultural exchanges, played an inestimable historical role. Beijing-Hangzhou Grand Canal, as a special living, linear and developing cultural heritage corridor, leaves abundant tangible culture heritages, and profound and extensive intangible cultural heritages.

To provide effective and high-level protection for intangible cultural heritages, efforts shall be made to scientifically and systematically identify and clearly define their specific content.

First of all, the cultural time and space formed by human oral and intangible heritages shall be defined. The so-called time and space of human existence

are not the time and space in the natural state, but refer to the civilized time and space of humans; In other words, humans attach cultural significances to the natural space and time. In human cultures, some cultural forms are based on specific cultural spaces, such as representative folk sacrificial dragon sword, Mazu temples and Tian Hou temples all over areas along canals and coastal areas; Some cultural forms are based on time, like China's Spring Festival, Tomb-sweeping Day, Dragon Boat Festival and Mid-Autumn Festival; In addition, some cultural forms are closely correlated with time and space, such as the "Canal-Opening Day" in Tongzhou District, Beijing, in the "Canal Age". In brief, the cultural time and space are important representations of intangible cultural heritages.

Next, the correlation between the development of human oral and intangible heritages and Beijing-Hangzhou Grand Canal shall be investigated. On the one hand, not all of intangible cultural heritages within the range of visibility of Beijing-Hangzhou Grand Canal are sourced from Beijing-Hangzhou Grand Canal; On the other hand, the direct coverage of the "Beijing-Hangzhou Grand Canal intangible cultural heritage area" shall not be restricted. In this chapter, the formation, heritage and development of the selected intangible cultural heritages are directly or indirectly correlated with Beijing-Hangzhou Grand Canal, with necessary connections in endogenesis, development, evolution and inheritance. On this basis, this chapter focuses on the following six aspects:

First, intangible heritages directly correlated with Beijing-Hangzhou Grand Canal, namely intangible cultural heritages formed during the construction of Beijing-Hangzhou Grand Canal, include traditional reconnaissance and measurement techniques during the excavation of the canal, traditional techniques for building gate dams, reinforcing embankments and blocking breaking, and traditional facility building techniques for water diversion, impoundment and water discharge.

Second, intangible cultural heritages directly correlated with original functions of Beijing-Hangzhou Grand Canal, include traditional manufacturing techniques of canal transportation boats, traditional construction, moisture-proof and mothproofing techniques of canal granaries, traditional waterway transportation techniques of giant logs, and traditional techniques for lockage and dam.

Third, human oral heritages derived from coastal life of Beijing-Hangzhou Grand Canal, include stories, tales, river work songs and boatman songs about Beijing-Hangzhou Grand Canal, folk songs and children's rhymes spread along Beijing-Hangzhou Grand Canal, social customs, etiquettes and festivals derived from Beijing-Hangzhou Grand Canal, and important dialects formed due to Beijing-Hangzhou Grand Canal.

Fourth, performing arts formed, inherited or developed in areas along Beijing-Hangzhou Grand Canal include opera arts, such as Peking Opera, Kunqu Opera, Bangzi Opera, folk arts, like Yangzhou storytelling, Suzhou ballad singing, crosstalk, monochord and storytelling, musical arts, such as Guqin and religious music, and dance arts, like western Beijing peace drum, Tianjin dharma drum and Yuhang rolling lamp.

Fifth, handicraft skills generated or developed under the promotion of Beijing-Hangzhou Grand Canal include Linqing's tributary brick firing technique, Suzhou's gold brick manufacturing technique, Song brocade and other high-grade silk fabric and embroidery manufacturing techniques, jade carvings, lacquer ware and other handicraft manufacturing technique, engraving typography technique, woodblock printing technique, celadon and dark-red enameled pottery firing techniques, Biluochun tea, Longjing tea and scented tea processing and production techniques, as well as Beijing roast duck, Tianjin Goubuli stuffed buns and other food processing techniques.

Sixth, traditional Chinese martial arts, traditional Chinese acrobatics and other representative recreational arts formed, spread or developed in areas along Beijing-Hangzhou Grand Canal.

3.3.1.4. Importance and Far-reaching Significance of Protection of Intangible Cultural Heritages in Beijing-Hangzhou Grand Canal area

Intangible cultural heritages of Beijing-Hangzhou Grand Canal contain characteristic spiritual value, way of thinking, value orientation and artistic quality of the Chinese nation, reflect the vitality and creativity of the Chinese nation, and embody the fruit of wisdom, labors and creations of the Chinese nation. Intangible cultural heritages along Beijing-Hangzhou Grand Canal are an important part of the Chinese culture. During the long history, the canal has not only nourished the body and strength of the Chinese nation, but also cultivated wisdom, spirit and national characteristics of the Chinese nation. Currently, among China's tangible and intangible heritages, many representative ones have been selected into World Heritage List, and become an important part of world heritages and treasures of human civilization.

3.3.2. Specific Categories of Intangible Cultural Heritage Along the Grand Canal

3.3.2.1. Traditional Opera

Traditional opera is among the most important categories of Chinese intangible cultural heritage. There are dozens of types of the Traditional operas emerging and growing along the Grand Canal, including Shaoxing Opera, Pingju, Pangzi(wooden clappers) and Tanhuang as well as Peking Opera and Kunqu Opera. As the two Chinese drama "giants", Peking Opera and Kunqu Opera have both appeared in the "List of the Masterpieces of UNESCO Intangible Cultural Heritage".

As a "National Essence of China", Peking Opera is one of the important symbols of Chinese traditional culture and is a "floating drama" on the Canal; it's marked with clear traces of grass-roots culture, coming from the masses and entertaining the masses; it's the fruit of the aggregation and fission of several dramas, and makes a vivid manifestation of the cultural spirit of inclusiveness and innovative in the Chinese nation; it's featured with a sound theory and

complete system, and is the representative of Chinese and even the Eastern theater system, which is jointly referred to as 'the world's three major performing systems', together with the Stanislavsky System and Brecht Drama System. With its unique charm, Peking Opera attracts a lot of the Chinese audience, but is also accepted and loved by the rest of the world, which has become an important means of introduction and spread of Chinese traditional culture.

The birth and development of Kunqu Opera is nourished by the canal culture. When it comes to such an "Elegant Drama" full of literati feelings and sweet temperament, the great ancient Chinese opera writer Tang Xianzu and his masterpiece Peony Pavilion must be mentioned. In the mid-Ming (1368-1644) Dynasty with the increasing maturity of Kunqu Opera, Tang Xianzu and his great works Peony Pavilion was born. In 2000, Tang Xianzu was chosen by UNESCO as one of "the World's Top 100 Historical and Cultural Celebrities," staying the same place with the British dramatist Shakespeare over the same period, which is the highest praise for the great Chinese dramatist Tang Xianzu and is the full recognition of the artistic value of Peony Pavilion. In 2001, Kunqu Opera was elected by UNESCO unanimously as one of the world's first batch of "Oral and Intangible Heritage Masterpieces of Humanity", to which Peony Pavilion makes significant contribution. Subsequently, years, Kunqu Opera are frequently performed on the stage around the world and has made a great success, to which Peony Pavilion makes a great difference.

3.3.2.2. Traditional Techniques

Among intangible cultural heritages, traditional techniques involve rich varieties and diverse and complicated content, and are closely correlated with people's life. The traditional techniques generated and developed in basin of Beijing-Hangzhou Grand Canal include porcelain firing technique, doskin weaving technique, enamel wire carving technique, tea baking and stirring techniques, traditional Chinese writing brush, ink stick, paper and ink-stone manufacturing techniques and traditional local food manufacturing techniques. These traditional skills are the essence of study and accumulation of laboring people, and visualized, living and artistic embodiments of the Chinese culture, and have a profound influence on our life, customs and culture.

3.3.2.3. Folk Literatures

Folk literatures are the most important component in intangible cultural heritage, including folk stories, legends, speeches and children's rhymes. The generation, reproduction and dissemination of folk literatures reflects local conditions and customs, and moral sentiments of people of a country, nation, region or stage, and their longing and yearning for a better life, reflect the sufferings and happiness of folks, and the friendship, affection and love among people, thus being precious cultural resources of a country, nation and even the world.

Beijing-Hangzhou Grand Canal covers basins of the Haihe River, the Yellow River, the Huaihe River, the Yangtze River and the Qiantang River in Central and East China, where is the most prosperous area with the best-developed transportation, active cultural life of the masses and productive folk literatures;

The folk literatures are a very important component of the Chinese culture. Specifically, many folk tales and legends have been reproduced, developed, spread and circulated in basin of Beijing-Hangzhou Grand Canal to describe the hardship of excavating the canal, people's life along the canal, beautiful love stories along the canal, and the wishes to protect and sustain the canal and pursue a better life.

3.3.2.4. Traditional Acrobatics, Wushu and Quyi

Of the intangible cultural heritage in China, China's traditional martial arts, acrobatics and Quyi (Chinese folk art forms) are an important component. They are the artistic skills and entertainment forms created in human cultural life and recreational activities, and are marked with a strong cultural identity and artistic property. Therefore, the development and protection of such precious cultural heritage shows a noble respect for ancestors' work and life and also expresses reverence for their culture implication.

Traditional acrobatics means that without the help of modern sound, light, electricity and other means, it mainly relies on acrobats' physical skills and techniques to perform actions and items which are difficult or even impossible for ordinary people to do so, such as driving skills, balancing skills on the forehead, animal training, body flexibility performances, wire-walking, trampoline jumping and human pyramids. The cities along the Beijing-Hangzhou Grand Canal, are characterized with numerous docks and wharfs, huge population and developed economy, which are a good breeding place for acrobatics and are also the most important and popular site of acrobatic performance.

Wushu (martial arts) is a means of fighting and the technique of self-defense, but is also a form of physical exercise and recreational activities. In terms of martial arts, fitness or fighting, the physical acts can be divided into such basic movements as pushing, hitting, beating, hacking, stabbing, kicking, jumping, sweeping and wrestling. If the basic movements are organized into a series of actions (called Taolu) in a certain order, such a relatively fixed action series can be called Wushu (martial arts). In the modern times, Wushu has become a cultural representation and an important cultural heritage, of which the existence and development plays a positive role in promoting the growth of Chinese civilization.

In addition, many forms of folk art and entertainment have come into existence thanks to the Canal, which are born and developed at the both sides of the Canal, and are popular in many parts of the country, marked with strong entertainment, exercise and cultural value.

3.3.2.5. Traditional Craft Art

Traditional craft art is a relatively broad field and hard to be classified. According to the classification mode of national intangible cultural heritages, it includes woodcut New Year picture, paper-cut, Thang-ga, wood carving, jade carving, embroidery, fine-toothed comb and miniascape, but excluding traditional painting art, such as traditional Chinese painting, oil painting and

watercolor painting. Because it includes sculpture art, people usually classify miniascape art into cultivation or gardening. Relevant craft arts in areas along Beijing-Hangzhou Grand Canal include New Year pictures, paper-cut, carving, sculpture, embroidery, silk figure, fine-toothed comb and miniascape.

3.3.2.6. Traditional Music and Dance

Music and dance are important instruments for people to learn from the nature, imitate the nature, describe the life and express their emotion, as well as their important artistic forms to express auditory and visual enjoyments, voice and body languages, and thinking and imagination. Music and dance are important components of life, and accompanying and inseparable parts of humans. They are elements of the mixed social and cultural phenomenon, as well as important forms of cultural pursuit and social consciousness.

Traditional Chinese music and dance are an important part of the world music and dance system; Its profound cultural spirit, national characters, aesthetic standard and value pursuit are true and profound portraiture of the Chinese culture. Traditional music and dance in areas along the canal are a representative part and principal content of traditional Chinese music and dance, and reflect the basic characteristics and characters of traditional Chinese music and dance, as well as the quality and characteristics of the regional culture and the canal culture.

3.3.2.7. Folk Customs and Song

Folk customs are an important part of intangible cultural heritages, mainly including Spring Festival, Tomb-sweeping Day, Dragon Boat Festival, Double Ninth Festival and other traditional festivals of the Chinese nation, as well as the Dai people's Water-Sprinkling Festival, Tibetan Show-Dun Festival and other festivals of ethnic minorities. The worship of ancient deities is another important folk form, such as the thousands of years of worship to the emperor in the Chinese nation, and the respect to Goddess Matsu in coastal areas and areas along the canal. Besides, temple fair, national costumes and other folk characteristics have been preserved and spread in the people's life. During the long history of the Chinese nation, ethnic groups have been intercommunicated and interconnected with each other, learned from each other and integrated with each other. Accordingly, many Chinese folk customs are universal nationwide, like Spring Festival and Tomb-sweeping Day. Among them, faith in Goddess Matsu, Canal Opening Festival in Tongzhou District and Dragon Boat Festival are widely influential and relatively unique folk customs in basin of Beijing-Hangzhou Grand Canal.

Folk Songs are a type of oral heritages, but closely correlated with folk customs. In particular, folk songs and children's rhymes in areas along Beijing-Hangzhou Grand Canal are mostly popular in folks, and obviously affected by local customs, architectures, landscape and the canal. Therefore, intangible cultural heritages derived from areas along Beijing-Hangzhou Grand Canal and correlated with folk songs cannot be ignored.

3.4. Geographical Name Heritages In Areas Along Beijing-Hangzhou Grand Canal

Geographical names, as a type of symbol, have profound cultural connotations, carry their geographic entity forms and relevant cultural information, and represent people's happiness, sense of belonging and other irreplaceable cultural value.

Since the 1970s, the cultural traits of geographical names have constantly attracted attention from the international community. Besides, some global geographical name standardization meetings began pay more attention to the geographical name standardization issue from the perspective of culture, and how to strengthen the cultural protection of geographical names.

The international community has been paying more attention to studies, protection and cultural value of geographical names, and setting increasingly clearer requirements for cultural value determination and protection and the protection behaviors. The following process fully reflects the progress:

- In 1987, the 5th United Nations Conferences on the Standardization of Geographical Names (UNCSGN) made the Resolution No.6 that “Geographical names are national culture heritages.”

- In 1992, the 6th UNCSGN made the Resolution No.9 that “As geographical names have important cultural and historical significances, any random change of geographical names will cause loss in inheritance of cultural and historical traditions.”

- In 2002, the 8th UNCSGN made the Resolution No.9 that “Geographical names are an important part of national historical and cultural heritages. Countries that have not taken any action shall be urged to systematically collect geographical names, in order to let the public to know more about the significance of inherited geographical names to local, regional and national heritages and characteristics.”

- In 2007, the 9th UNCSGN made the resolution after negotiating with UNESCO that “In accordance with the Convention Concerning the Protection of the World Cultural and Natural Heritage approved by UNESCO On October 17, 2003, geographical names belong to intangible cultural heritages.” It required all countries to make census statistics geographical names in conformity with the standards of the Convention, recognize them to the senior committee established by the Convention, draft a plan to protect and promote the heritages, and put them into practice.”

- In 2012, the 10th UNCSGN decided to set up the “working group for geographical name heritages”, and made the resolution for the basic principles of cultural heritages of geographical names that the following factors shall be taken into account when determining protection objects of cultural heritages of geographical names:

1. Generation time of geographical names
2. Duration of use of geographical names
3. Cherishing degree of geographical names
4. Memorable characteristics of geographical names
5. Attraction of geographical names
6. Affinity of geographical names

Beijing-Hangzhou Grand Canal is collectively known as the world's most magnificent top four ancient projects with the Great Wall, Egyptian pyramids and Indian Buddhist pagodas. As a linear cultural heritage with a history of more than 2,000 years and length of thousands of kilometers, it involves a large number of historical geographical names; Many of the geographical names carry abundant geographical information and historical and culture connotations of the canal, with strong attraction and appeal. Therefore, the protection and inheritance history geographical names along the canal are an important part in the efforts of protecting intangible cultural heritage of the canal, and so shall draw high attentions.

CHAPTER 4. CHARACTERS AND VALUES

4.1 Heritage Value

4.1.1. The Recognition of Heritage Value

People have a long history in the protection and restoration of historic buildings in European countries. Although this kind of classic restoration didn't have conscious measurement of value, people still had a ambiguous impression of value. Architectures have use value, and also memory value for some specific groups of people. Moreover, some monuments seen as world wonders have universal symbolic values. (Jokilehto J. A History of Architectural Conservation[M]. Oxford: Elsevier Butterworth-Heinemann, 1999)

From the end of 14th Century, people began to notice the artistic value of ancient architectures. The protection on historical architecture reached a peak during the wave of "the romantic restoration" in 19th Century. At the same moment, there rose the conservation which emphasized on the authenticity of the material and the literature value, represented by John Ruskin, William Morris, Camillo Boito, which draw people's attention to the historical value of historic sites. (Jokilehto J. A History of Architectural Conservation[M]. Oxford: Elsevier Butterworth-Heinemann, 1999)

The seeking of values had been throughout all the period of times in the conservation of historical architectures. The evaluations of values is the premise of conservation and preservation, which dictated how people would protect, preserve and take advantage of ancient ruins and Heritages.

Historical architectures, as same as art works, whose values depended on subjective evaluation by human. And it took different forms depending on anxieties of the time. For example, in the restoration project of Notre Dame de Paris in 19th Century, the architect Eugene Emmanud Viollet-le-Duc made several modifications to the existing form of the architecture, included a taller and more ornate reconstruction of the fleche, as well as the addition of the chimeras on the Galerie des Chimères. He also changed the vault to the roman style same as the nave. He stated that the most important evaluation indicator is the value of architecture art, and the medieval style had higher value than the time-mixed style. Viollet-le-Duc wrote that restoration is a "means to reestablish a building to a finished state, which may in fact never have actually existed at any given time."

His design led to fierce controversy and hot debates. In the theory of Ruskin and Morris, the authenticity weighed more than a hypocritical restoration on style and form. Ruskin decried the type of restoration employed by Viollet-le-Duc as "a destruction out of which no remnants can be gathered: a destruction accompanied with false description of the thing destroyed." The attitude focusing on the historical value was inherited and developed in Italy in 19th Century. In 1883, Boito spoke at the 3rd conference of architects and engineers, emphasized that his preservation theories and operation principles were based on the historical values.

During a long time, the historical value was regarded as the highest standard of historical architecture, guiding all kinds of protection and restoration.

With the time developed, the understanding of the values of historical buildings has been extended. Scholars and architects from Italy, France, UK, etc, brought forward their studies on the values of architecture heritages according to their own cultural background, from the use value, the universal value, to the art value, historical value and emotional value. In the theory of Ruskin, he also raised the value of picturesque.

Above all, to protect and preserve a historical building, it is important to recognize its characteristics and values at the first step, and take them as guidance.

4.1.2. The Universal Value of Heritage

After the 2nd World War, the United Nations and the United Nations Educational Scientific and Cultural Organization(UNESCO) were established one after another. At the 9th Session of the UNESCO General Conference held in New Delhi, in 1956, a an intergovernmental centre was proposed for the study and improvement of methods of restoration. Later in 1959, International Centre for the Study of the Preservation and Restoration of Cultural Property(ICCROM) was established in Rome.

From the beginning of 20th Century, some international organizations and conferences kept stressing that cultural heritages had universal values that could be recognized by all human beings. The Athens Charter of 1931, passed by International Congresses of Modern Architecture(CIAM) connected historical values with public interest.

In 1954, 39 nations signed the Convention for the Protection of Cultural Property in the Event of Armed Conflict, stating that cultural heritage had universal value.

International Charter For the Conservation and Restoration of Monuments and Sites passed in 1963 in Venezia, laid the foundation and the principle of conservation in modern time. It mentioned that “People are becoming more and more conscious of the unity of human values and regard ancient monuments as a common heritage. The common responsibility to safeguard them for future generations is recognized.” Human values were set as the basic value of heritage, and according to this, “It is essential that the principles guiding the preservation and restoration of ancient buildings should be agreed and be laid down on an international basis, with each country being responsible for applying the plan within the framework of its own culture and traditions.”

In the further explanation of the universal value of mankind, the Charter referred to three aspects: history, archaeology and aesthetics. After that, the universal value was identified as the guide and basic principle in the cultural heritage conservation all around the world.

4.1.3. The Outstanding Universal Value(OUV) of Heritage

The Convention Concerning the Protection of the World Cultural and Natural Heritage concluded in 192 was the basis for the formation and promotion of the world heritage.

The primary purpose of establishing the World Heritage Lists was to strength the understanding and identification between different states, civilizations and

cultures, and to protect the natural and cultural heritages of all mankind. Starting from this background, it was necessary for the research on the World Heritage theory to establish a credible heritage value evaluation system to provide objective criteria for state parties. The system focused on the reorganization and explanation of Outstanding Universal Value(OUV), and developed a series methods and criteria relating to research on heritage values.

According to The Operational Guidelines for the Implementation of the World Heritage Convention(2015), “Outstanding Universal Value means cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. As such, the permanent protection of this heritage is of the highest importance to the international community as a whole. The Committee defines the criteria for the inscription of properties on the World Heritage List.”

A property will be included in the World Heritage List only if it is considered as having outstanding universal value and therefore satisfies one or more of the selection criteria listed in the Operational Guidelines for the implementation of the World Heritage Convention.

The recognition and protection of OUV are the key problems throughout the World Heritage protection. To be included on the World Heritage List, a cultural heritage should be of outstanding universal value. All the protection measures should pay attention to the elements carrying OUV. For those heritages already included in the list, they are also required to update the explanations of the OUV, to supervise and urge the state parties to follow the management and development of the heritage sites.

Therefore, the research and understanding of OUV is a dynamic process, playing an important role not only in the nomination of the World Heritage List, but also in the management of the heritages on the List.

From the primary purpose of the world heritage, all the properties on the List should reflect the diversity of the global civilization.

In The World Heritage List: Filling the Gaps-an Action Plan for the Future in 2005, ICOMOS put forward three framework to analyze and prepare all the properties in the List and the Tentative List: typological framework, chronological-regional framework, and thematic framework.

A heritage site should be analyzed by the three framework to identify whether it meets the criteria of OUV. Meanwhile, its value should also be analyzed, and compared with other heritages on a global scale to prove that it has a deserved representative.

1) Chronological-Regional Framework

While assessing the value of a heritage site, it's required to put it inside the framework of all the civilizations in world history, examining the representative compared with other similar sites in the Chronological-Regional Framework.

2) Typological Framework

Currently, the typology of cultural heritage has begun to differentiation. The category of monuments □ groups of buildings and sites can be concluded as traditional types, reflecting classical values. Historical cities are also included because they are considered as the extended concept of the groups of buildings.

The cultural landscape, heritage canals, and cultural routes are concluded

as new types, representing the protection theory changes in new ages. They reduced the typology part, instead they tried to express cultural characteristic and cultural meaning deeper from the view of some popular theories, such as anthropology and semiotics.

The relationship of these two typologies is complicated. The new types, like cultural landscape, originated from a deeper explanation of the concept coming from the traditional types. But with development, they overcame the limitations of the times, incorporated the traditional types into their own integrated system tolerantly.

The traditional types can be summarized as single types, while the new type can be a complex classification to express the comprehensive heritage. There's no either - or decision for a site in these types, but coincidences of concepts to some extent, aiming at accommodating more cultural manifestations and representing the most widely accepted values.

3) Thematic Framework

With the development of the global strategy, researchers put forward a non-type dynamic theme theory to embody the diversity of cultural heritage. According to *The World Heritage List: Filling the Gaps-an Action Plan for the Future*, there are nearly a hundred themes. And one property can respond to multiple themes at the same time.

The Thematic Framework is used to judge whether a property fits universal theme that can be recognized by all mankind. Thereby, the explanations of OUV would be based on the global universality instead of the preference of local culture.

The Thematic Framework and the Typological Framework are together applied to the value evaluation of a property. The former one is mainly used to identify the OUV of a property.

Jukka Jokilehto noted that "Identification of the outstanding universal value of heritage sites can only be made through systematic thematic studies, based on scientific research according to themes common to different regions or areas".(Jokilehto J. *What is OUV?_Defining the Outstanding Universal Value of Cultural World Heritage Properties*[M]. Berlin, 2008). He referred that there is a logical correspondence between the theme and the criteria. When a property fits one theme, it could also find the appropriate criteria through the research on the theme.

4. 2 The Value of The Grand Canal of China

4. 2.1. selection criteria for World Heritage List

There are 10 selection criteria for the nomination of the World Heritage List according to *The Operational Guidelines for the Implementation of the World Heritage Convention*(2015):

- (i) represent a masterpiece of human creative genius;
- (ii) exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or

technology, monumental arts, town-planning or landscape design;

(iii) bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared;

(iv) be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;

(v) be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change;

(vi) be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria) ;

(vii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance;

(viii) be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;

(ix) be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals;

(x) contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation.

Operational Guidelines (year)	Cultural criteria						Natural criteria			
2002	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(i)	(ii)	(iii)	(iv)
2005	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(viii)	(ix)	(vii)	(x)

Fig. criteria according to the Operational Guidelines of World Heritage

4.2.2. The Basic Analysis on Values

This chapter will analysis the OUV of the Grand Canal of China, find the unique characters, and analysis the relationship between the criteria and the OUV.

4.2.2.1. Chronological-Regional Framework

Under the ICOMOS Chronological-Regional Framework, the Grand Canal

belongs to “Chinese Empire” of “(Far East) Asia”, from 2nd Century BC to 19th Century. The “Chinese Empire” was considered as one of the five civilizations that had great impacts on a vast area. And there’s no other heritage of waterway having similar chronological-regional properties.

Among the sites on the World Heritage List and Tentative List in China, the heritages with similar theme were compared as below.

Chronological-Regional Framework			The Grand Canal	The Lingqu Canal	The Great Wall	The Dujiangyan Irrigation System	The Silk Roads
IV. Asia 3. East	b. Chinese empire	i) Ch'in empire (255-206 BC), Han dynasty (206 BC – 220 AD), Reunification of China	×	√	√	√	×
		ii) T'ang dynasty, the Sung dynasty (618-1279); Mongol-Chinese rule under the Yüan dynasty (1271-1368)	√	√	×	×	√
		iv) The Ming dynasty (1368-1644), Ch'ing dynasty (1644-1912)	√	×	√	×	×

Fig. The Analysis Form on Chronological-Regional Framework of the Grand Canal and other similar heritages in China

Seen from the above table, there’s a slight difference on the historic period of the Grand Canal and the other four heritages. The Lingqu Canal, the Great Wall and the Dujiangyan Irrigation System represent the achievements of the early feudal empire; the Silk Roads mainly functioned during 7th-13th Century, and had been into oblivion in 16th. However, the Grand Canal had been functioning well from 7th Century until 20th Century, creating huge profits.

4.2.2.2. Thematic Framework

According to the ICOMOS Thematic Framework, the theme of the Grand Canal can be selected as follows.

Thematic Framework	Explanations	Similar Cases
I. B. 1 Expressions of Society / Cultural and Political Associations / Cultural and political identity	The fortunes of the Grand Canal were directly related to the dynasties that waxed and waned. And it was also an important witness to the imperial throne.	The Great Wall
	Associated with the political events in history, such as the emperor's southern tour.	
	Related historical and political events were reflected in some famous art works and literary works.	
II. 12 Transport structures	It is the longest canal in the world, everything is on a gigantic scale. Some traffic facilities were original designed.	Rideau Canal, Canal du Midi
	Some traffic facilities were described in some classic art works.	
IV Utilization of Natural Resources	The design of the Grand Canal as a large scale north-south river, changed the situation in China whose water system had only have natural water from west to east. Connecting the five major river systems, it made full use of natural rivers and artificial channels, extending the inland navigation to most parts of China.	Manchester and Salford (Ancoats, Castlefield and Worsley)
V. D. 1 Cultural Routes / pilgrimage routes, Commercial and trade routes; Heritage routes	The Grand Canal supported the materials circulation and personnel exchanges, promoted the communication between the national political centre and some important cultural areas. It was also a important route of cultural communication between Japan, South Korea and other Asia countries, as well as some European missionaries.	The Silk Roads
	Descriptions about the folk customs of the canal, business, religious communication, can be seen in many classic literary works.	
	The Grand Canal witnessed the development of important commercial cities and the changes in business characteristics.	
V. E. 4 c) systems of transportation / Water transport, navigation, harbors and canals	The traffic system supported many factors and activities keeping the balance of ancient society, such as the disaster relief, maintaining the political operation of the vast state and national defense security.	The mercury and silver routes
	The traffic system was a proof of the changes of the national political and economic structure, such as the capital moving to another place, etc.	

Development of Technologies	The technical system of the Grand Canal represented a masterpiece of integrated technology, such as shipping, water supply, flood control and so on. The technical characteristics of each section are different, on behalf of the rich managerial experience.	the Dujiangyan Irrigation System
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Fig. the theme of the Grand Canal selected from Thematic Framework

Except the third category “Spiritual Responses”, the Grand Canal can respond to other five main themes and some other secondary themes.

Cause the thematic framework was designed to be linked with OUV, the selection of the theme means that the character in this area can be considered as universal or outstanding.

Thematic Framework	Explanations	Similar Cases
I. B. 1 Expressions of Society / Cultural and Political Associations / Cultural and political identity	The fortunes of the Grand Canal were directly related to the dynasties that waxed and waned. And it was also an important witness to the imperial throne.	The Great Wall
	Associated with the political events in history, such as the emperor's southern tour.	
	Related historical and political events were reflected in some famous art works and literary works.	
II. 12 Transport structures	It is the longest canal in the world, everything is on a gigantic scale. Some traffic facilities were original designed.	Rideau Canal, Canal du Midi
	Some traffic facilities were described in some classic art works.	
IV Utilization of Natural Resources	The design of the Grand Canal as a large scale north-south river, changed the situation in China whose water system had only have natural water from west to east. Connecting the five major river systems, it made full use of natural rivers and artificial channels, extending the inland navigation to most parts of China.	Manchester and Salford (Ancoats, Castlefield and Worsley)
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	Descriptions about the folk customs of the canal, business, religious communication, can be seen in many classic literary works.	
	The Grand Canal witnessed the development of important commercial cities and the changes in business characteristics.	
V. E. 4 c) systems of transportation / Water transport, navigation, harbors and canals	The traffic system supported many factors and activities keeping the balance of ancient society, such as the disaster relief, maintaining the political operation of the vast state and national defense security.	The mercury and silver routes
	The traffic system was a proof of the changes of the national political and economic structure, such as the capital moving to another place, etc.	
Development of Technologies	The technical system of the Grand Canal represented a masterpiece of integrated technology, such as shipping, water supply, flood control and so on. The technical characteristics of each section are different, on behalf of the rich managerial experience.	the Dujiangyan Irrigation System

Fig. The Selecting Themes and Explanations

4.2.2.3. Typological Framework

The typology research of the Grand Canal had been a controversial part in the value analysis, because it can conform to a variety of definitions of heritage types. It is a composite type, involving lots of types, for example, Lineal or Serial Cultural Heritages, Culture Routes and Cultural Landscape.

The definition of Cultural Landscape is the "cultural properties [that] represent the combined works of nature and of man." (UNESCO World Heritage Centre. Operational Guidelines for the Implementation of the World Heritage Convention. 2012.) During the development of the definition of Cultural Landscape, scholars classified it into different categories. Besides gardens, organically evolved landscape and associative cultural landscape, it embraces the "landscape designed and created intentionally by man", such as urban historical landscape,

industry landscape and agricultural landscape.

In the Xi'an Declaration in 2005, the definition of setting was combined with cultural heritage types, extended the content of these types, including "the relationship with nature". (ICOMOS. Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas: 15th General Assembly of ICOMOS, Xi'an, China, 2005[C].2005)

In that sense, whether heritage canal or cultural routes, are extended to the surrounding natural environment in the concept. Actually, They had already contained the definition of cultural landscape.

The definition of heritage canals referred that "a canal is a human-engineered waterway"(□Report of the Expert Meeting on Heritage Canals. Canada. September 1994), identifying the feature of transportation.

In the ancient, tangible traffic roads were the precondition of all kinds of cultural exchanges, which evidenced the definition of Cultural Routes, "any route of communication, be it land, water, or some other type, which is physically delimited". (ICOMOS. Charter on Cultural Routes. 2008) Therefore, from the view of the function, canals can be a form of cultural routes. Meanwhile, the definition of heritage canal stated that it may be "the defining feature of a linear cultural landscape, or an integral component of a complex cultural landscape" (□ □), which puts the canal as an important part of the cultural landscape.

The Report also referred to the four important factors to examined the significance of canals as "technological, economic, social, and landscape". Among them, the social value and the economic value are directly related with the traffic function of the canal, that is, related with the definition of Cultural Routes. And the landscape value is related with the definition of Cultural Landscape.

The ICOMOS Charter on Cultural Routes in 2008 referred to five defining elements of Cultural Routes, including the discussion on "setting", "A Cultural Route connects and interrelates geography and very diverse heritage properties, forming a unified whole. Cultural Routes and their setting are related to their different landscapes, natural or cultural, which are but just one of their components and have their own distinctive characteristics and identity depending on the different areas and regions they pass through in their course. The different landscapes contribute to characterize the diverse sections of the Route as a whole, enriching it with their diversity."

The definition also tried to involved all cultural landscape with different characters along the linear area, considering them as important elements of the routes.

Taken altogether, as a typical composite heritage, the definition of the Grand Canal go across the cultural landscape, the cultural route and the heritage canal.

4.2.3. Corresponding to Criteria

The themes of a heritage property have a correspondence to the criteria of OUV. In the analysis of the themes of the Grand Canal, it was possible to compare the value under the Thematic Framework to the criteria of the OUV of World Heritage.

Criteria	Explanation	Theme	Similar Case
(i)	The unique water transport system.	V. E. 4 c)	Lingqu Canal, Roman Ways System
	Huge scale.	II. 12	Rideau Canal, Canal du Midi
	The comprehensive technical structure could adapt to the complex geographical and natural conditions.	VI	
(iii)	The traffic system supported the communication between many important cultural areas.	V. D.1	Silk Roads
(iv)	The technical system of the Grand Canal represented a masterpiece of integrated technology, adapting to complex environment.	VI	Rideau Canal, Canal du Midi
(vi)	Associated with the history of political events, signifying the unity and stability of the empire.	I. B. 1	
	reflected in some famous art works and literary works.	II. 12	The Great Wall
	communicating between other Asia countries and some European countries.	V. D. 1	

Fig. The selection of criteria of the Grand Canal

criteria (i)

The original motivation of this criterion was to draw attention to the outstanding artistic achievement of architecture, then extended to human creative genius. Besides the fields of art and aesthetics, it also worked in science, technology, history, culture, and anthropology, etc.

“It represents the greatest masterpiece of hydraulic engineering in the history of mankind, because of its very ancient origins and its vast scale, along with its continuous development and its adaptation to circumstances down the ages. It provides tangible proof of human wisdom, determination and courage. It is an outstanding example of human creativity, demonstrating technical capabilities and a mastery of hydrology in a vast agricultural empire that stems directly from Ancient China.”

criteria (iii)

This criterion intended to identify the properties that witnessed the great development of human civilization. In the initial description, it tended to archaeological remains. Later the word “living” was added into this criterion, enlarged the typology to Cultural Landscape, Cultural Routes, Canals and Historical Towns.

“The Grand Canal bears witness to the unique cultural tradition of canal management via the Caoyun system, its genesis, its flourishing, and its adaptations to the various dynasties and their successive capitals, and then its disappearance in the 20th Century. It consisted of an imperial monopoly of the

transport and storage of grain, salt and iron, and a taxation system. It contributed to the fundamental link between the peasant economy, the imperial court and the supply of food to the population and troops. It was a factor of stability for the Chinese Empire down the ages. The economic and urban development along the course of the Grand Canal bears witness to the functioning core of a great agricultural civilization, and to the decisive role played in this respect by the development of waterway networks.”

criteria (iv)

This is the one of the most used criterion, using to identify the property considering as a masterpiece in a certain region and time. It ranges from architecture and groups of buildings to landscape and technology. It can also be used to the heritage canal which represents the technology of a particular culture.

“The Grand Canal is the longest and oldest canal in the world. It bears witness to a remarkable and early development of hydraulic engineering. It is an essential technological achievement dating from before the Industrial Revolution. It is a benchmark in terms of dealing with difficult natural conditions, as is reflected in the many constructions that are fully adapted to the diversity and complexity of circumstances. It fully demonstrates the technical capabilities of Eastern civilizations. The Grand Canal includes important, innovative and particularly early examples of hydraulic techniques. It also bears witness to specific know-how in the construction of dykes, weirs and bridges, and to the original and sophisticated use of materials, such as stone and rammed-earth, and the use of mixed materials (such as clay and straw).”

criteria(vi)

Originally this criterion was only associated with important person, events, views, beliefs and philosophies. Later joined living traditions, artistic and literary works. In the present, it mostly linked with religious beliefs, secondly political themes, and then culture themes.

“Ever since the 7th Century and through successive Chinese dynasties up to modern-day China, the Grand Canal has been a powerful factor of economic and political unification, and a place of major cultural interchanges. It has created and maintained ways of life and a culture that is specific to the people who live along the canal, whose effects have been felt by a large proportion of China’s territory and population over a long historical period. The Grand Canal is a demonstration of the ancient Chinese philosophical concept of the Great Unity, and was an essential element in the unity, complementarily and consolidation of the great agricultural empire of China down the ages.”

Considering the technology value as a heritage canal, the Grand Canal could correspond directly to criteria(i) and criteria(iv). Besides, it also had values on other aspects.

From the view of cultural landscape, it showed the relationship between human and water resource, not only about the material interdependence, but also about the mental dependence and challenge, corresponding criteria(vi). In this case, reconstructed in a giant scale, the canal was as well a combination of various cultural landscape types, including organically evolved landscape and associative cultural landscape. However, from the current research situation,

it was still lack of evidence and expression in the heritage composition, authenticity and integrity.

From the view of cultural routes, the characters of the Grand Canal were very prominent. Firstly, as a shipping waterway, it directly related to the traditional transport system in ancient China, ensuring the demand for large-scale economic goods and materials. Secondly, the unique water transport cultural accompanied by the transport system, brought the communications on culture and technologies all along the canal.

Above all, the canal could be concluded as a culture route bringing integration and unity. Taking into account its degree in the world cultural exchange, it was enough to meet the criteria(iii) and criteria(vi). At present for the waterway heritage on the List, there is no property explained its value as a cultural route. The Grand Canal filled the gap of the List, and showed its outstanding values in the complexity, depth and breadth of cultural communication.

On the other hand, the research of the Grand Canal as a cultural route is not complete yet. Because of the complex elements and huge scale, pertinence and systematic research are insufficient.

4.2.4. Other Values

Besides the outstanding universal values, it is still necessary to analyze the values of the Grand Canal from other perspectives in the follow-up research and development, to explain this comprehensive heritage.

The most important thing is, it is a living Cultural Heritage, that is, it has witnessed many vicissitudes of the ancient society, and it is still playing a huge benefit and having the development potential.

4.2.4.1. A witness of Chinese history

The development of the canal engineering in China, has generally experienced four periods, the start-up, the big development, the consummation and the maintenance. Reviewing the canal history in the second chapter, the process coincided exactly with process of the feudal society of China, the feudal empire established, consolidate, flourish and declined.

The chronological chart was referred to Chapter 2.

a) social value

since 1900, the Grand Canal has no longer borne the main traffic. As the modern transportation developing, the requirement for water transportation also fell down. But the Grand Canal itself has high quality, connecting many important cities. It still has the ability of transportation considering the quantity of shipments and the urban development.

Furthermore, the function of entertainment increased. The canal has gradually become an important cultural resource for tourism and leisure activities. And it is also one of the important elements of the historical tourism.

As a cultural heritage, the canal has begun to undertake responsibilities of cultural continuity and public education. There is a variety of historical monuments along the canal, including temples, gardens, river facilities, ancient bridges, historic buildings, etc. Museums of those relics have been constructed in recent years.

b) Spiritual and Emotional Value

The Grand Canal itself was not a typical religious heritage, but it became a part of the folk beliefs and part of the philosophy because of the contribution on cultural communication. Most of the cities along the canal laid the foundation on the canal due to the benefits brought by the canal. The water god became popular along these cities, so as the temples of water god.

Another good example is that around 15th Century, Muslims doing business along the canal built mosques in many cities along the route, which have remained so far.

Because of the birth of folk beliefs, civil activities relying on the canal proved the strong feelings of the local residents on the canal. Many of these kinds of folk activities have continued until now as intangible cultural heritages.

c) Landscape Aesthetic Value

As an huge transportation construction, the Grand Canal owned a design aesthetic reflecting the tendency of the eastern traditional society in the shape of water conservancy facilities, riverside landscape, and the buildings along the water.

One of the most representative remains were the ancient bridges. Many of them were well preserved. They created various landscape effects with the difference between natural and human environment, by varied structures, shapes and decorations.

For the Gongchen Bridge in the section of Hangzhou City, the bridge was designed as a three-span arch bridge. The biggest arch in the middle met the dimension of the large ships, and also constitute a stable triangle in a wide river. For the Wuting Bridge in Yangzhou City, one of the most famous landscape bridges in China, the bridge was designed in the shape of “I”, with 5 pavilions on the bridge and 15 arches.

The traditional residence houses, temples, and streets along the river also reflected the spatial relationship and landscape effect related to the canal. In the original design of the architecture and courtyard, there would be a door facing the waterway, creating a landscape for the ships on the canal. The tower in the temple occupied the centre point of the landscape by the contrast between the vertical volume and the broad flat water surface.

4.2.4.2. Value of Water Conservancy Project In the History of World Canal Engineering

Engineering is a purposeful, organized human practice to transform the world, including the process and the results. Essentially the aim is to improve and to transform instead of repeating the production. It is the process that promotes the development of human, and makes the canal a dynamic, sustainable system.

According to the historical terrain and water characteristics, the Grand Canal can be divided into 4 sections, the lock district, the lake district, the natural river district, and the confluence district. The huge engineering system had been ensuring the smooth flow of the canal for more than 600 years.

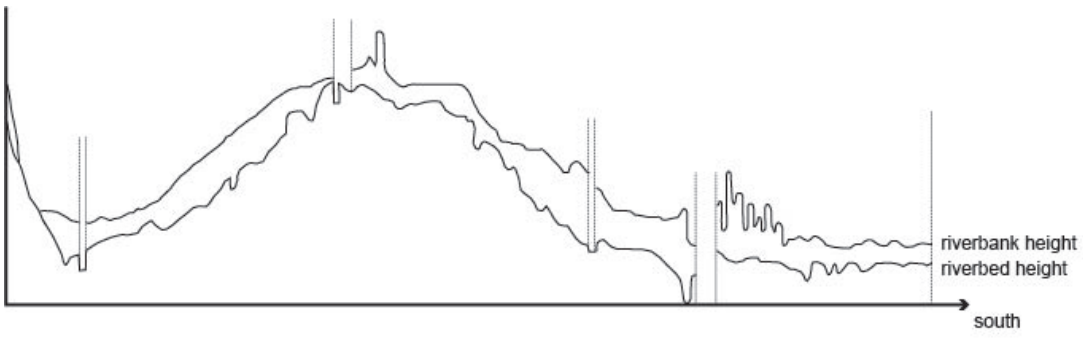


Fig. The Section of the Canal

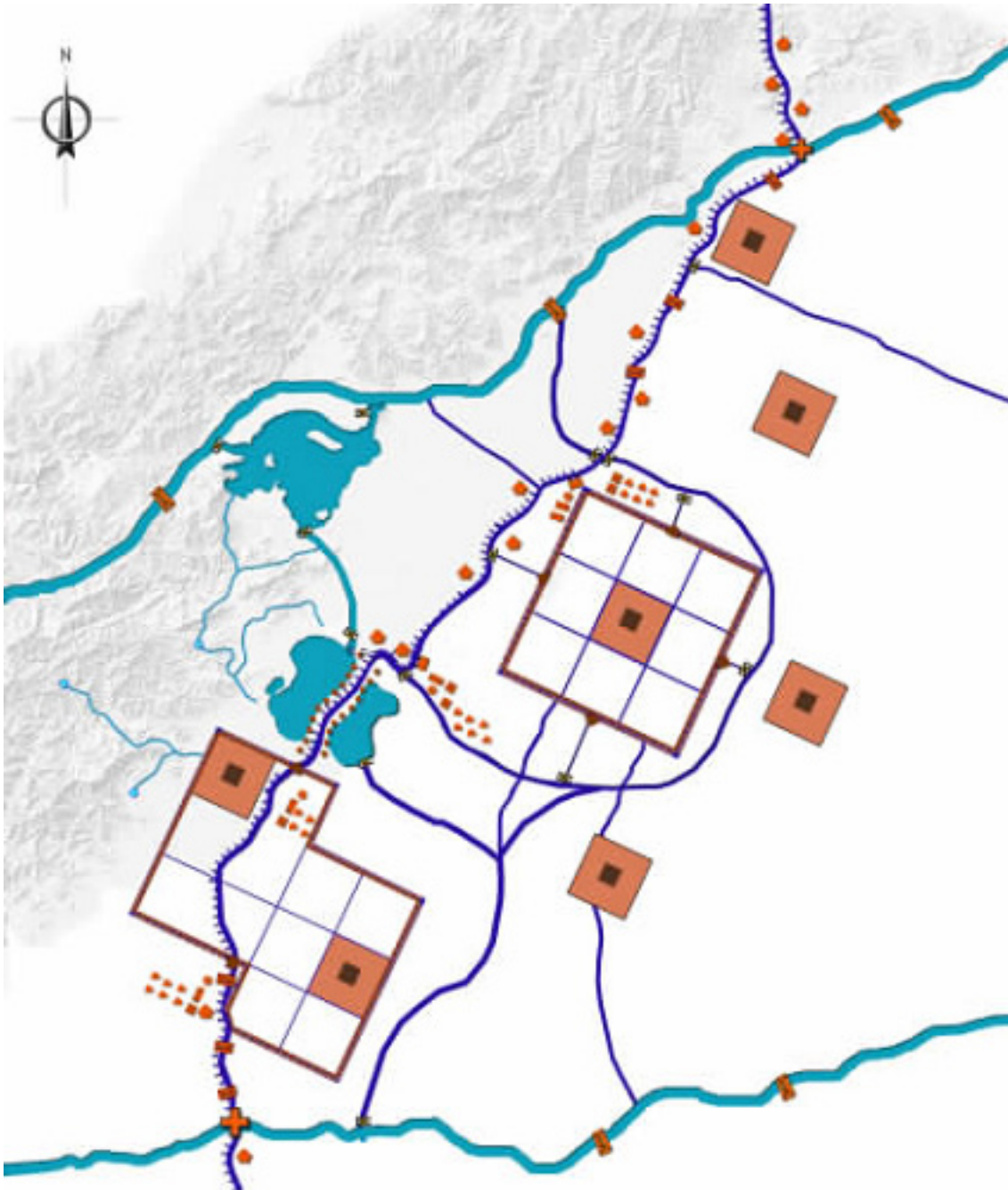


Fig. The Concept Map of the Constitutions of the Grand Canal

waterway project	Water channels: main waterway, branches
	Constructions to control the depth of the waterway(across the canal): locks, dams, etc
	Constructions to control the water quantity(along the canal): dams, culverts, distributaries, etc
	Ports
water source project	Water tank, aqueducts
Management facility	Fortress, customs office, other relating facilities, etc
Attached building	Transport facilities: bridges, towpaths, vessels, etc
	Management buildings: government offices, shops, etc
	Sacrificial architecture: temples, beast sculptures in water

Fig. The Consisting of the Water Project

Section	Length (km)	Typical Constructions					
		Water source project	branch	distributary	lock	Water tank	port
Tonghui River	50	√	√		√		
Bai River(north canal)	140			√			
Wei River(south canal)	600			√			√
Huitong River	300	√	√	√	√	√	
Zhong River(middle canal)	180		√	√	√	√	√
Nan River(Huaiyang Canal)	150		√	√		√	√
Jiangnan Canal	300	√	√		√	√	√

Fig. The Construction Examples of Different Sections

The following engineering heritage mainly refers to the ancient engineering heritage. Compared with ancient architectural heritage which has the ritual and aesthetic value, it is more practical; compared with the industrial heritage which has the value of modern science and technology, it has the characteristics of agricultural civilization.

The value of the engineering heritage is reflected in the balance among multiple engineering objectives, multi-domain science and technology, and multi-stakeholder. The process of adjusting relationships between the property and society and nature, makes the property to keep changing itself to adapt to the environment.

a) The System of Lock Flight

The natural water resources and landforms along the Grand Canal had quite

different levels of quality. The Earliest ship lock on the canal was the single lock in Yangzhou around 423 AD. In 984 AD, the Zhenzhou Lock was built as the first multiple lock in the world.

In the following 100 years, 31 locks was built in the sections of Huitong River, in order to solve the problem of different height in different sections. Later the number increased to 38. Together they consisted of the earliest lock flight in the world, gradually changing the water level inside the gates to move the boats to a higher or lower section.

b) The Water Diversion Project In Nanwang

This project began around 13th Century(during the Yuan Dynasty), and finished around 1420 DC(during the Emperor YongLe in the Ming Dynasty). The project in Nanwang built a perfect water diversion system. Located at the hilltop vantage point, the constructions controlled the flow of water and divided them into reasonable quantity to both sides, so that the fleet could go up and down.

The whole project was composed of the Daicun Dam which converged water, several controlled lakes which were used as reservoirs, and lots of locks and diversion gates.

c) The Water Conservancy Project In Qingkou

The Grand Canal flowed from south to north, while the Huaihe River from west to East, and the Yellow River from north to south. They merged in Huai'an, creating a rare pattern.



Fig. Map of Water System In Qingkou

Through the continuous improvement of the past dynasties, a set of engineering measures system was formed to guarantee the transport safe and smooth under the flood and sediment threat, especially in flood season.

The measures system included: creating branch channels, to avoid the interference of the Yellow River; repairing the Gaojiayan Dam, to constrain the

Huaihe River from undermining their banks; adding sluices and overflow dams, to protect the Canal free of threat from the natural rivers and lakes with high water level.

d) Water Saving Project and Adjusting Tank

Usually water was lost each time when using the multiple locks. In order to save water, especially in some dry regions, a kind of water lock using as adjusting tank was designed with the normal lock around 10th Century. Two storage ponds were designed near the two gates of the lock. The water level was controlled by the gates and water wheel. And the water used to be wasted would be transferred to the ponds and could be use again, which reduced a large quantity of water when using the lock.

e) Safety System

During a long time, some sections of the Canal shared channels with natural rivers or lakes, which means that it would be in risk of floods. To ensure the safety of the canal, a series of constructions were built to discharge floods through overflow dams and sluice gates in order to reduce the water level in the canal.

CHAPTER 5. CASE STUDY

5.1. Heritage Canals

The World Heritage List is an international platform, so it requires the value of properties to transcend national boundaries. Which means, the identification of OUV should be analyzed and compared in a broader view. The process of analysis and comparison would also help the state party in finding the most suitable orientation for the property.

There are two kinds of methods of comparative study: a general analysis of properties with same typology and same theme, ordinarily properties already on the World Heritage List or Tentative List; a comparison with several similar properties, attesting that the property has unique culture traits different from others.

In the World Heritage List, the heritage of waterway includes transport canal and irrigation canal. They have different functions, but share the similarities in technology.

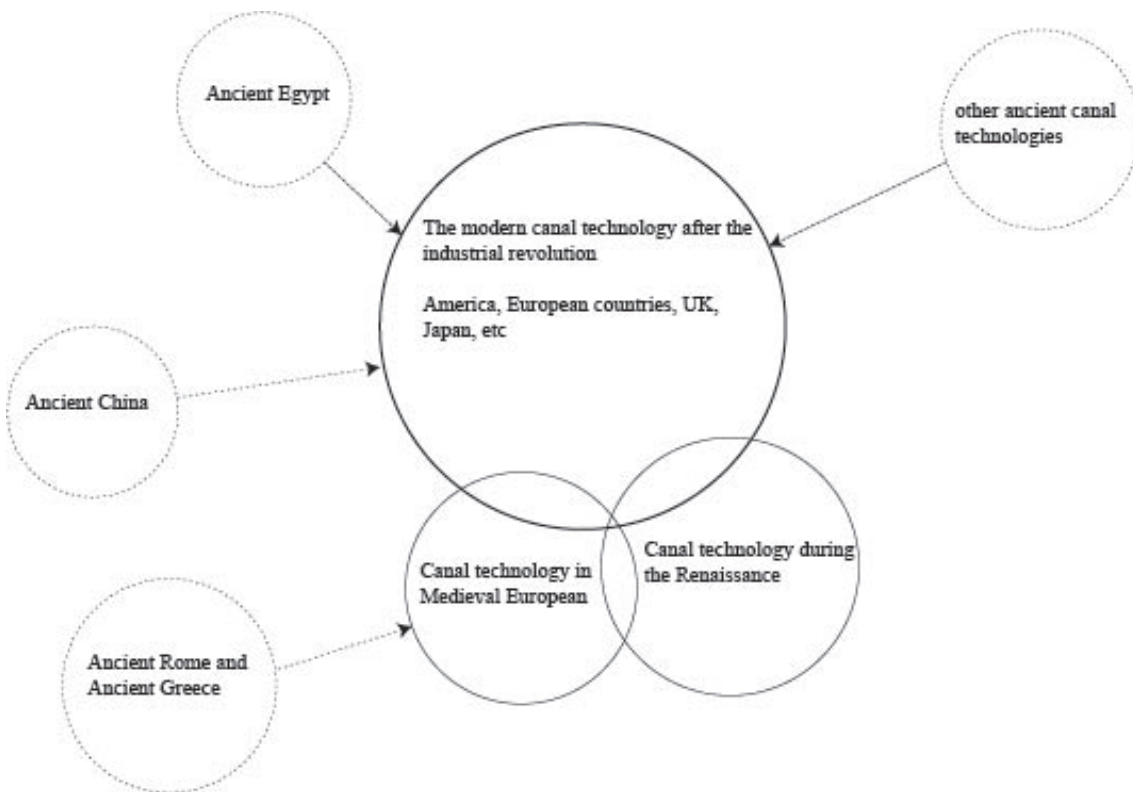


Fig. The mode of the technology system of the canals on the World Heritage List

Site	Function	Location	Year	Criteria
Canal du Midi	Transport canal	France	1667-1671	(i)(iv)(v)(vi)
The Augustów Canal (Kanal Augustowski)	Transport canal	Poland/Belarus	1823-1839	Tentative List
Rideau Canal	Transport canal	Canada	1826-1832	(i)(iv)
Shushtar Historical Hydraulic System	Irrigation systems	Iran	3BC-now	(i)(ii)(v)
Aflaj Irrigation Systems of Oman	Irrigation systems	Oman	unknown	(v)
The Grand Canal	Transport canal	China	486BC-1912	(i)(iii)(iv)(vi)
Mount Qingcheng and the Dujiangyan Irrigation System	Irrigation systems	China	256BC	(ii)(iv)(vi)
Lingqu Canal	Transport canal/ Irrigation systems	China	218BC	Tentative List (i)(iv)(vi)

Fig. The waterway properties on the World Heritage List and the Tentative List

5.1.1. Rideau Canal

Canada

Date of Inscription: 2007

Criteria: (i)(iv)

Property : 21,454.81 ha

Buffer zone: 2,363.2 ha

“The Rideau Canal, a monumental early 19th-Century construction covering 202 km of the Rideau and Cataraqui rivers from Ottawa south to Kingston Harbour on Lake Ontario, was built primarily for strategic military purposes at a time when Great Britain and the United States vied for control of the region. The site, one of the first canals to be designed specifically for steam-powered vessels, also features an ensemble of fortifications. It is the best-preserved example of a slack water canal in North America, demonstrating the use of this European technology on a large scale. It is the only canal dating from the great North American canal-building era of the early 19th Century to remain operational along its original line with most of its structures intact.”

The nominated heritages included engineering works, related military installations, buildings, lock station grounds, archaeological resources, and channels of the slack water system.

a) Dam and Sluice

Along the 202 km canal, 74 dams and 50 locks were constructed, 47 locks could be traced back to the beginning of the construction era.

Most of the dams were rammed earth embankment, and 7 of them were stone arched dams, all kept the original form. There were 23 dams preserved in original structure, others were preserved with some transformation and material replacement.

In some locks, the wooden floor had been damaged. And one of the dams was reconstructed by concrete. At first, all of these locks were operated by human winches, while nowadays some of them have switched to water and electricity.

b) Bridges

In the beginning of the construction of the canal, no bridge was designed because of the sparse population. As the population grew in 19th Century, bridges were built at the locks.

There were 12 bridges including in the heritage list. 3 of them were preserved in original statue as steel king-post swing bridges, 4 of them were reconstructed copies of the original wooden bridges, and another 5 were modern steel bridges. To some extent, these bridges showed the historical development process of bridge design.

c) Staff Housing For the Locks

Along the existing canal, there were 33 staff housing dating back to the early years of the canal. All of them were one-floor buildings in the beginning, and some added the second floor later.

More staff housing were built at the end of 19th Century and beginning of 20th Century.

d) Fortifications

There had been 6 fortifications along the canal, but only 4 of them survived. Now all the fortifications were restored according to the original appearance.

Up to the criteria(i), Rideau Canal was the most outstanding representative of slack water canal in early 19th Century. It was considering the earliest canal specifically designed for steam powered ships.

The construction of Rideau Canal introduced and Perfected European transport technology to North America. And it was the only instance in this area.

5.1.2. Canal du Midi

France

Date of Inscription: 1996

Criteria: (i)(ii)(iv)(vi)

Property : 1,172 ha

Buffer zone: 2,014 ha

This 360-km network of navigable waterways linking the Mediterranean and the Atlantic through 328 structures (locks, aqueducts, bridges, tunnels, etc). It is one of the most remarkable feats of civil engineering in modern times. Built between 1667 and 1694, the construction of Midi Canal made a big progress for Europeans in the field of Civil Engineering. It paved the way for the Industrial Revolution.

The creator, Pierre-Paul Riquet, took care in the design as well as the way it blended with its surroundings. Finally the constructions turned a technical

achievement into a work of art.

The project implemented the vision of the communication of the two seas, and made a great contribution to the canal engineering. In the Garonne section of the canal in Toulouse, the section was 32 miles long, the elevation from the bottom to the top of the hill was 260 feet high, and 26 locks were designed to adjust the water level.

After 3 miles from the hilltop, the section was 115 miles long, having a fall of 620 feet high in total. 74 locks were constructed for this section, bringing ships to the Mediterranean, the end of the canal.

In the water supply system, channels and reservoirs were used in conjunction with each other, to transfer water to the peak of hills. Many other technologies which commonly applied to industrial canals for next generations, such as tunnels, underground culverts, and highway bridges, had been successfully constructed in this project.

5.2. Linear Heritage and Culture Route

5.2.1. Silk Roads: the Routes Network of Chang'an-Tianshan Corridor

China, Kazakhstan, Kyrgyzstan

Date of Inscription: 2014

Criteria: (ii)(iii)(v)(vi)

Property : 42,668.16 ha

Buffer zone: 189,963.1 ha

The Silk Roads were declared by China, Kazakhstan, and Kyrgyzstan together, and officially included in the World Heritage List in 2014.

In 1877, a Germany geologist, Eliseeff, named the “Silk Roads”, which referred to the land transport routes starting from 114 BC to 127 AD. The roads system started from China, crossing Europe and Asia. The name came from the goods delivered on the roads, mainly silk from ancient China.

“This property is a 5,000 km section of the extensive Silk Roads network, stretching from Chang’an/Luoyang, the central capital of China in the Han and Tang dynasties, to the Zhetysu region of Central Asia. It took shape between the 2nd Century BC and 1st Century AD and remained in use until the 16th Century, linking multiple civilizations and facilitating far-reaching exchanges of activities in trade, religious beliefs, scientific knowledge, technological innovation, cultural practices and the arts. The thirty-three components included in the routes network include capital cities and palace complexes of various empires and Khan kingdoms, trading settlements, Buddhist cave temples, ancient paths, post houses, passes, beacon towers, sections of The Great Wall, fortifications, tombs and religious buildings.”

In the interpretation of the importance of the UN on the Silk Road, it stated that “Spanning a quarter of the globe, it did not only bring goods such as silk and spices to the western world, and objects of gold, glass and other prized Roman creations to the elite of the Orient. But in being the first route joining the Eastern and Western worlds, the Silk Road may be given a spiritual identity - along the

Silk Roads technology travelled, ideas were exchanged, and friendship and understanding between East and West were experienced for the first time on a large scale. Therefore, the importance and value of the Silk Road can be related to the unity it brought about and this leads Zekrgoo to state that ‘the great Silk Road may be counted as the most important route in the history of mankind’.” (UNESCO WHC. Mission Report: UNESCO Mission to The Chinese Silk Road as World Cultural Heritage Routes_ A Systematic Approach towards Identification and Nomination[EB/OL]. 2003)

Year of Submission	Year of Inscription	Country	Criteria
2008	2014	China	(ii)(iii)(v)(vi)
2010		Kyrgyzstan	
2012		Kazakhstan	

Fig. Silk Roads: the Routes Network of Chang'an-Tianshan Corridor(Ref: 1442)

Year of Submission	Ref. in Tentative List	Country	Criteria
2008	5268	Iran	(i)
2010	5492	India	(ii)(iii)(vi)
2010	5500	Uzbekistan	(ii)(iii)(iv)(v)(vi)
2010	5518	Kyrgyzstan	(ii)(iii)(iv)(v)(vi)
2010	5521	Turkmenistan	(ii)(iii)(iv)(v)(vi)
2013	5790	Tajikistan	(iii)(iv)(v)(vi)

Fig. Projects Still in Tentative Lists

From the external form and typology, the Grand Canal was no doubt a linear waterway system with clear routes, while the Silk Roads was a directional land roads network with no clear path.

Different traffic patterns and road structure made big differences in content, speed and the final form of cultural dialogue.

Then, from the civilization crossed by the two cultural routes, the Silk Roads had passed through China, Central Asia, West Asia and other types of civilizations, while the sub-cultural areas crossed by the Grand Canal were all within the same independent civilization. In other words, the communication value of regional cultural, materials, and human should belong to regional value. However, besides the wide range of regional exchanges, the Grand Canal was also connected with the Silk Roads in the transportation system, which made it a extension of international communication routes in China.

From the theme of communication, the Silk Roads exchanged goods and religion, while the Grand Canal had more plentiful objects, including literature, art, political concept, philosophy, science and technology, traditional customs and folk custom as well as normal goods.

5.2.2. Qhapaq Ñan, Andean Road System

Argentina, Bolivia, Chile, Colombia, Ecuador, Peru

Date of Inscription: 2014
 Criteria: (ii)(iii)(iv)(vi)
 Property : 11,406.95 ha
 Buffer zone: 663,069.68 ha

The Qhapac Ñan, known as the Andean Road System, was a famous heritage of Inca Empire, which had been the biggest empire in South America, raised in 11th Century and declined in 16th Century. And this road system was the main North-South line on the land in Inca Empire.

“this extraordinary network through one of the world’s most extreme geographical terrains linked the snow-capped peaks of the Andes – at an altitude of more than 6,000 m – to the coast, running through hot rainforests, fertile valleys and absolute deserts. This site is an extensive Inca communication, trade and defense network of roads covering 30,000 km. Constructed by the Incas over several centuries and partly based on pre-Inca infrastructure, It reached its maximum expansion in the 15th Century, when it spread across the length and breadth of the Andes. The Qhapac Ñan, Andean Road System includes 273 component sites spread over more than 6,000 km that were selected to highlight the social, political, architectural and engineering achievements of the network, along with its associated infrastructure for trade, accommodation and storage, as well as sites of religious significance.”

The Andean Road System expressed the outstanding universal value as a huge-scale heritage. Nuria Sanz stated that this road had crossed the most broken area and the most extreme geography area in the world, and here the maximum biological diversity and cultural diversity could be found at the same time.

Year of Submission	Ref. in Tentative List	Country	Criteria
2001	1583	Argentina	(ii)(iii)(iv)
2010	5547	Peru	(ii)(iii)(iv)(vi)
2010	5549	Colombia	(ii)(iii)(iv)
2010	5550	Bolivia	(ii)(iii)(iv)(vi)
2011	5597	Ecuador	(ii)(iii)(iv)(vi)
2011	5606	Chile	(ii)(iii)(iv)(vi)

Fig. The nomination of Qhapaq Ñan, Andean Road System(Date of Inscription: 2014; Ref. 1459)

5.2.3. The Mercury and Silver Route of the Intercontinental Camino Real

Covered a large area through Europe, America and Southeastern Asia, connected to ports, cities, villages and many other cultural heritage related to cultural exchange, the Route represented the monopolistic economic trade pattern developed from the Spanish Empire.

It was not only one route, but a full international road network developed based on Spain. It aggregated relating routes and heritage from dozens of countries,

including new trade route, seaway of three oceans, and inland rivers, lakes, roads of different continents.

From 16th Century to 19th Century, this trade route was mainly used for the delivery of silver and mercury imported to European countries. It strengthened the connection between Spain and the America in culture and religion, and also preserved the rural and urban landscape relating to the silver mining in Spanish colonial period.

In 2000, ICOMOS-SPAIN held a long-term project, the routes of the Intercontinental Camino Real, which attracted CIIC experts and research institutions to participate. The project organized to publish relating research publications, held special conference of relating theme, and in the end promoted the protection of the heritage successfully.

(ICOMOS-CIIC. Pamplona Conclusions: The Intangible Heritage and Other Aspects of Cultural Routes, Spain, Pamplona,2001)

Year of Inscription	name	Ref. in Lists	Country	Criteria
2010	Camino Real de Tierra Adentro	1351	Mexico	(ii)(iv)
2012	Heritage of Mercury. Almadén and Idrija	1313rev	Spain, Slovenia	(ii)(iv)

Fig. Relevant Properties in the World Heritage List

Year of Submission	name	Ref. in Tentative List	Country	Criteria
1998	The Silver Route	1024	Spain	(ii)(iii)(iv)(v)
2007	San Luis Potosí on the Mercury and Silver Route of the Intercontinental Camino Real	Former Tentative List	Mexico	

Fig. Relevant Properties Still in Tentative List

5.2.4. Erie Canal national heritage corridor

USA

Property : 1,252,000 ha(4,834 Square miles)

The Erie Canal was the first fast transportation route connected the east coast the interior of the west of the United States, 584 Km long and with 83 locks in total. It belonged to the New York State Canal System. Based on the Mohawk River and importing to Hudson River, it connected the New York City to the five Great Lakes of North America.

The project started in 1817 from its middle section, the New York City, and

finished the construction of channels around 787 Km from 1817 to 1835, including Erie Canal, Oswego Canal, Champlain Canal and Cayuga-Seneca Canal. Up to 1918, the increasing waterway traffic resulted in the expansion project of the canal held by the state government, improving the traffic capacity to 240 tons, and expanding the minimum river section to 2.1m depth and 21.3m width.

In that time, the towpath was designed along the canal for the needs of towing by horses. Since 1918, the development of the steam mechanical ship had put forward new requests to the waterway.

In the beginning of 20th Century, the New York canal system was organized on the foundation of the previous canal. The system constructed new channels and optimized part of the canal by new technology. The minimum river section was enlarged to 3.8 m depth, and all the locks were updated to electrically control. Until now, the traffic capacity have been improved to around 3000 tons.

The Erie Canalway National Heritage Corridor Act was passed in 2000, identifying the canal as a heritage corridor in the protection.

Heritage Corridor was a concept and a regional heritage protection strategy for the protection of large-scale cultural landscape. The protection of the heritage corridor was part of the national park system. And the certification should be nominated by a special organization or government agency, evaluated by the National Park Service(NPS), and approved by the Congress. After that, the relating protection laws and regulations could be enacted.

Referred to the Erie Canalway National Heritage Corridor Act, the important values of the Eric Canal were stated as below:

- (1) ...the Erie Canalway for commerce, transportation, and recreational purposes, establishing the network which made New York the ``Empire State" and the Nation's premier commercial and financial center.
- (2) The canals and adjacent areas that comprise the Erie Canalway are a nationally significant resource of historic and recreational value, which merit Federal recognition and assistance.
- (3) The Erie Canalway was instrumental in the establishment of strong political and cultural ties between New England, upstate New York, and the old Northwest and facilitated the movement of ideas and people ensuring that social reforms like the abolition of slavery and the women's rights movement spread across upstate New York to the rest of the country.
- (4) The construction of the Erie Canalway was considered a supreme engineering feat and most American canals were modeled after New York State's canal.
- (5) At the time of construction, the Erie Canalway was the largest public works project ever undertaken by a State, resulting in the creation of critical transportation and commercial routes to transport passengers and goods.
- (6) The Erie Canalway played a key role in turning New York City into a major port and New York State into the preeminent center for commerce, industry, and finance in North America and provided a permanent commercial link between the Port of New York and the cities of eastern Canada, a cornerstone of the peaceful relationship between the two countries.
- (7) The Erie Canalway proved the depth and force of American ingenuity, solidified a national identity, and found an enduring place in American legend,

song, and art.

Later, the system of protection and management was formed. Due to the features of crossing regions and multi-function of the heritage corridor, the management was required to coordinate different administrative regions and functional departments. Therefore, the Act also determined that the protection and management should be based on partnership.

The Erie Canalway National Heritage Corridor Commission (ECNHCC) supported by NPS was established through the Act, as the centre department of the management system.

The purpose of ECNHCC was stated as “(1) To work with Federal, State, and local authorities to develop and implement the Canalway Plan. (2) To foster the integration of canal-related historical, cultural, recreational, scenic, economic, and community development initiatives within the Corridor.” The Commission also took charge of the Federal funds, including seeking funds and receiving government funds and social contributions.

At the same time, the Department of the Interior (USDO I) and NPS would be involved in the management of ECNHCC. NPS would set up project for national heritage, and draw the attention and investment of other federal departments on the Erie Canal Heritage Corridor.

Partnerships among Federal, State, and local governments and their regional entities, nonprofit organizations, and the private sector offered the most effective opportunities for the preservation and interpretation of the Erie Canalway. They undertook different works in the overall coordination of NPS and ECNHCC.

In 2006, NPS carried out the Erie Canalway National Heritage Corridor Preservation and Management Plan as a long-term regional comprehensive planning, which completed the regional planning, and set up the principles and structure of the management. Compared to the specific site planning, it paid more attention to the foundation of the framework of the basic works.

By contrast, the short-term strategic planning focused on the financial situation, clarified the key projects and the detail work of the ECNHCC within the planning period. The annual work reports ensured the smooth implementation of the planning. And the long-term planning would be corrected and revised depending on the realities of short-term planning.

The Plan put forward the goals of the planning:

- (1) The Corridor’s historic and distinctive sense of place will be widely expressed and consistently protected;
- (2) The Corridor’s natural resources will reflect the highest standards of environmental quality;
- (3) The Corridor’s recreation opportunities will achieve maximum scope and diversity, in harmony with the protection of heritage resources;
- (4) The Corridor’s current and future generations of residents and visitors will value and support preservation of its heritage;
- (5) The Corridor’s economic growth and heritage development will be balanced and self-sustaining;
- (6) The Corridor will be a ‘must-do’ travel experience for regional, national and international visitors.

The first two emphasized the protection of resources; the following two emphasized the integration of single element, and the promotion of the overall value through the corridor experience; while the last two emphasized the brand building of the canal, and the overall economic growth of the heritage.

Typology	Resources	Protection Actions	Economic Potential	Cases
Towpath-Era Canal	Erie Boulevards and similarly named streets; linear parks; sections within parks or associated with other recreational resources	For buried or lost segments, wetland, preservation of surviving elements in original location; Preservation of existing watered segments	Connect the canal to the urban form; wetlands contribute to recreation-based economic strategies	Syracuse; Buffalo Erie Canal Harbor; Albany; Schoharie Crossing State Historic Site; Vischers Ferry Nature and Historic Preserve; Port Byron Erie Canal Heritage Park; Old Erie Canal State Park; Erie Canal Park
20 th Century Barge Canal: Land Cuts, Riverways	Canal Corporation lands; the continuity of public land along the canals	preservation and rehabilitation of historic waterfronts; conservation of canalside farmland and rural land use	A new land management policy provides for review of proposed sales and procedures for compliance	Little Falls; Schuylerville; Phoenix Bridge House; Lockport
Settlements: Hamlets, Villages, Cities	Settlements with the most threatened historic assets, and most disadvantaged economies; historic canal towns	Consider local heritage development planning; embrace preservation as an economic development strategy; mixed uses and encourage adaptive reuse	Main Street revitalization; High-quality, contemporary materials and good design can provide the intimacy and comfort level that encourage mixed-use activity and busy sidewalks	Fairport; Oswego; Canastota; Vischers Ferry; Waterford; Whitehall

Industrial Landscapes	Towpath-era power generation facilities and mill districts; Barge Canal ports and maritime districts; sites amenable to adaptive reuse	survey and remediate past pollution; rehabilitate waterfront infrastructure where conditions threaten water quality and ecology or detract from adjacent historic or recreational settings; remediation and rehabilitation to prepare the site for adaptive reuse	New commercial and residential development	Buffalo; Canajoharie; Cohoes
Rural Landscapes	Historic agricultural structures; working farms; timberlands and open space; the continuity of Canal Corporation lands	rehabilitation and adaptive reuse of agricultural structures; preservation of agricultural activity; preservation of open space, timberlands, and traditional clustering of buildings	The beauty of farmland and opportunity to attracts automobile tourists; rural open space and timberlands buffer recreation and protected wildlife areas from other land uses; greenmarkets	Floating Farmer's Market; Finger Lakes region; Agricultural Industry Development, Enhancement and Retention(AIDER)
Vessels	Archeological remains of towpath-era vessels; Canal Corporation floating plant	develop a comprehensive preservation plan for its floating plant	providing advance publicity for significant commercial lock-throughs, a good source of advertising	Canal Corporation Tugboat <i>Unger</i> ; Waterford Tug Boat Roundup; Canal Motorship <i>Day Peckinpaugh</i>

Archeological Sites	Native American sites; towpath-era canal prism and structures; submerged artifacts	Preservation in place		Chittenango Landing; Albany Lock 1
Others	Documents and Artifacts; Arts and Folkways	virtual research collections for the public		

Fig. The Protection and Sustainable Actions of the Historical Resources of the Eric Canalway National Heritage Corridor According to the Erie Canalway National Heritage Corridor Preservation and Management Plan

Dating back to 1995, the New York State had made the project of New York State Canal Recreationway Plan, which was developed as a framework to promote the use of the canal system as a recreational resource. In ten years many improvements was constructed, including seven canal harbors, many of the service port and lock park projects identified in the plan, and 220 miles of the Erie Canalway Trail.

On base of this, the Eric Canal National Heritage Corridor Trail System provided various opportunities for recreation from countryside to city; the abundant natural resources provided high quality recreational resources; the integrity and continuity of the corridor landscape attracted cycling and hiking; the unique historical and cultural resources along the canal enhanced the sense of space and the opportunities to understand the heritage corridor.

	Activities	Guideline
Heritage Tourism and Sightseeing	experiencing cultural landscapes, historic sites, natural resources, and cultural institutions	Present the American identity; natural ecosystem not destroyed; emphasize the value relating to cultural resources; ensure the high visual quality of the recreation experiences
Water Related	boating, fishing, and swimming	strongly encourage new boating opportunities for recreational users; continue to install new boating facilities and support service; encourage the user groups of club and student athletes; encourage fishing through improved boating and dock; the maintenance and upgrade of existing swimming facilities; face the threat of the spread of invasive species

Trail	bicycling, walking, in-line skating, horseback riding	Encourage to link to the Canalway Trail system; Trailheads should be constructed at regular intervals on major pedestrian and bicycle trails as a means to increase public access and promote use; access canal-related sites and allow travel through or views of Corridor cultural landscapes; multi-use; choose proper surface material; Individual regional and community trail planning and management efforts should seek to cooperate on use regulations
Off-Trail	hiking, camping, bird watching, hunting, and trapping	campsite construction should be prioritized where gaps exist along the Canalway Trail and other known multi-day outing routes; link the additional hiking trails to existing trails and establish trail networks outside the Corridor; for bird watch facilities, minimize interference with the quality of the wildlife habitat; Hunting activities can be promoted through the preservation of large tracts of inter-connected wildlife habitat
Winter	cross-country skiing, snowshoeing, ice skating, ice fishing, and snowmobiling	Regional working groups should be convened address the dual use of trails by snowmobiles and cross-country skiers; Ice skating may be possible on portions of the canal if cooperative agreements can be arranged between the Canal Corporation and local municipalities and interest groups

Fig. The Guidelines of the Recreation Promoting of the Eric Canalway National Heritage Corridor According to the Erie Canalway National Heritage Corridor Preservation and Management Plan

The goals of the canal heritage corridor was to build a new brand of itself, and integrate all the independent elements such as heritage tourism, natural protection, outdoor recreation, heritage education, etc. The balance among sustainable of the heritage corridor, the protection of resources, and the development of economy, had promoted the travel experience for travels and also the daily life of the local residents.

“The economic revitalization goal for the Erie Canalway National Heritage Corridor is that economic growth and heritage development in the Corridor will be balanced and self-sustaining.” The four objectives were as below to show an development perspective.

- (1) Harness existing tourism, industrial, agricultural, and community development assets in the service of economic development that reinforces the region’s sense of place;
- (2) Increase local capacity to undertake heritage- and place-based approaches to economic development;

- (3) Establish a unifying National Heritage Corridor identity of place and lifestyle that complements regional identities, tourism destinations, and individual cities; links lesser-known towns; and encompasses canal stories;
- (4) Integrate a heritage- and place-based perspective into every message communicating the benefits and rationales underpinning Corridor public investment decisions.

Since 1984, NPS already had accumulated experience in the protection and management for 32 years. Its working experience on protection and sustainable development of linear cultural heritage was available to the protection of the Grand Canal in China.

(1) a integrated protection concept

The Erie Canalway National Heritage Corridor Act, identified the values of the Erie Canal in engineering technology, natural landscape, recreation resources, national identity, etc. All the projects included in the heritage corridor were divided into different levels, built up the platform system emphasizing the integration of nature and culture along the canal.

(2) sustainable economic revitalization

To motive the regional economy through the heritage corridor, many actions had been taken, for example, the completion of the trail system, and related effective marketing strategies. The combined of protection and sustainable use ensured the development of the heritage corridor.

(3) a broad partnership

To coordination of different administrative regions and functional departments in order to achieve the crossing-region and mix-use projects, a partnership system was built with a core sector as a link to connect other departments and private non-profit organizations. The system made itself a shield for the common benefits of all the partnership, ensured that the federal government, the state and local departments could all participate in the protection and management.

5.2.5. The Great Wall

China

Date of Inscription: 1987

Criteria: (i)(ii)(iii)(iv)(vi)

Property : 2,151.55 ha

Buffer zone: 4,800.8 ha

“In c. 220 B.C., under Qin Shi Huang, sections of earlier fortifications were joined together to form a united defense system against invasions from the north. Construction continued up to the Ming dynasty (1368–1644), when the Great Wall became the world's largest military structure. Its historic and strategic importance is matched only by its architectural significance.”

Its scale is huge. The main body consists of walls, horse tracks, watch towers, and shelters on the wall, and includes fortresses and passes along the Wall.

The Great Wall reflects collision and exchanges between agricultural civilizations and nomadic civilizations in ancient China. It embodies unparalleled significance as the national symbol for safeguarding the security of the country and its people.

Compared the Grand Canal of China and the Great Wall, there were points of similarity between them, that is, both of them were strategic projects at national level, and had been continued to construct during successive dynasties. The Great Wall had been functioning for more two thousand years, while the Grand Canal for one thousand years. They not only played a practical role in social development, but also express the national identity and the symbol of national spirit. Both of them were considered in “I. B. 1 Cultural and political identity” in ICOMOS Thematic Framework.

Nevertheless, they had different symbolic meanings in cultural identity. Used as a military barrier, the Great Wall was a symbol of defense. While the Grand Canal tended to communicate, showing a peaceful and stable society as a symbol of national stability.

In Oct. 2006, the State Council of China announced the Regulation on the Protection of Great Wall, to build the legal support for the protection of the Great Wall, which also provided a reference for heritage protection for similar properties.

Before the Regulation was published, due to the unreasonable utilization, the authenticity of the Great Wall was damaged in some sections, and the most serious damage was caused by tourism development. In the absence of detailed regulations, some local communities violated the principle of not changing the original state. They did some projects changing the original locations, forms or materials of the cultural relics, which damaged the original historical information delivered by the cultural heritage.

There is still a big difference between the protection of the Great Wall and of the Grand Canal. The Great Wall was protected in a static state and would never be used in original functions any more. The protection focused on the preservation of its original historical form and original ecology. But the Grand Canal is keeping in developing and functioning. It is necessary to continue to absorb new information and technology to achieve the continuation of civilization.

5.3. Case Study Of the Italian Laws

5.3.1. Timeline of the Cultural Heritage Conventions and Other Instruments

(1) UNESCO RECOMMENDATION CONCERNING THE SAFEGUARDING OF THE BEAUTY AND CHARACTER OF LANDSCAPES AND SITES (1962):

The Recommendation includes some important statements of principle, for example that the State should extend the protection to the whole territory, not only to selected landscapes and sites, and that the issue should be both preventive and corrective.

(2) UNESCO RECOMMENDATION CONCERNING THE SAFEGUARDING AND CONTEMPORARY ROLE OF HISTORIC AREAS (1976):

The Recommendation stressed the urgency of taking measures to protect and revitalize historic areas and noted the importance of co-ordinating national, regional and local planning to avoid the danger of irrational demolition and inappropriate reconstruction work and its attendant «social disturbance» (damage).

(3) COUNCIL OF EUROPE RECOMMENDATION ON MEASURES TO PROMOTE THE INTEGRATED CONSERVATION OF HISTORIC COMPLEXES COMPOSED OF IMMOVABLE AND MOVABLE PROPERTY (1998):

This recommendation is unique among international instruments. In fact, the recommendation attempts to protect an aspect of cultural heritage that is ignored by other instruments probably because its protection cut across legal categories of property and impacts ownership rights in property.

On the other hand, it is well recognized that the significance of structures of heritage interest is greatly enhanced if they can be presented to the public together with these features historically associated with them.

For example, a house that has had a famous statue present in it for many years will lose significance if the statue is removed.

(4) UNESCO RECOMMENDATION ON THE HISTORIC URBAN LANDSCAPES (2011):

This Recommendation does not replace existing conservation approaches, but is a tool to integrate policies and practices of conservation of the built environment into the wider goals of urban development, in respect of the inherited values and traditions of different cultural contexts.

This tool is a “soft-law” to be implemented by Member States on a voluntary basis.

5.3.2.Laws and Regulations in Italy

As a country owning the largest amount of UNESCO heritage sites, on the basis of international conventions and recommendations, Italy had enacted several laws aiming at the protection and preservation of the heritage. The first of them was adopted by the Parliament in 1902 and 1909. And in 1939, another two were enacted to provide core legislation regarding cultural heritage(No. 1089) and natural beauty(No. 1497).

In 1947, Constitution Of The Italian Republic set the goals of the protection and promotion of heritage, stating in article 9 that “The Republic promotes the development of culture and of scientific and technical research. It safeguards the natural landscape and historical and artistic heritage of the Nation.”

In 2006, LAW no. 77 about UNESCO World Heritage Sites, confirmed the principle that UNESCO sites, due to their uniqueness, were outstanding features of Italian cultural heritage, and the intervention of them should take priority.

In Italian laws, the structure of the protection system consists of the state, the Regions, the Metropolitan Areas, the Provinces and Municipalities, public bodies and private owners of property. They should all take part in the conservation of the cultural heritage.

Local government bodies must cooperate with the ministry, and exercise their legislative powers in compliance with the fundamental principles.

The current law focusing on protection and conservation is the Italy’s Cultural Heritage and Landscape Code (Legislative Decree no. 42/2004). Refer to it, the protection measures included prohibited actions, actions subject to authorization, and authorization procedures for construction. And the enhancement of the heritage consisted of the exercising of functions and the regulation of activities to promote knowledge of cultural heritage, also including promoting and supporting conservation work on the cultural heritage.

Article 20: Cultural property may not be destroyed, damaged or adapted to use which is not compatible with its historic or artistic character or of such kind as to prejudice its conservation.

Article 21:

The following actions are subject to the authorization of the Ministry:

- a) The demolition of things constituting cultural property, even with subsequent reconstitution
 - b) The removal of cultural properties, even when temporary
 - c) The dismemberment of collections and series
 - d) The discarding of documents in the public and private archives for which a declaration of cultural interest has been issued
 - e) The transfer to other corporate entities of organized sets of documentation belonging to public archives, as well as of archives belonging to private persons.
- conservation measures includes: conservational obligations; voluntary conservation work; obligatory conservation work; charges and financial contribution.

The conservation of the cultural heritage is ensured by means of consistent, coordinated and planned study, prevention, maintenance and restoration activities.

The work of maintenance and restoration of movable cultural property and the decorated surfaces of architectonic properties shall be carried out exclusively by those who are qualified restorers of cultural property in accordance with the regulations in this regard.

For voluntary conservation work, funding shall be granted by the Ministry after the work has been completed and the costs effectively borne by the beneficiary have been verified.

The Code has also amended the system of sanctions concerning cultural property between administrative sanctions and penal sanctions. Penal Sanctions mainly consider the unlawful use, forgery of works of art, violations pertaining to alienation, unlawful exit and exportation, violation relating to archaeological research.

5.4. Analysis

5.4.1. Protection System Framework

The Silk Roads protection project and the Andean Road System protection project had similar process, proposed by UNESCO, and carried out by the UNESCO global research through experts conferences and regional conferences, gradually helped the state parties to identify and protect their heritages.

In the case of the routes of the Intercontinental Camino Real, the research was more planned and targeted, and more active in the excavation and protection. The administrator departments did not position it as a short-term project in the beginning, instead, they established a long-term cooperation intention with the UN and international organizations, studying from the concept of definition, history, culture and protection measures.

The final conclusion was not to take the Routes as a heritage site, but to link together all the same theme OUV of each countries with the mercury trade

routes as a starting point. In this case, all the routes could be presented as a integrated heritage.

Spain is one of the countries owning the maximum heritage relating to cultural routes in World Heritage List, Tentative List, CIIC projects and List of European Cultural Routes. To present these cultural routes properties, Spain had two basic platforms, the World Heritage List and List of European Cultural Routes. The two lists at different level had different definitions and criteria for the protection of cultural routes, which could complement to each other. To some extent, the world heritage emphasized outstanding universal value, while the European Council cultural routes focused on the cultural identity shared by European people.

	World Heritage Cultural Routes	European Council Cultural Routes
Values	outstanding universal values	transnational, trans-regional, regional; representative of European cultural entity and of its memory
Features	interactive, dynamic, and evolving processes of human intercultural links	including virtual and abstract routes; itineraries based on a historic route, a cultural concept, figure or phenomenon
Routes Structure	Tangible historical routes heritage	Historical routes; geographic routes network; culture routes network

Fig. Comparison of the definitions in World Heritage Cultural Routes and “Cultural Routes of the Council of Europe”

so far, the protection of cultural routes in Spain is a three-level system. The first level is the traditional historical heritage protection for all the elements involved in the routes; the second level is the integration of all the historical remaining, identifying the theme and management planning; the third level is to make strategy plan to promote the expression and the development, and nominate for World Heritage List and “Cultural Routes of the Council of Europe”.

The system

The protection system involves a large number of social groups, such as governments at all levels, cultural heritage departments, research organizations, universities, etc. The Spanish National Committee of ICOMOS(CNE) have played an important role in the protection system, organizing international conferences on the theoretical and practical protection, researching on relating subjects, cooperating with relevant research institutions, and publishing academic research results regularly. And with this protection system, cultural routes is considered as one of the most important type of the Spanish heritage, committed to continue research and protection.

Thereby, there is a common feature in the protection of these large-scale complex heritage which established a hierarchical protection system from local value to outstanding universal value, from local regional protection, to national heritage protection, intercontinental protection system and at last the World

Heritage system.

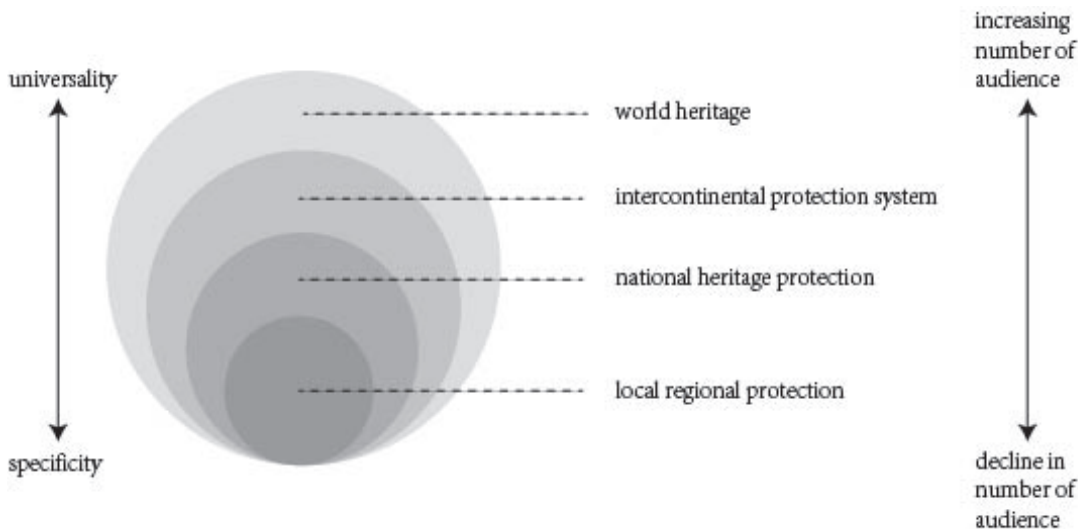


Fig. The Relationship of Different Platforms

5.4.2. Waterway Heritage

Owning many water-related heritage, Canada is one of the countries with the richest water resource. Taking charge of the heritage protection, Parks Canada, a governmental agency, set up the protection project of National Historic Sites of Canada, preserving the historical sites considered in two levels.

Besides, Parks Canada also led the Canada Heritage Rivers System (CHRS), the Canada's national river conservation program, which provided national recognition, research, legal supervision and protection for Canada's outstanding rivers with natural, cultural, and recreational values through making special charters.

The two protection systems worked co-operatively, conserving the waterway itself as well as the historical relics and sites along the rivers.

For example, the protection of Rideau Canal had different protection aspects in management. Firstly as a world heritage, constituent elements of outstanding universal value based on some river channels, water conservancy facilities and military installations. Then as the representative of Canada national value, the second level cultural resources included other channels, settings and relics. The system had different protection strategies for different relics, but connected all the heritage elements at the same time, preserving them as an integrate heritage canal.

Canal du Midi in France is the first canal to be included in World Heritage List. Its management system is divided into national level and local level. The national level involved ministries of communications, environment and culture. The certain management was given to Voies navigables de France (VNF). While the local level administrators were the local waterway departments, managing the natural river supplying water to the canal. The landscape, architectures, bridges and other elements were managed by different relevant departments.

This could be a meaning reference for the Grand Canal of China. Cause in China, the cultural relics department only has the right to supervise but no right

to decide on the protection and management projects. However, it is necessary to cooperate with water conservancy department and transportation department in the heritage protection.

for the protection and management of the river is only the right to supervise the supervision

5.4.3 View of Other Kinds of Heritage

5.4.3.1. The View of Industrial Heritage

The Canal system represented by Rideau Canal and Midi Canal belonged to the canal technology around the industrial revolution. While the Grand Canal stood for a pre-industrialization technology in the traditional conditions. Benefiting from many water conservancy technologies all over the world in that age, it was characterized by the flexible use of several technologies based on different natural conditions.

In European countries, the construction of canals relied on a proven science and technology knowledge system. The relics reflected a particular engineering technology, based on the material, the related scientific knowledge or the breakthrough of a key technology. However, the Grand Canal did not have advantages in this respect. It was based on the experience of the transformation to the natural environment from generation to generation.

The relics from different ages showed the history of the evolution of the canal technology. And its integrity and continuity made it highly noticeable, manifesting the ability in the management of large technology projects.

And in the comparison in the scale of engineering, the Midi Canal was about 360 Km in length, Rideau Canal about 202 Km, while the Grand Canal had 1800 Km only considering the section during 16th Century(the Ming and Qing Dynasty).

5.4.3.2. The View of Landscape

The Midi Canal referred to its value in the perspective of landscape in the explanations of OUV as a World Heritage. Riquet, the designer, paid attention to combine the technology project with the popular classical architecture aesthetics and landscape design. The landscape design and the sycamores planted on the riverbank sought simplicity, giving expression to the elegance of the French classical garden.

As an important traffic route in eastern China, the Grand Canal linked the most prosperous ancient cities and bustling business districts together. Because of the huge amount of traffic, the canal was wide, with urban landscape and rural landscape staggered.

In rural areas, hydraulic facilities were made of wood and timber. The canal showed a natural state, matching with traditional rural landscape like the farmland and villages. Meanwhile, in urban areas, the riverbanks were made of hard stone. Piers, bridges, shops and temples along the canal created the waterfront landscape in the ancient city.

CHAPTER 6. PROTECTION REGULATIONS OF THE GRAND CANAL OF CHINA

The Grand Canal of China was authenticated in the Cultural Relics Protection Entities At National Level, which was a certification of the maximum protection level. Usually the cultural relics entities included single architecture, complete groups of buildings and historical cities.

In order to show the value in different views, relevant national platform has begun to establish.

The Office of Protection and Management of Grand Canal heritage was set up in 2014, aiming at the protection of the canal, and coordinating with the Ministry of Communications, Ministry of Water Resources, Administration of Cultural Heritage and local government departments.

6.1. Existing Research On the Regulations and Laws

Since 2009, under the call of the international cultural routes list, China has started the research on the comprehensive background and the resources reorganization of its own culture routes.

As a world heritage site and a cultural route, it's an opportunity for the Grand Canal to collect basic data and implement protection through the work in cultural route list.

At present, the main policies for the protection of the canal is as the following:

- 1) Keeping on surveys, historical analysis and research;
- 2) Planning for overall protection
- 3) Improving laws and regulations
- 4) Improving management
- 5) Completing and updating explanations for OUV
- 6) Protecting the authenticity and integrity as a linear cultural heritage
- 7) Encouraging the public and the community to participate in the protection

6.1.1 Basic Laws And Regulations

In the heritage protection system, laws and regulations applicable to the protection of the Grand Canal were as following:

Cultural Relics Protection Law of the People's Republic of China (2015Amendment);

Regulation for the Implementation of the Cultural Relics Protection Law of the People's Republic of China(2003);

Laws and regulations referred to waterway were as following:

Water Law of the People's Republic of China (2002 Revision);

Law of the People's Republic of China on Flood Control (2015 Amendment);

Water Pollution Prevention and Control Law of the People's Republic of China (2008 Revision);

Environmental Protection Law of the People's Republic of China (2014 Revision);

Regulation of the People's Republic of China on the Administration of River Courses(2011 Revision);

Regulation of the People's Republic of China on the Administration of Navigable Waterways (2008 Revision).

Level	Laws and Regulations	Issuing Authority
National	Cultural Relics Protection Law(2015Amendment)	Standing Committee of the National People's Congress
	Principles for the Conservation of Heritage Sites in China(2015 Revision)	ICOMOS China
	Regulation for the Implementation of the Cultural Relics Protection Law(2003)	State Council
	Measures for the Administration of Culture Relics Preservation Projects(2003)	Ministry of Culture
	Administrative Measures for the Protection of World Culture Heritages(2006)	Ministry of Culture
	Administrative Measures for the Protection of Grand Canal Heritage	Ministry of Culture
	Requirements of Protection Planning for Cultural Relics Protection Entities At National Level(2007 Revision)	State Administration of Cultural Heritage
	Measures for the Administration of Monitoring and Inspecting World Cultural Heritage in China(2006)	State Administration of Cultural Heritage
Provincial	Regulation for the Cultural Relic Protection in different provinces	Provincial People's Congress
	Planning on Grand Canal Heritage Protection(sections in related provinces)	Provincial Governments
	Overall Planning of Protection and Administration of Grand Canal Heritage	The provincial and ministerial consultation group of Grand Canal Protection
City Level	Planning on Grand Canal Heritage Protection(sections in related cities and counties)	Local governments
	Measures for the Protection of Grand Canal Heritage	Local governments
	Protection Agreement of Grand Canal Heritage	Cities Alliance of Grand Canal Heritage Protection

Fig. The Structure System Of The Laws And Regulations Referred To The Protection Of The Canal Heritage

6.1.2. Provisions and Protection Principles

The most important one, Cultural Relics Protection Law of the People's Republic of China (2015Amendment), determined the basis of the heritage protection policies.

Article 4 The principles of focus on protection, giving first place to rescue, reasonably utilization and strengthening the management shall be followed in the work concerning cultural relics protection.

	Delimit	Protection Principle	Examine and Approve
Cultural Relics Entities	The entities at national level should be selected by the department of cultural relics administration under the State Council. The entities at the province level or at the city level can be subject to governments at related levels.	The original site shall be protected by whatever possible means.	
Protection Area	The protection area of shall be delimited by governments. Specific measures shall be developed by cultural relics administrative departments.	No additional construction projects or operations such as explosion, drilling or excavation, etc. may be undertaken within the scope of protection of a protected historical and cultural site.	Repairs and maintenance of unmovable cultural shall be taken care of by the users. Repairing, removal and reconstruction shall be undertaken by an entity with the qualification certificate for cultural relics project.
Construction Control Area	According to the actual needs for the protection of cultural relics, and with the approval of governments at related level.	Not deform the historical features of the protected historical and cultural site. No facility that pollutes the site and the environment thereof may be constructed, neither may any activity that may affect the safety and environment of that site be carried out.	The project design scheme must, according to the level of the site, be subject to the consent of the corresponding department of cultural relics administration before it is submitted to the department of urban and rural construction planning for approval.

Fig. Provisions In the Cultural Relics Protection Law

	Object	Protection Principle	Examine and Approve
<i>Water Law</i>	The rational development, utilization, preservation, and protection of water, for the prevention and control of water disasters, and for the sustainable utilization of water resources.	Delimit protection area and management of water constructions.	The department of water administration under governments at all levels.
<i>Law on Flood Control</i>	Controlling floods.	Protect the river courses and the environment.	
<i>Regulation on the Administration of River Courses</i>	To protect river courses, includes lakes, artificial canals, flood way area, the flood storage basins, and flood detention basins.	Protect the water quality in the waterway. Preserve the old embankment, the original engineering facilities.	

Fig. Provisions in the laws related to waterway

6.1.3. Administrative Measures for the Protection of Grand Canal Heritage

The Administrative Measures for the Protection of Grand Canal Heritage was issued in Aug. 2012, by the Ministry of Culture of China, and came into force since October 1st, 2012.

The 15 Measures defined the protection area for the Grand Canal, responsibilities of departments at all levels, and basic protection system. It referred to authenticity, integrity and continuity in the preservation and monitoring system with regular reports.

Article 7 The state shall implement the Grand Canal Heritage protection planning system. The Grand Canal Heritage protection planning shall be comprised of the general planning, provincial planning and municipal planning.

Article 8 The composition, protection standard and protection priorities of the Grand Canal Heritage shall be clarified in the Grand Canal Heritage protection planning, and the protection measures shall be formulated based on different categories.

Article 12 The state shall practice the Grand Canal Heritage monitoring and inspection system which shall be organized and implemented by the competent departments under the State Council in charge of cultural relics with monitoring and inspection reports being released on a regular basis.

	Protection Measures	
	Heritage Area	Buffer Zone
Heritage Point	Preserved in original state.	No new buildings or structures that are not compatible with the coastal environment in form, height, color, etc.
Heritage Canal	No new project unrelated to the canal.	
Intangible Cultural Heritage	To protect, study and carry forward the intangible cultural heritages. Sponsoring the inheritors.	

Fig. The Principles In Measures for the Protection of Grand Canal Heritage

6.2. Existing Problems

Other than general historical sites, the Grand Canal is still in use, so it needs not only protection, but also planning and development under the guidance of protection. As a living heritage, Changing and developing were the continued themes and characteristics of the Grand Canal and the cities along. And there is an objective requirement of development and construction.

Under the background of urbanization, the main problem lies in how to control the changes, how to inherit and emphasize the city context, and maintain the ecological.

6.2.1. Administration System

According to the laws and regulations in the former chapter, traditional heritage protection can easily be at odds with the development of water conservancy facilities. However, in the current administration, local transportation departments took charge of the section management of the canal. Usually, cultural relics departments only provided measures and guidance, but not participated in the actual management. Therefore, a large number of actual management staff paid more attention to the commercial efficiency and river renovation itself than the protection of cultural resources. These also led to the imperfect work on the collection of historical information, which made planning losing a complete analysis basis.

On the other hand, the traditional protection of cultural relics favored a stationary state. For ancient sites, ancient buildings and other memorable heritages, it is important to keep the original state. But the Grand Canal is living and developing. It is necessary to have a legal basis and guidelines to control the development.

A vertical value gradient system was formed to help protecting huge-scale cultural heritage like the Grand Canal. In dealing with the multi-level protection system, it was still facing some problems in the construction. For example, in the cooperation of crossing regions and crossing departments, the system would need a unified structure planning to ensure dialogue and to coordinate all aspects of protection work.

It is undeniable that in some sections, the canal has not been properly protected.

1) Lack of suitable typology for the Grand Canal

Presently the only heritage protection system at national level is the Cultural Relics Entities system. It is mainly used to classify and protect the traditional cultural heritage, such as ancient architecture, ancient sites, tombs, groups of ancient buildings. It is appropriate to protect the single element of the Grand Canal, but not possible to cover the integrated value and the overall significance of the Canal as a complex heritage.

In this system, the Grand Canal was currently defined as groups of buildings. Nevertheless, this classification is not accurate, which would limit the value expression and subsequent development.

2) lack of the national platform to deal with the multi-level value of the Grand Canal

Compared with the protection of cultural routes in European countries, the World Heritage List is the only platform for the Grand Canal to the world. A intercontinental or national heritage platform would be meaningful to express the values which were not enough to meet the OUV criteria, but still make sense for regional culture and history.

Besides the OUV in the system of World Heritage, the Grand Canal also has some other explanations of values other than OUV which could be significant in Asian countries such as Japan and Korean.

6.2.2. Lack of Cultural Communications

Different from the Silk Roads, the whole Canal is located in Chinese territory. Because of the vast territory of China, and the closure of the civilization development in history, the Grand Canal had few opportunity to cooperate with international institutions and other state parties in research. This might resulted in the unclear understanding and non objective interpretation.

6.2.3. Threats and Opportunities of Modern Engineering Constructions

The accelerated urbanization process have had great influence on an increasing number of elements of the Grand Canal heritage, including the setting, and the ecological system. The large scale project construction is a threat to environmental landscape and the heritage itself. Urbanization also made dramatically changes on the cultural tradition, lifestyle and ideological conception of the residents along the river.

In 2004, the eastern section of South-to-North Water Diversion Project in China was initiated. The project would renovate the ancient channel of the Grand Canal, and use the Canal to transfer the water resource from the south to the north, balancing the supply and demand of water in northern cities and southern cities.

The main purpose of this project was to supply the urban domestic water and industrial water for cities along the canal, and improve the water supplement of agricultural water in Huaibei area.

The eastern section of this project was 1156 km in total. And about 750 km of it was sharing channels and branches with the Canal.

This project was bound to have a certain impact on the canal heritage. Only in

the first stage of this project, 919 of the cultural relics were involved.

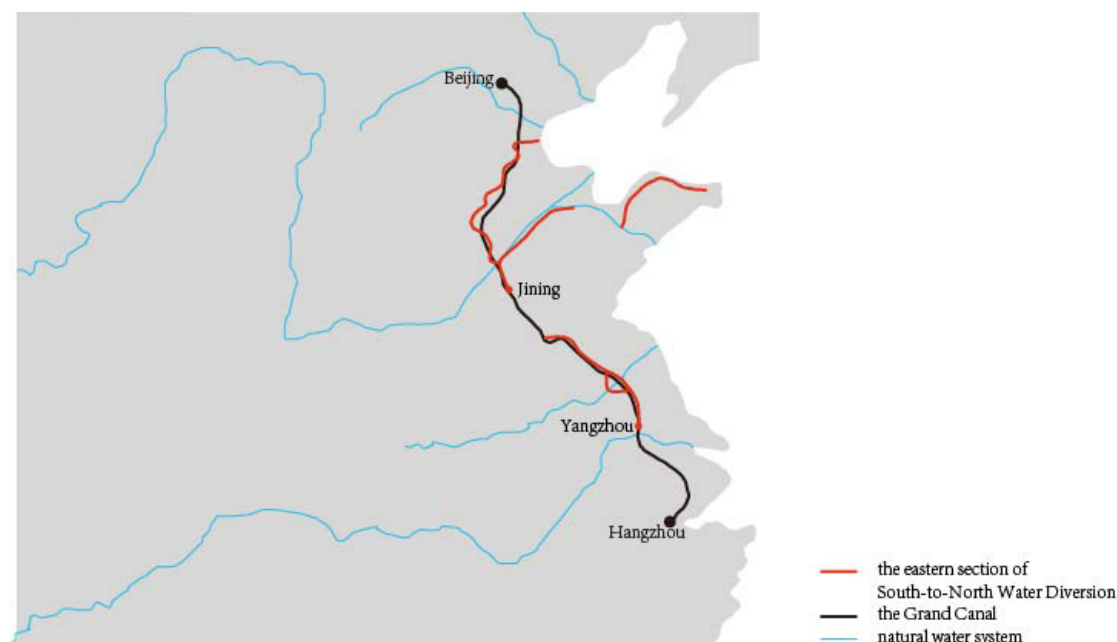


Fig. The Map of the Overlapping Section of the Project and the Canal

The whole project was finished in 2014, with water flowing and water quality reaching the standards. But at the same time, the follow-up protection and supervision of the involved historical heritage cannot be ignored.

In the project process, the salvage archaeological excavations and the protection of the cultural relics themselves were carried out. According to the current protection measures, the protection principle of this kind of historical remaining was to keep the original statue, and reduce the influence. Embankment, dam, reinforcement and other necessary protective measures were taken depending on different situations, making the cultural relics surviving in the original statue as much as possible.

For those cultural relics which could not or should not be relocated, such as stone inscription, methods of reconstruction in higher level, reconstructed in other place or partly reconstructed in other place could be applied, trying to preserve the traditional landscape.

Modern constructions brought threats towards the protection of the Canal without doubts. However, this could be an opportunity to some extent. On the one hand, in the beginning of the project, numerous survey of historical relics and landscape had been down to complete the basic database. With the completeness of the regulations in the canal protection, the awareness of residents on heritage protection was improved, the investment brought by the economic development was also conducive to the protection.

On the other hand, modern water transport project was also a part of the “living” canal. The large scale water transfer activated the function as an ancient canal system, and also systematically restored the environment in the area which had been drying up.

It continued the function and value as a canal in the long run, which would benefit the development of the Canal as a cultural route.

The functioning of the canal relied on the nature but also struggled with the nature. In the history of construction on the canal, there had been several

engineering disasters and damage to the environment. As a living cultural heritage, it is a new subject to modern engineering for its reasonable utilization.

6.2.4. Urban Convergence

The cities along the Canal showed highly diversity due to the differences in region, ethnic and so on. Thanks to the local ancient cultures of the various regions, different cultural circles were formed, bringing special city texture and river landscape.

All of them owned these living cultural heritage. Because of this, the planning of the canal cities should be different from normal ones, focusing as below: the historical and cultural value, unique space related to the Canal, protection of the canal heritage, and the development of the value in the future.

But it was noticed that in the development of modern cities, some cities had converged in the city form, landscape and cultural because of the improper control. The loss of local characteristics led to a single impression of many different cities. Therefore, the Grand Canal was losing the unique value brought by the diverse cities along the canal.

Since 1970s, areas along the Canal with developed economy and increasing population had experienced a rapid urbanization process. To meet the needs of the housing and modern transportation, some cities have begun to chase for large-scale construction groups and large volume modern architecture.

Most of the ancient water conservancy projects, which had lost their functions but still had historical value, have been abandoned or replaced. And in some landscape design, some ancient piers was pushed out on the river, and transferred into another function, which weakened the authenticity and integrity of cultural relics.

The urban landscape of the canal heritage was influenced by the improper construction in the old city, the design lacking cultural connotation and increased commercialization.

6.2.5. SWOT and Stakeholder Analysis

Strength

- The transport facilities were still remained and functioning.
- Most of the historical relics were preserved.
- Many historical cities and towns located along the Canal.
- Already included in the world heritage list.
- Many intangible cultural heritage remained.

Weakness

- In some sections the waterway was damaged.
- The department of cultural relics do not take charge of the project.
- There was no proper platform to express all the value.
- The regulations and laws only focused on the single cultural relics but not the whole cultural routes.

Opportunity

- Many historical cities along the canal became developed modern cities.

- Typical landscape was preserved along the canal.
- Special tourism can be developed based on the linear route.
- Connecting with the Silk Roads.

Threat

- Urban convergence.
- Excess commercialization in some tourism cities.

STAKEHOLDERS	POWER	INTEREST
Researchers on local culture	Low	High
Local media	Medium	High
Experienced intangible cultural heritage professionals	Low	High
Souvenir stores	high	High
Investors on cultural industry	Medium	high
Target tourists	low	High
Local merchants	medium	Medium
Tourism administration	High	High
Administration of culture heritage	low	High
Administration for industry and commerce	high	Medium
Administration of taxation	high	Medium
Local citizens	low	Medium
UNESCO	medium	medium

Fig. Stakeholder Analysis

6.3. Strategy Plan

The objectives and strategies can be established according to protection system in different level. The system shall be available to solve the real problem in the protection, providing case and experience for the following work.

6.3.1. Academic Research

1) The establishment of the discipline of heritage canal

Starting from the Grand Canal, the discipline of heritage canal can be established through three aspects. Firstly, based on the current situation, specialized technical archaeology shall be necessary to collect professional data for those engineering relics which had been abandoned in the long history. Secondly, compared with the development of the history of international technology, the research on the history of technology of Chinese canal shall be further combined with the cultural history, relating with the economic, social and ideological factors in the specific period. Thirdly, the research on the philosophy related to the canal shall be developed, helping to understand the relevant literary works and explain the uniqueness of the canal technology.

For some historical relics and sites, their current state could only show the survival of the situation, which had big difference with the original state, and could not reflect their authenticity and integrity.

Under the circumstances, only the academic research could help to provide evidence to restore and preserve.

2) The research of the Cultural Landscape

As an integral cultural landscape heritage, the complete research framework of the Grand Canal needs to refer to the results of Western Studies and integrate the fragmented content.

Referring to the common process of the cultural landscape value analysis, the collection and analysis of the data of the landscape value should be done at first. Then describing the landscape features, analyzing the landscape elements in different historical periods and discovering their relationship in space.

3) The research of the Cultural Route

The study of cultural routes needs a comprehensive interdisciplinary vision for the research. According to The Charter on Cultural Routes, the five elements, context, content, cross-cultural significance as a whole, dynamic character, and setting, shall be analyzed as the major concerns in the research.

6.3.2. Framework Strategy of the Protection of the Canal Heritage

The cultural route is a mutually staggered cultural network, consisting of nature heritage and cultural heritage, also tangible heritage and intangible cultural heritage. It can be seen a new system of heritage protection and management. Under the supervision and suggestion of this system, the administrator could adjust the input, revise the laws and regulations, and carry out the planning for the development.

1) establish a value protection system of different levels

Besides the cultural relics entities at all levels, it makes sense to establish another independent, comprehensive heritage protection system. Taking the similar system in Canada and Spain for examples, the system itself could represent an updating understanding and new insights into the heritage. It shall deliver the significance and value of a single monument, and also the relationship of different heritage elements, to keep them living and updating.

2) identify a more clear relationship between the whole heritage and the single monument element in the protection system

In current situation, the cultural relics entities could only cover the single heritage element, and protect them separately. For the cultural route as a whole heritage, and the related topic such as the heritage setting, the ecosystem and landscape, which are different with the traditional heritage, it is necessary to complete the protection system.

CHAPTER 7. PRESERVATION

Cultural Routes and similar concepts such as cultural corridors, heritage corridors, serial monuments and sites, historic pathway, etc, were emphasizing the existing of time, space and cultural. They paid attention to the cultural influence of each heritage element on human society and sustainable development. What's more, they underlined the communication and influence among different cultural communities along the route.

Besides the canal heritage, there are many other kinds of cultural route heritage. The study of the similar large-scale complex cases shall do much to sum up the protection model of the Grand Canal from the existing experience, and to prepare for the problems which may arise.

7.1. General Goals

Cultural Heritage does not only bring huge tourism benefits, but also draw people's attention to their own culture and history, and their cultural identities. For the large-scale heritage like canal, cultural routes, heritage corridors, people will have stronger cultural experiences in space and time, which will cover the shortage of the superficial and fragmented information of the single tourist site. It is necessary for the Grand Canal to change its role in the protection process, from simply functioning for traffic, to the representative of landscape, culture, education and tourism.

The technology system formed in the Canal, and the spiritual connection between human and cultural landscape, will together promote the expression of the knowledge system of Oriental civilization.

The basic goals for the Canal can be considered in three parts:

- (1) the promotion of the water quality the river channel itself
- (2) the preservation of culture relics along the Canal
- (3) the construction of a linear culture route system and a new navigation system

7.1.1. Mission

To develop in local and preserve the heritage at the same time based on the linear culture route through a series of integrated guidelines and projects.

7.1.2. Vision

A living cultural route with series of cultural heritage sites and landscape, developing sustainable tourism and owning its own cultural brand to preserve the heritage.

7.2. Strategy Guidelines

The preservation of the Grand Canal is not to maintain the Canal as a closed system, but to make this series of cultural heritage actively integrate into the

current social development and the daily life of the local communities. The development of the Canal pay attention to the protection and preservation as well as the cultural value and emotional value. As a living dynamic system, the development can also promote the cultural resources and improve values. For the static cultural relics, the major work is to protect, and for the dynamic part, the opportunity to continue to function and the ability to develop are as important as protection.

The Canal was a engineering project, and without functioning, the engineering facilities and constructions would soon be damaged.

The function and the monuments cannot be divided, in fact, it is the function of the monuments which deliver the significance of the important part of themselves. (Petzet M. , Mader G. T. , *Praktische Denkmalpflege*(Practical Conservation), 1993)

From this point of view, for the protection of the Grand Canal heritage, it should take into account that as far as possible to maintain its vitality with the minimum intervention, so that it can maximize the authentic existing, and develop in sustainability. The relationship between human and the Canal in each period and the overlapping of development in history are also part of the canal heritage. This kind of dynamic updating has been continued in the history, will continue in the future. The important thing is to strengthen the supervision and the planning guidance in the protection and development to ensure the authenticity and integrity.

The ideal model is to seek a common progress between protection and development. And this can only be achieved in a long-term and large-scale project with sustainable goals.

7.2.1. Laws, Regulations and Policies

Control the real estate, industry and other related development along the Canal, especially the new projects in the protected area and the surrounding buffer area, to prevent the damage of excessive development and construction to the cultural relics, landscape and ecosystem.

The protection planning should also involve the focusing project of the protection of the Canal and its settings, and the procedure for examination and approval of projects.

- (1) complete the relating laws and regulations
- (2) making provincial protection plan and municipal protection planning
- (3) maintain regional history features

7.2.2. Document Protection and Resource Data Digitization

- (1) collating and publishing documents and classics

Collecting and collating ancient books with descriptions of the Canal, sections of the Canal, or constructions, and publishing scholarly monographs. Considering the different descriptions of one elements in different books, it is necessary to have textual criticism to track the original state.

- (2) establishing document library and database

The canal document library is a platform to provide the basic research information and facilitate the follow-up retrieve and use.

The data and information of the Canal were relatively fragmented, which made

the database more useful. The database can also include the information in working, classify them and be propitious to exchanges and publicity.

7.2.3. Popularization

7.2.3.1. information delivery

Publishing historical maps, setting canal online forum and seminars.

7.2.3.2. local communities

Developing activities in local communities and citizens to improve their participation in the preservation and protection.

7.2.3.2.1. Grand Canal Heritage Trek System

The proposal of “Grand Trek”, a trail system along the Grand Canal was firstly put forward in 2009. The system planned to develop a pedestrian path along the Canal based on the civilian forces. The trail system was designed only for cycling and walking, to achieve sustainability and less intervention to the heritage. In the construction, no damage would be allowed to the original landscape.

And in the proposal plan, it would be more than 3200 Km long after finished. It would link all the single heritage spot and area, and combine with the media and the public participation as a kind of historical trail and a experience route for world cultural heritage.

Attached to the Canal, the trail system provides a authentic platform for the public to experience the Canal.

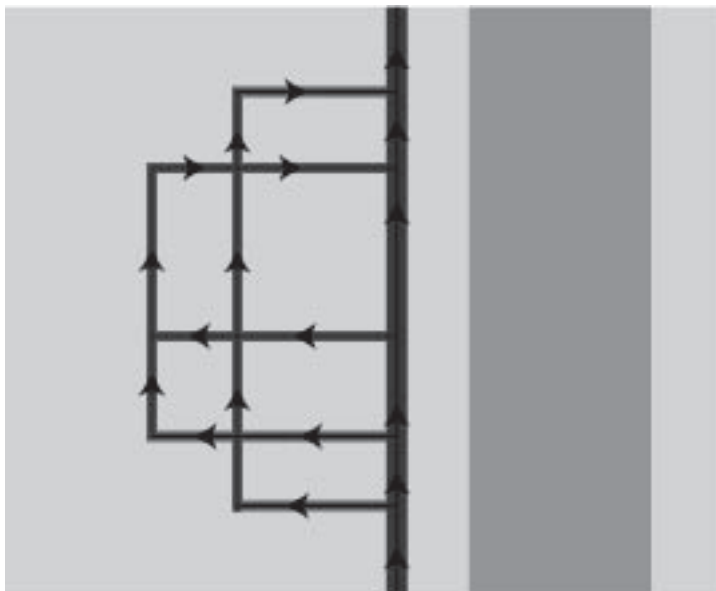


Fig. The Basic Structure of the Trek System

Through the investigation of the constructed sections, it could be seen that the trail system along the canal could be more attractive for tourists than one single spot. The experience of the linear space of the trail system reflected the

real space form of the linear cultural route with authenticity and integrity. And the system could be more effective in the participation and experience of local residents.

On the other hand, the trail system could be a new platform for the long-term management and comprehensive development. Through the building of the road network, the interpretation system of the trail, and the logo design, the value of the cultural heritage could be re-discovered, and updated.

7.2.3.2.2. The Series of Historical Cities

The cities along the canal are the important constituent element of the canal heritage, most of them were ancient commercial cities developed and raised by the development of the Canal. The Grand Canal went through the city, brought unique features of the river channels. And most of these cities have been considered as the national historical cities, and composed a series of historical cities and towns.

The inhabitation environment of the city was supported by the Canal, channels, and water network with different dimensions. And the city was built along the water, forming a tree system.

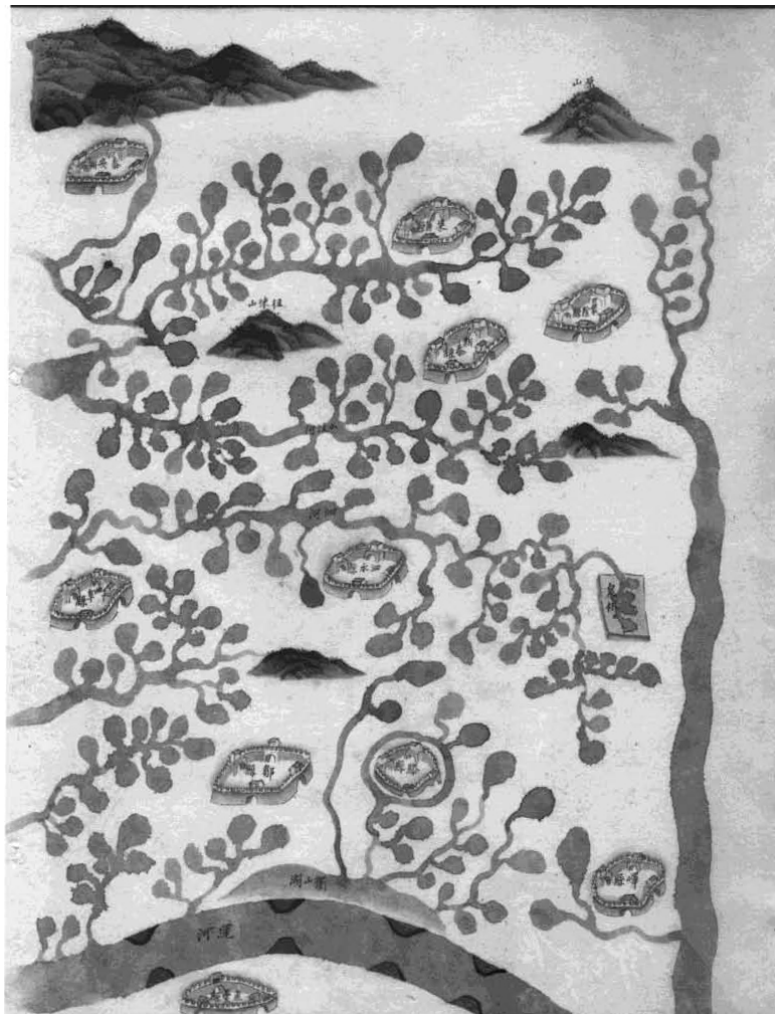


Fig. The Memory Map of the Canal System in 1703 Showing the Branches Structure of the Water Transport System

Compared with common urban planning, the city along the canal paid more attention on the preservation and maintenance of the living culture which based on the heritage value and showed the identity of the city. The Egyptian archaeologist, Fekri Hassan stated his opinion in the speech Archaeology for Our Times on the Shanghai Archaeology Forum in 2013, that in the future work of archaeology, the archaeology should be combined with the management of cultural heritage, switched the focus from the relics to the heritage resources.

He stated that the destine of valorizing heritage was not to praise the past or return to the past, but to create a sustainable culture, making the present time as a stage of the dynamic historical process, and making the new generations realizing the value of the great civilizations.

Connecting the heritage and the daily life, a more effective community could be constructed to inherit the tradition and culture, making the culture living and alive.

Generally, the sustainable development of living heritage can be concluded as below.

(1) taking the heritage as part of the civilization, not only to study the past, but also to improve the current life.

(2) keeping continuity, showing the connections between the past and the present. For example, some relating intangible cultural heritage like handicraft, can be developed as the link of the heritage and the current life in community to seek for new economic opportunities.

It was important that not strengthen the opposition between the city function and the city culture.

(1) the change of the concept of cultural heritage protection

The Grand Canal should consider the interaction and combination of all elements in heritage type, space, time, and switch from the protection of the cultural relics to the protection of the cultural heritage.

(2) the expansion of the content and scope of the protection of cultural heritage

The Grand Canal heritage includes a large number of related water networks. It goes across the land of China, and also connects with the Silk Roads, which organized the ancient large-scale commercial transportation and the cultural exchange system.

7.2.3.2.3. Sustainable Tourism

Travel and tourism have become one of the biggest industries in the world. The volume of global travel is expected to double by the year 2020. The prospects of tourism can be very important, particularly in the developing world where sustainable tourism can provide jobs, help preserve traditions and customs, and reduce poverty.

In 2001, the World Heritage Sustainable Tourism Program was launched by the World Heritage Committee to provide guiding and support to control and develop the tourism in States Parties.

The program identified 7 main actions to preserve the world heritage sites while developing sustainable tourism:

1. Building the capacity of the site management in dealing with tourism, notably through the development of a sustainable tourism management plan;
2. Training local populations in tourism-related activities so that they can

- participate and receive benefits from tourism;
3. Helping to promote relevant local products at the local, national and international levels;
 4. Raising public awareness and building public pride in the local communities through conservation outreach campaigns;
 5. Attempting to use tourism-generated funds to supplement conservation and protection costs at the sites;
 6. Sharing expertise and lessons learned with other sites and protected areas;
 7. Building an increased understanding of the need to protect World Heritage, its values and its policies within the tourism industry.

The World Heritage Centre, which functioning as the secretariat of the World Heritage Committee, plays an active role in this sustainable tourism program. It conducts missions to examine the impact of tourism development projects on the value of World Heritage sites. It also organizes regional workshops for site managers.

(Managing Tourism at World Heritage Sites: a Practical Manual for World Heritage Site Managers.2002)

CHAPTER 8. SECTION DESIGN

8.1. Design Concept

(1) Natural Harmony

The Canal itself was a product of the harmony living between human and nature. The future development of the canal should also pay attention to the coordination of human, water and land, and the continuation of the idea of protecting the natural environment.

One of the important principle is to have natural openings, reducing unnecessary new constructions to preserve the water landscape.

(2) Characteristics Performance

In the preservation and construction of the buildings in the site, try to use local materials to achieve a new vernacular atmosphere. And in the design of landscape and gardens, also try to follow the original principles and dimensions.

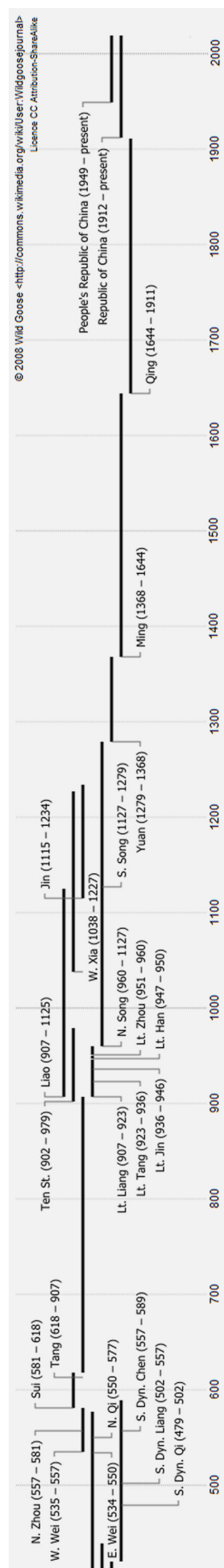
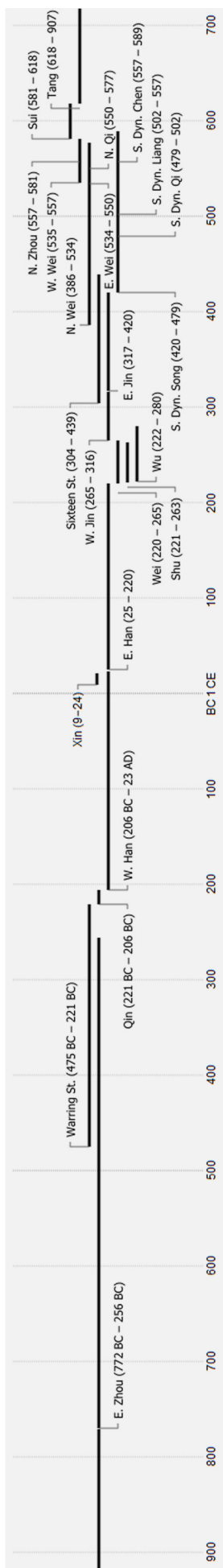
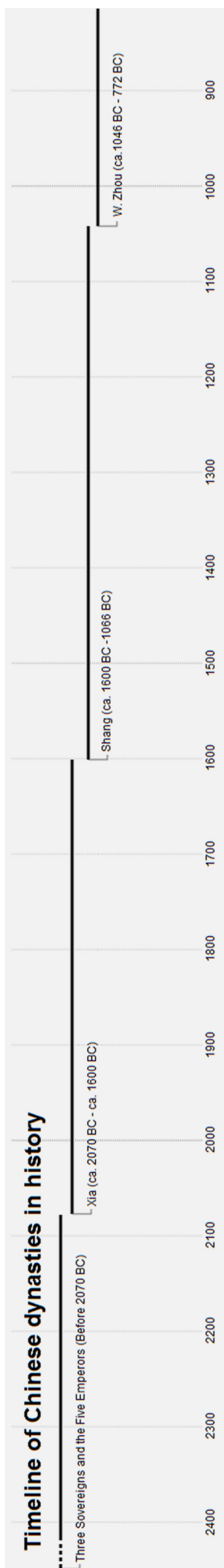
The four level space analysis from national to local:

- (1) national, position the city in the whole state;
- (2) provincial, analyze the relationship between the city and its neighboring regions;
- (3) municipal, analyze the urban environment, form and structure;
- (4) community, focus on blocks, sections in the city.

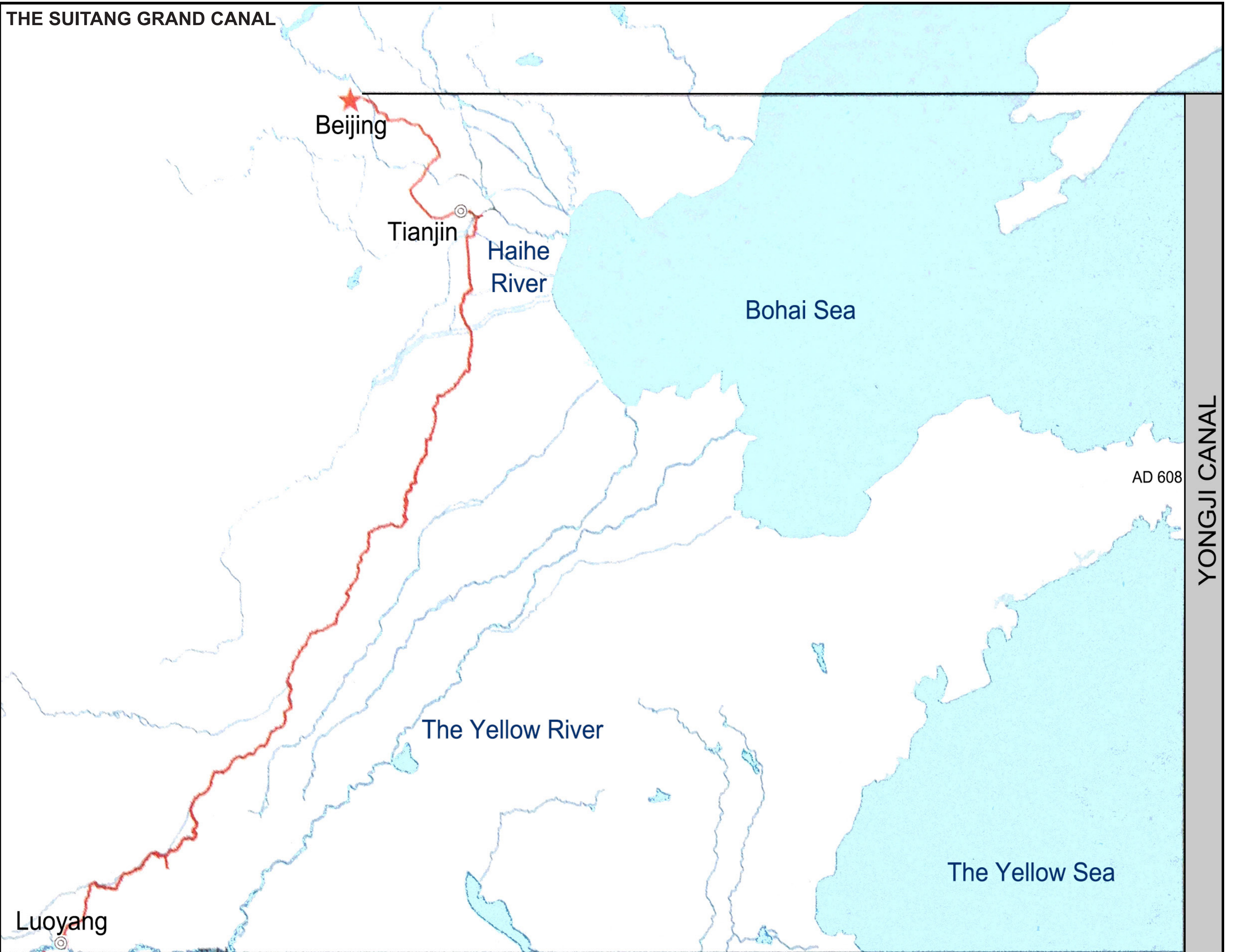
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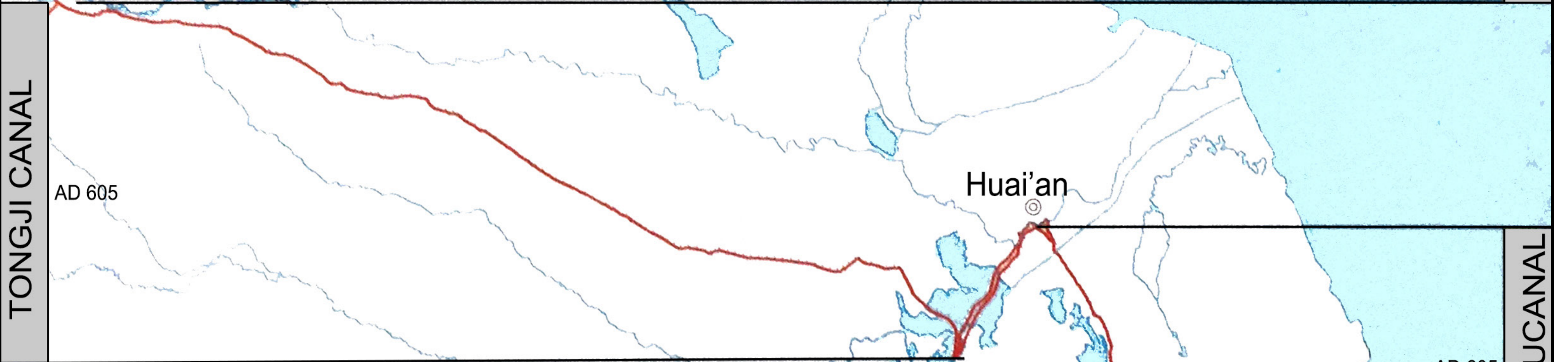
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THE SUITANG GRAND CANAL



YONGJI CANAL



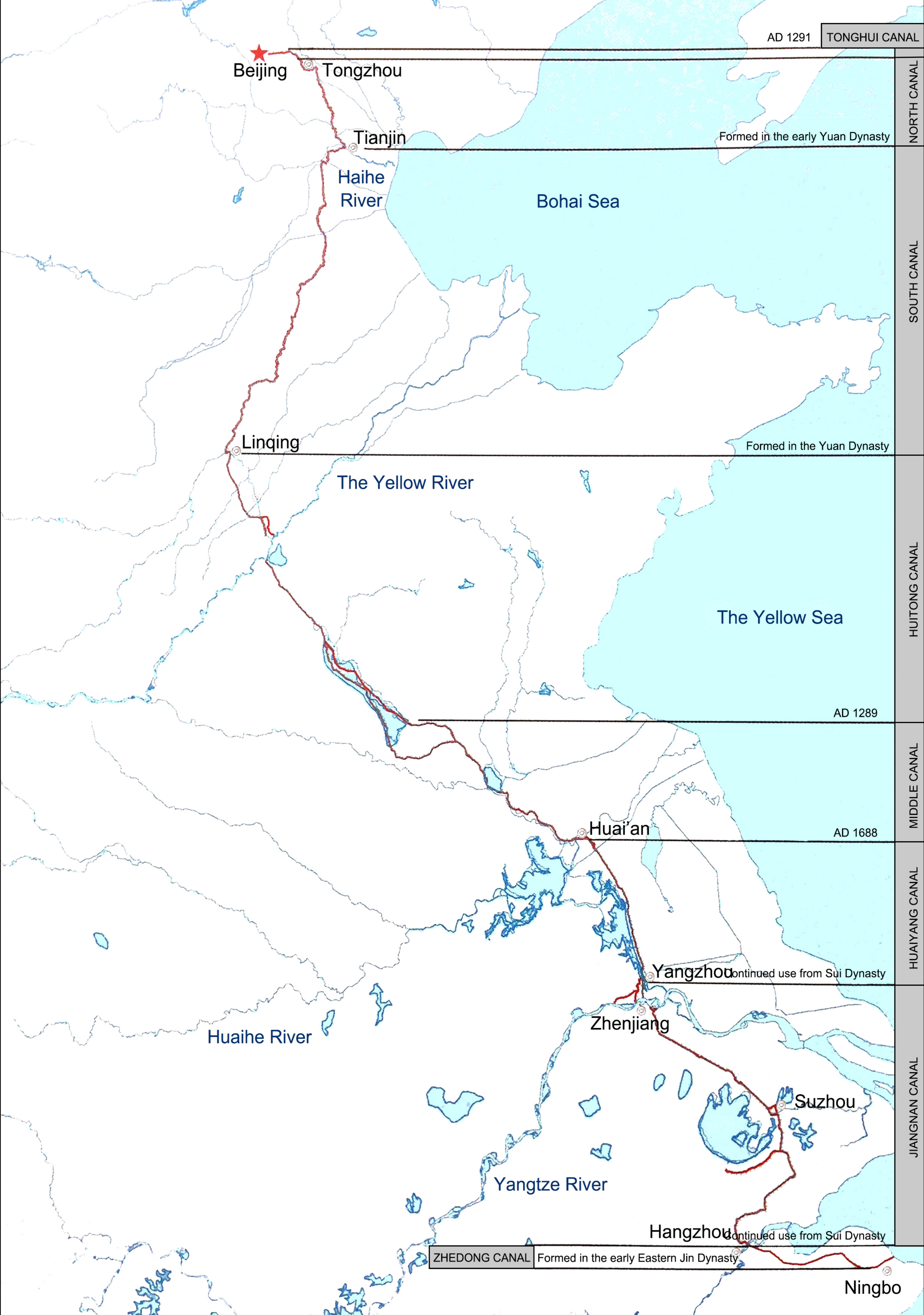
TONGJI CANAL

HANGOU CANAL



JIANGNAN CANAL

THE BEIJING-HANGZHOU GRAND CANAL

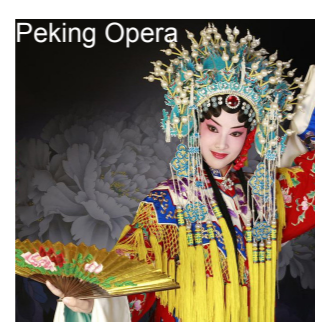


INTANGIBLE CULTURAL HERITAGE OF BEIJING-HANGZHOU GRAND CANAL

Beijing-Hangzhou Grand Canal, as a special living, linear and developing cultural heritage corridor, leaves abundant tangible culture heritages, and profound and extensive intangible cultural heritages.

First of all, the cultural time and space formed by human oral and intangible heritages shall be defined. The so-called time and space of human existence are not the time and space in the natural state, but refer to the civilized time and space of humans; In other words, humans attach cultural significances to the natural space and time. In human cultures, some cultural forms are based on specific cultural spaces, such as representative folk sacrificial dragon sword, Mazu temples and Tian Hou temples all over areas along canals and coastal areas; Some cultural forms are based on time, like China's Spring Festival, Tomb-sweeping Day, Dragon Boat Festival and Mid-Autumn Festival; In addition, some cultural forms are closely correlated with time and space, such as the "Canal-Opening Day" in Tongzhou District, Beijing, in the "Canal Age". In brief, the cultural time and space are important representations of intangible cultural heritages.

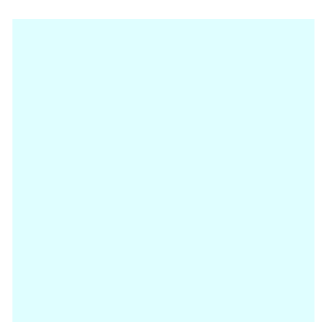
Next, the correlation between the development of human oral and intangible heritages and Beijing-Hangzhou Grand Canal shall be investigated. On the one hand, not all of intangible cultural heritages within the range of visibility of Beijing-Hangzhou Grand Canal are sourced from Beijing-Hangzhou Grand Canal; On the other hand, the direct coverage of the "Beijing-Hangzhou Grand Canal intangible cultural heritage area" shall not be restricted. In this chapter, the formation, heritage and development of the selected intangible cultural heritages are directly or indirectly correlated with Beijing-Hangzhou Grand Canal, with necessary connections in endogenesis, development, evolution and inheritance.



Peking Opera



Kunqu Opera



Tea baking and stirring techniques



Folk Literatures



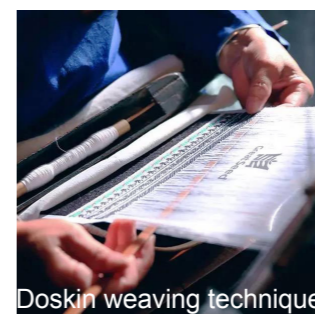
Shaoking Opera



Pingju



Porcelain firing technique



Doshu weaving technique



Children's rhymes

Traditional Opera



Pangzi



Traditional Chinese writing brush manufacturing techniques



Enamel wire carving technique



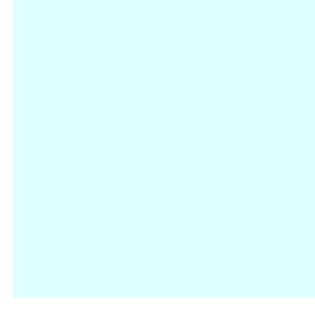
Speeches



Folk stories



Tanhuang

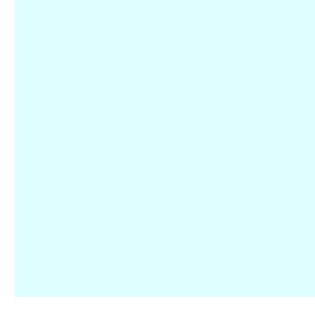


Traditional local food manufacturing techniques

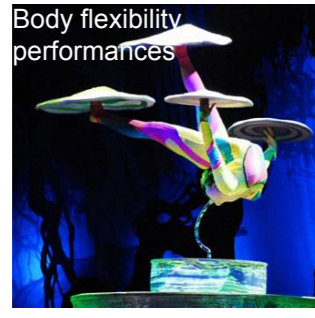
Traditional Techniques



Legends



Human pyramids



Body flexibility performances

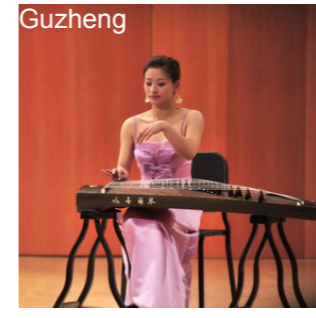


Wire-walking



Paper-cut

Traditional Craft Art



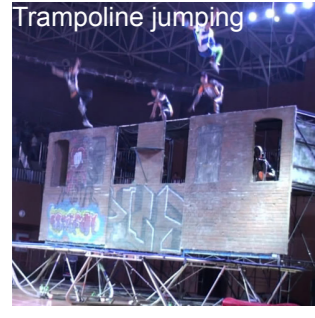
Guzheng



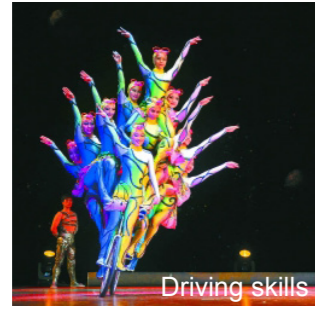
Pipa



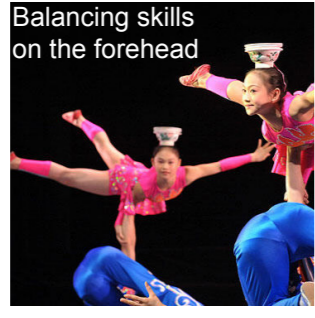
Spring Festival



Trampoline jumping



Driving skills



Balancing skills on the forehead



New Year pictures

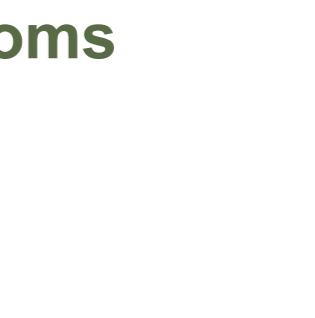


Carving



Percussion

Traditional Music and Dance



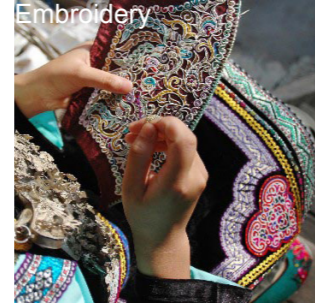
Canal Opening Festival



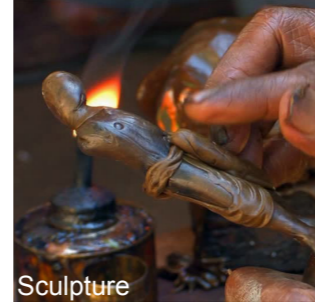
Traditional Acrobatics, Wushu and Quyi



Animal training



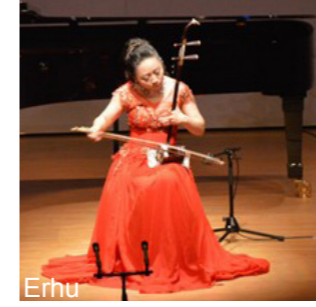
Embroidery



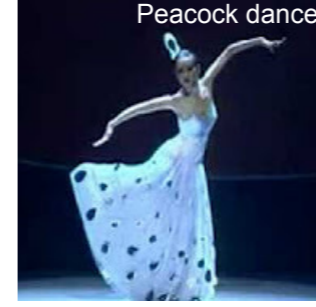
Sculpture



Silk figure



Ethnic



Peacock dance



Dragon Boat Festival



Quyi



Wushu



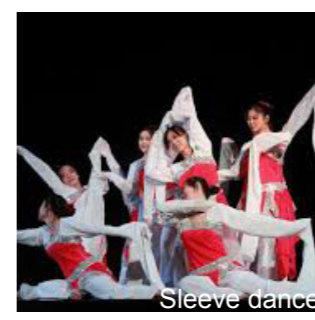
Miniscape



Fine-toothed comb



Chinese dance



Sleeve dance



Water-Sprinkling Festival



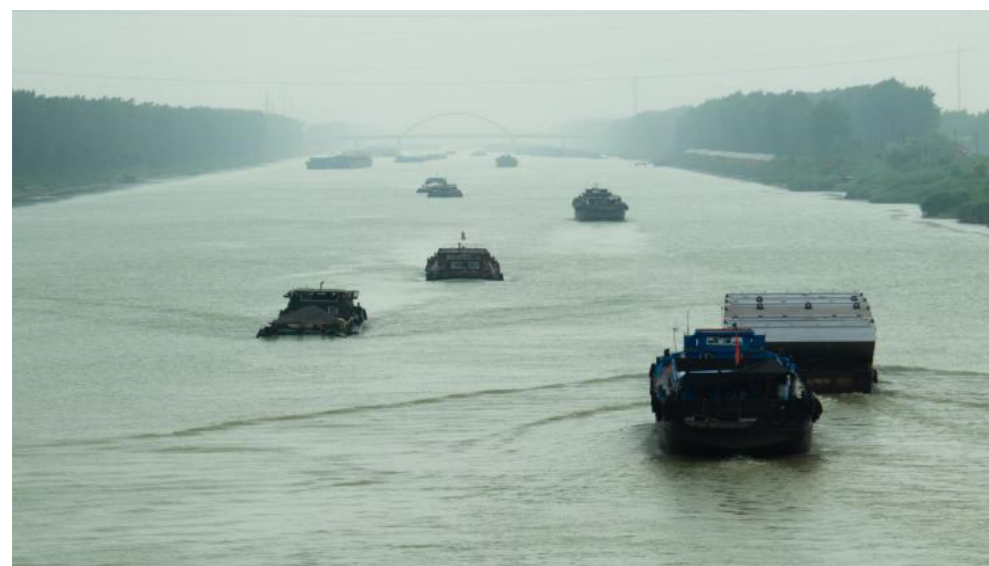
CITIES ALONG THE CANAL

Oswald Arnold Gottfried Spengler said in Decline of the West that the history of the world is the history of the cities. A majestic history of canal is also the history of urban development along both banks of the canal. The Grand Canal and the cities along the Canal are closely related and mutually dependent, while such close interaction between the canal and the city can be roughly divided into three types.

The first type is the cities as political center, that is, the capital. The capital was the heart of a nation. To feed huge population including members of the royal family, the central bureaucracy and a standing army, it was far from enough to rely only on food production of the capital itself, let alone these cities themselves were not located in the most developed area of agriculture, it thus required a stable and sustainable food supply system. While tribute grain transportation by water was almost the optimal solution to solve food problem.

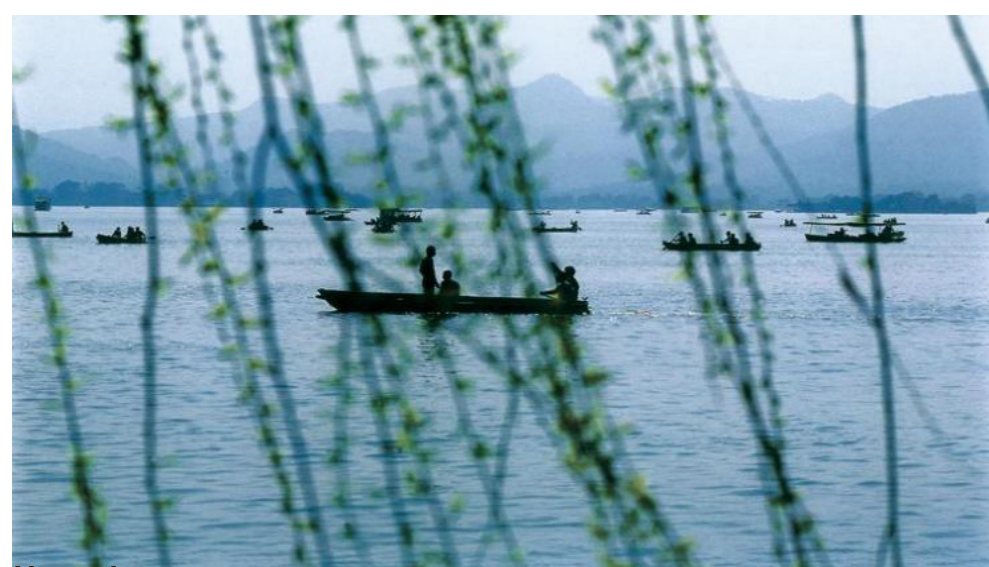
The second type is the cities as economic center. Now that the excavation of the canal was mainly for the purpose of meeting the demand of the capital for goods, political center and economic center must be linked together.

In addition to political centers and economic centers, there is a more general city type along the canal. The location selection of this type of canal city, besides political radiation and defense issue which were considered by most of the ancient Chinese cities, also needed to solve the problem of transshipment in grain transportation by water, thus the cities tended to be constructed at waterway throat.



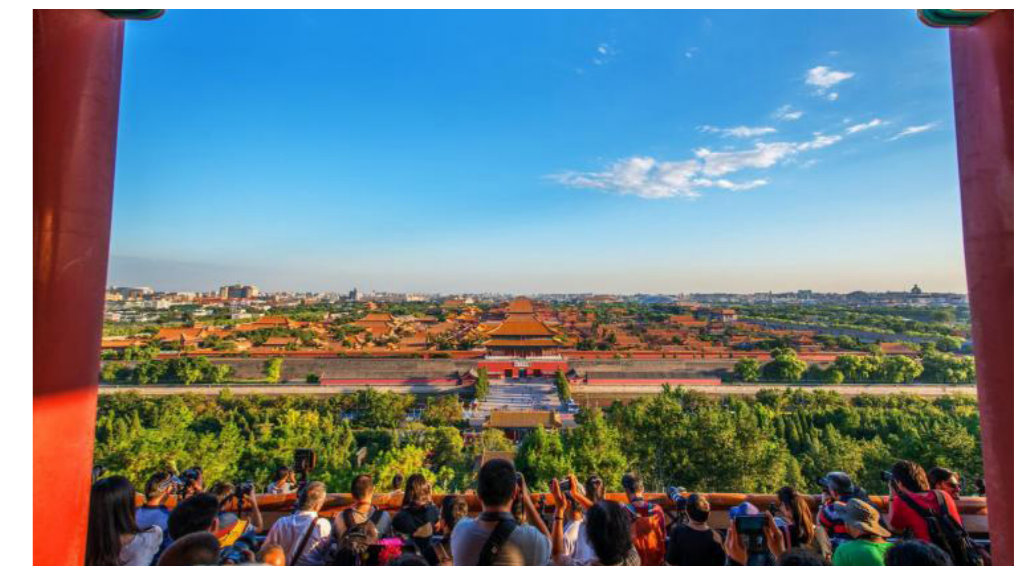
Huai'an

Of the many cities along the Beijing-Hangzhou Grand Canal, Huai'an City is known as the "Capital of the Canal." As an important line of water transport and salt transport, Huai'an is the national command center of water transport, the river-taming center, food storage and transportation center, salt tax center and transport ship manufacturing center, which is jointly known as "Four Major Cities along the Canal", together with Yangzhou, Suzhou and Hangzhou.



Hangzhou

Hangzhou City is always closely tied to water, which can be described as 'the building by water and the flourishing through water'. by means of Hangzhou the Grand Canal also rapidly extended its influence to the Yangtze River region and the wider south China, eventually making Hangzhou become a very important canal city with the dual function of being a river port and sea harbor, and the most beautiful ending of the Grand Canal flowing south from Beijing.



Beijing

Located in the northernmost of the Beijing-Hangzhou Grand Canal, Beijing is the national capital with a founding history of more than 860 years. The city construction and waterway construction of all periods had mutually promoted and complemented each other.

In addition to relying on Beijing's natural geographical advantage and landscape environment, the emperors of different dynasties also carefully carried out the planning and construction of artificial environment. The Grand Canal excavated was directly connected to Beijing and became the lifeline of the capital for grain transportation, with urban construction and channel construction being developed in parallel.



Yangzhou

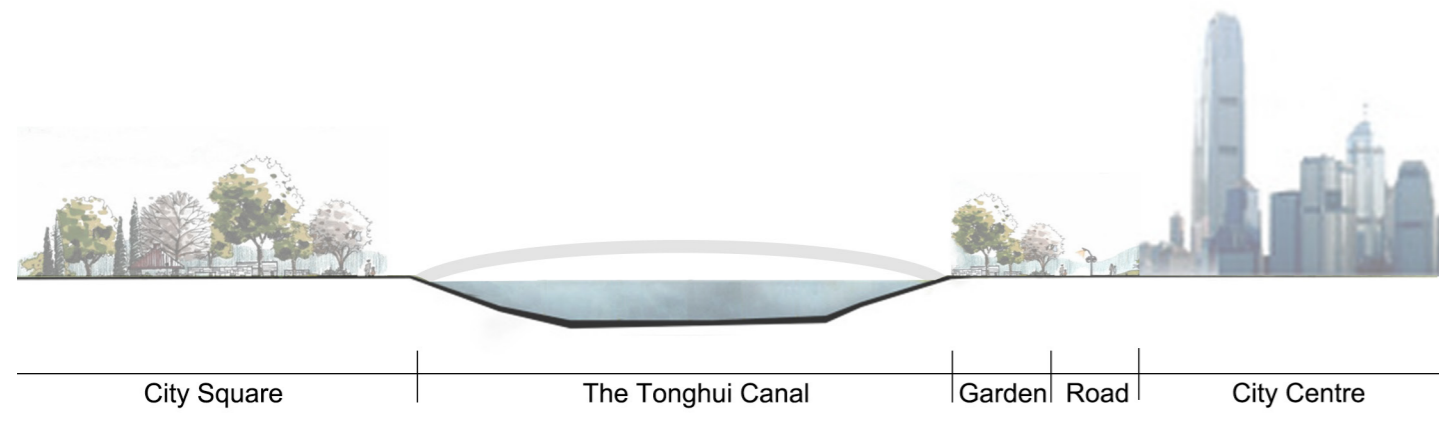
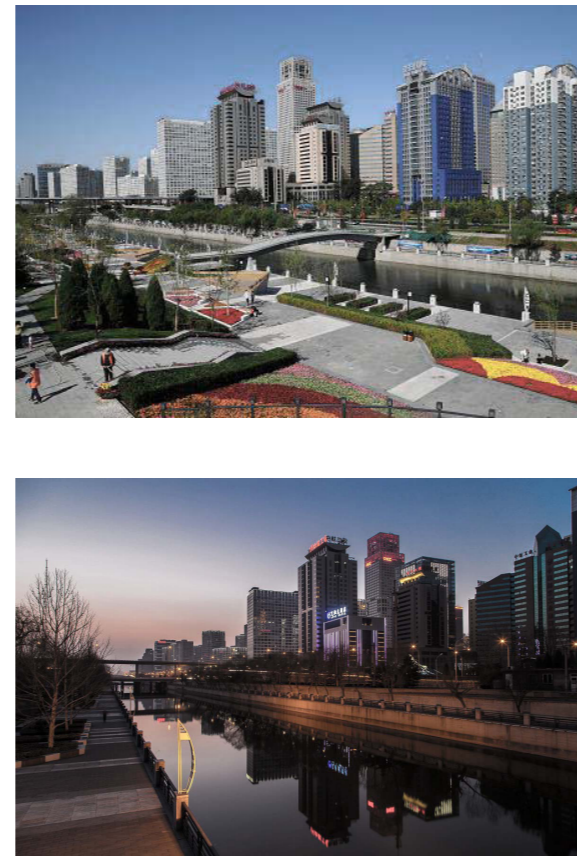
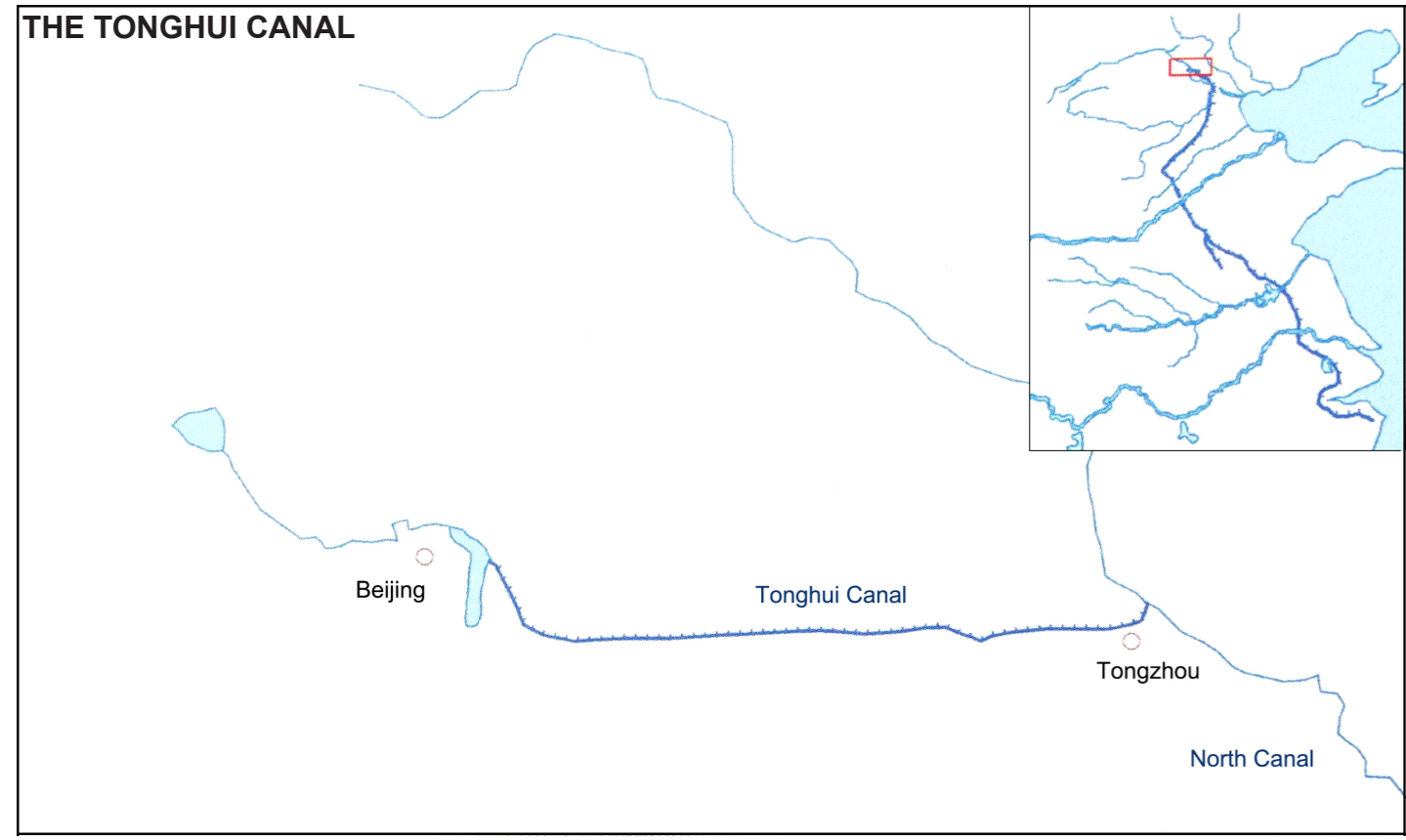
Yangzhou City is the communications hub connecting the Grand Canal to the Yangtze River. Yangzhou is China's famous historical and cultural city, and is also the most representative canal city along the Beijing-Hangzhou Grand Canal. The first excavation shovel of the 1,800-kilometer-long Grand Canal is made in Yangzhou. In this sense, Yangzhou is a city having the same age with the Grand Canal and is the historical origin of the Grand Canal.



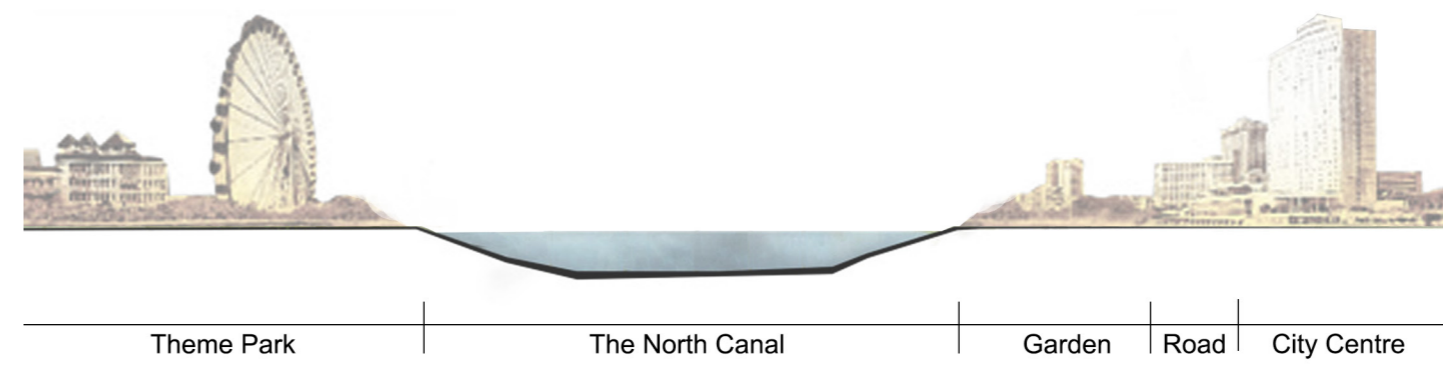
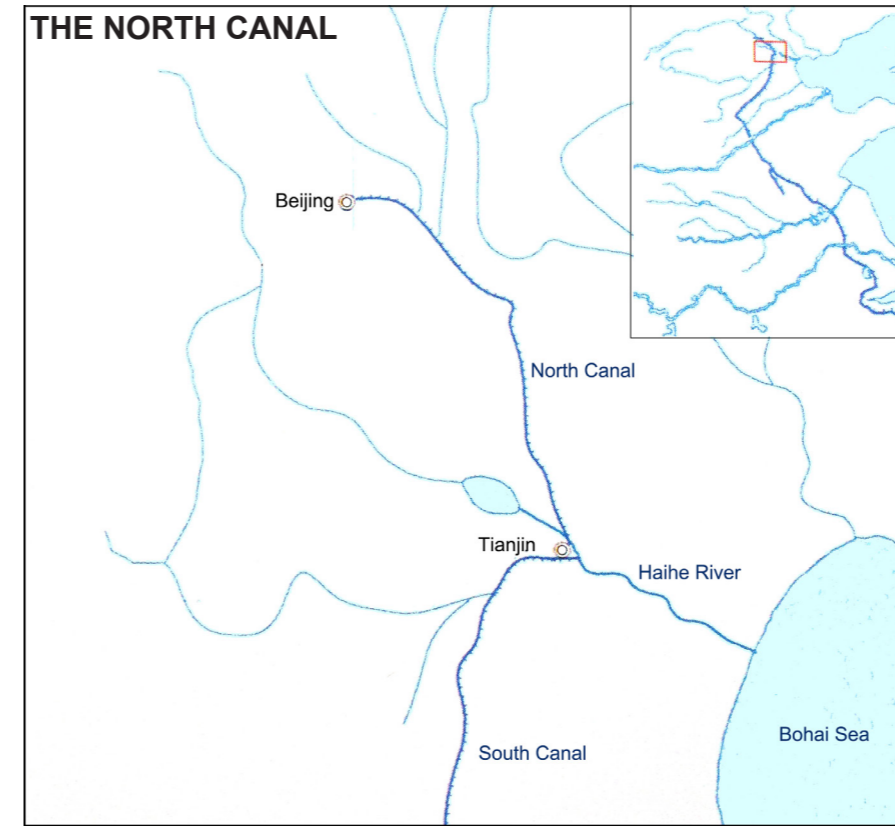
Suzhou

Today, Suzhou Part of the Grand Canal belongs to the Jiangnan section of the Canal and accounts for 4.5% of the total length of the Grand Canal and 24% of the total length of the Jiangnan Canal. Suzhou Section of the Grand Canal was first excavated in the 6th century BC, which came with the establishment of the city of Suzhou. It was an important national center of food gathering, storage and shipment.

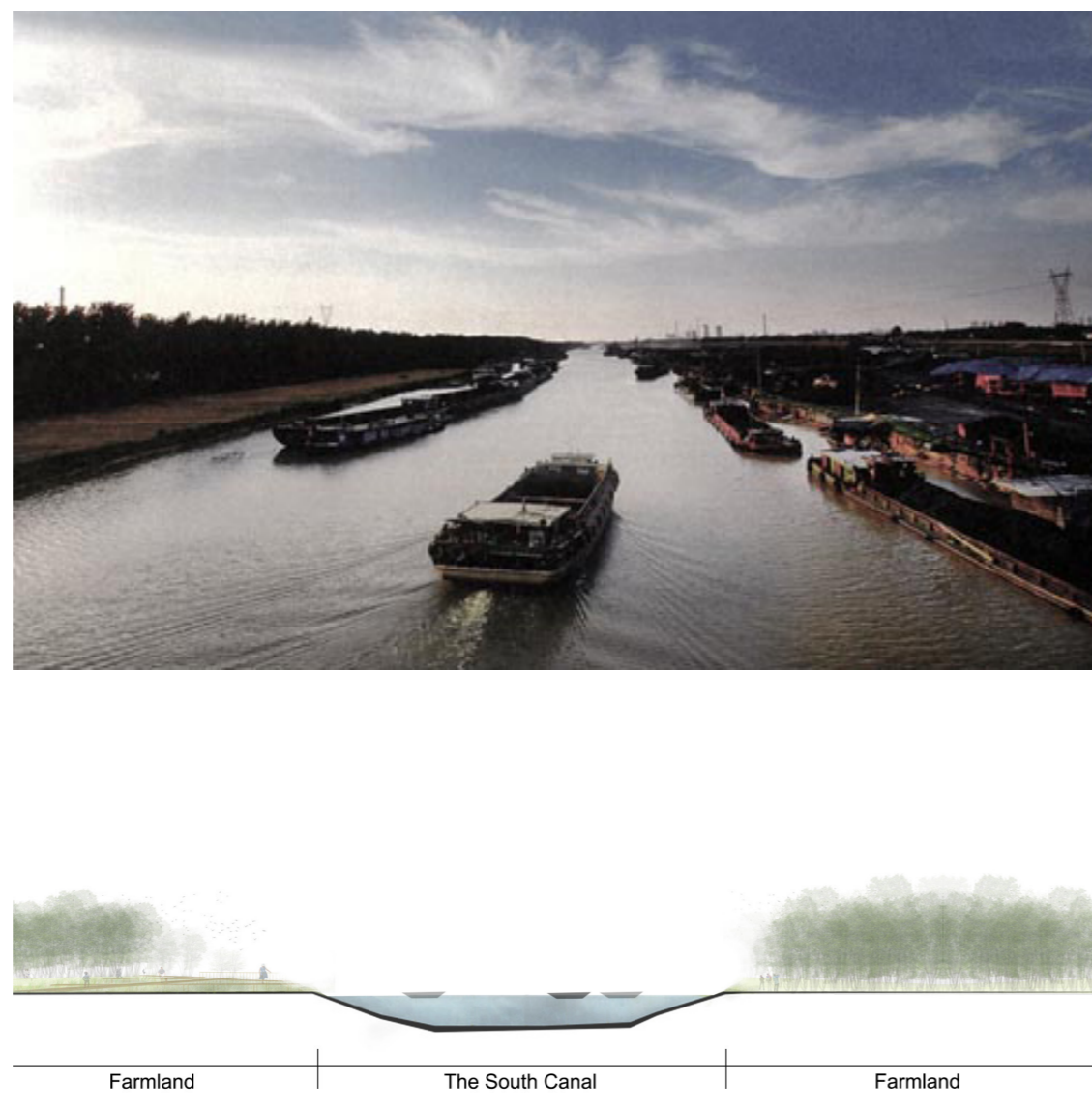
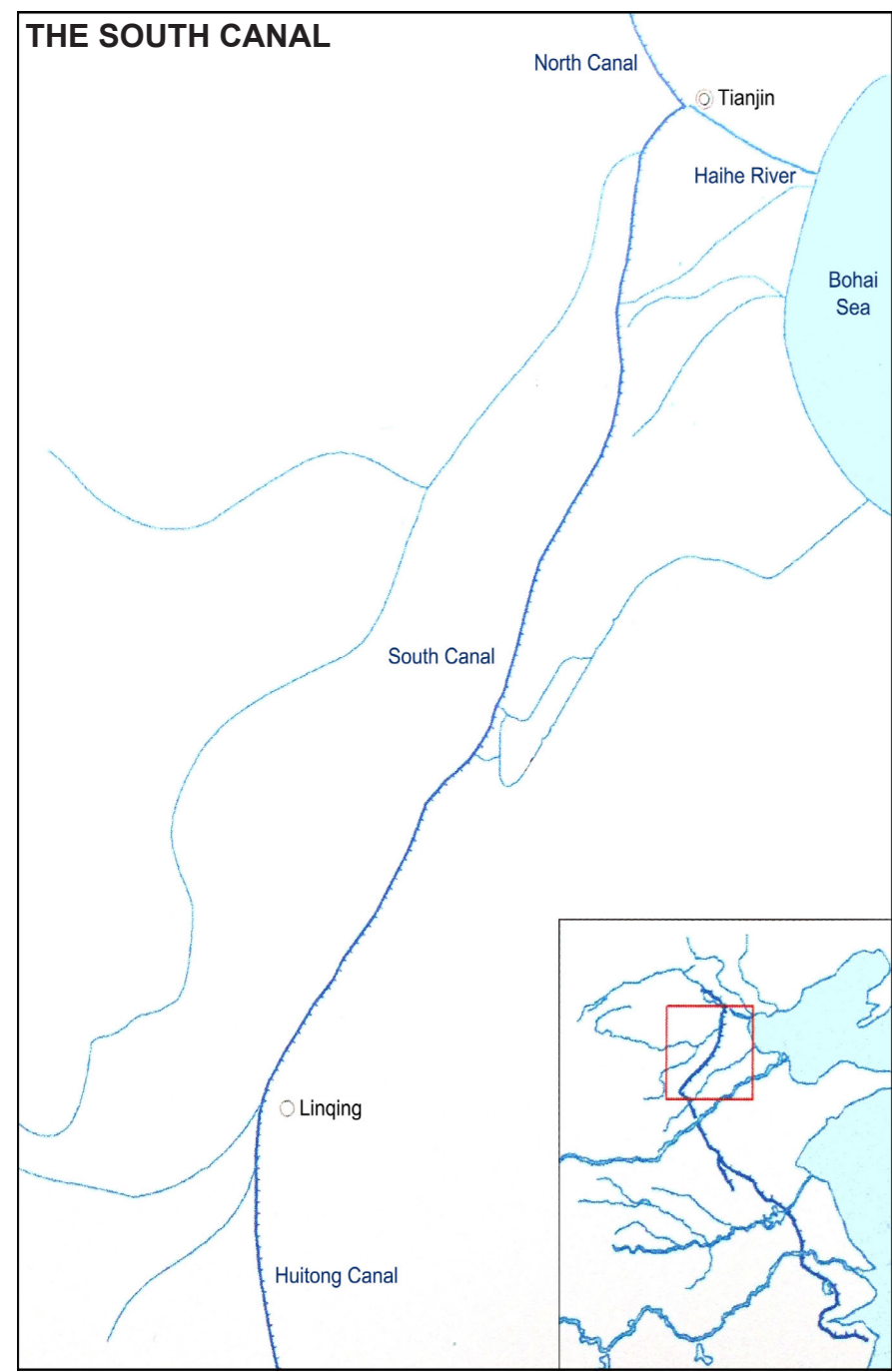
REPRESENTATIVE SECTIONS AND THEIR RECENT DEVELOPMENTS OF BEIJING-HANGZHOU GRAND CANAL



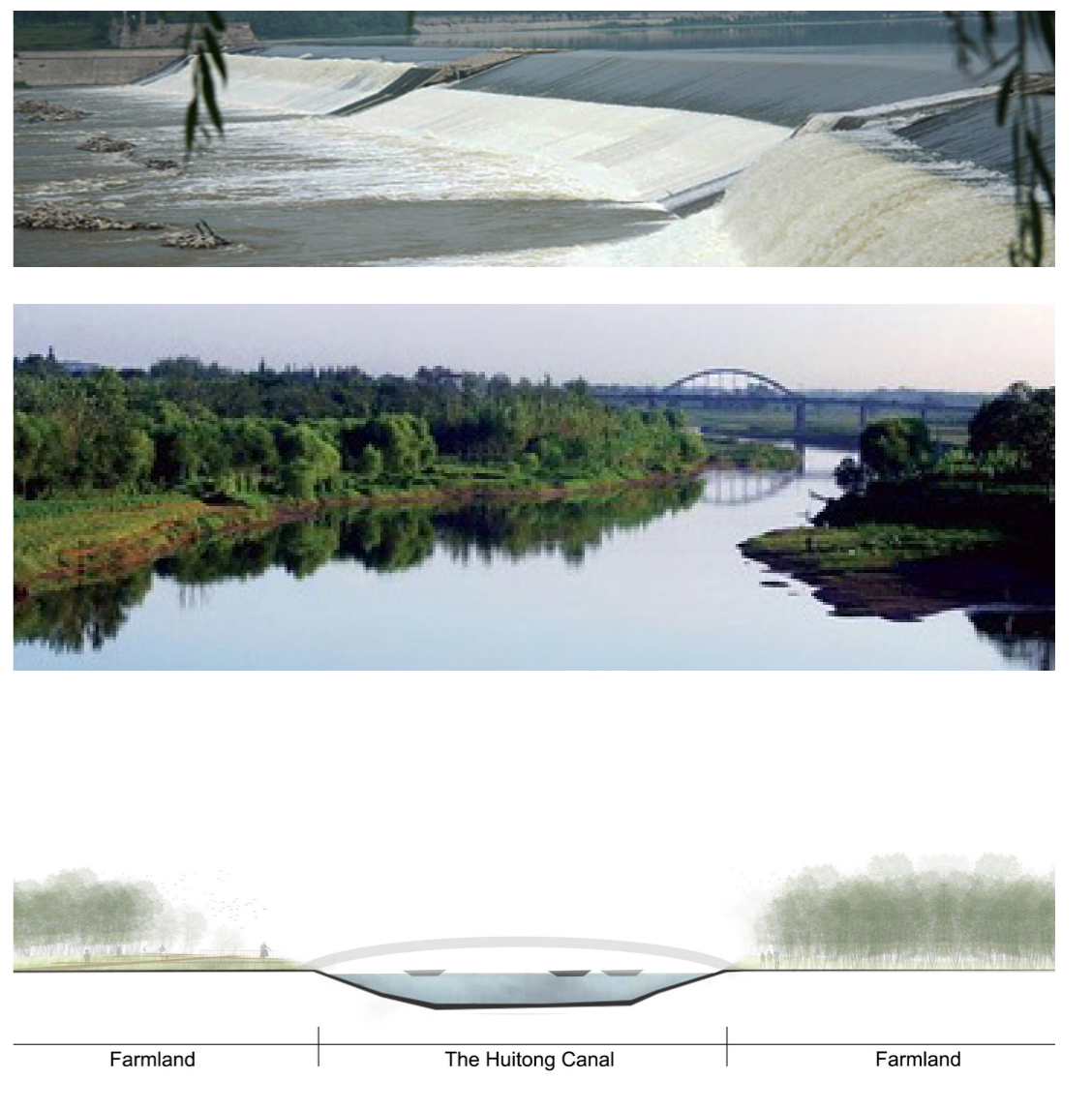
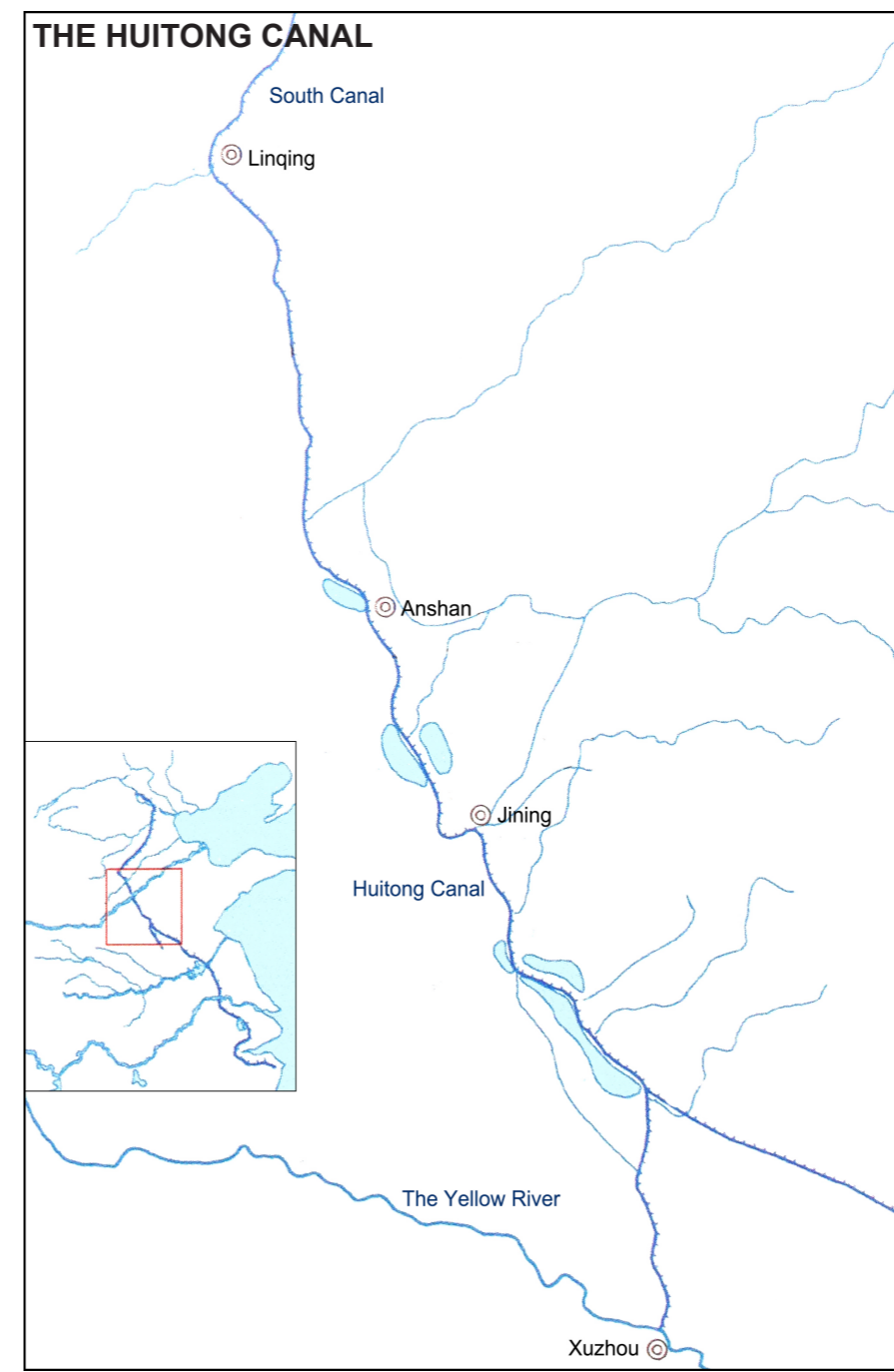
The treatment of the Tonghui Canal mainly concentrated in Tongzhou, with gardens, cultural squares, wharfs and forest parks being built along the banks, in 2008, the Tongzhou section of the Tonghui Canal was formally open to navigation.



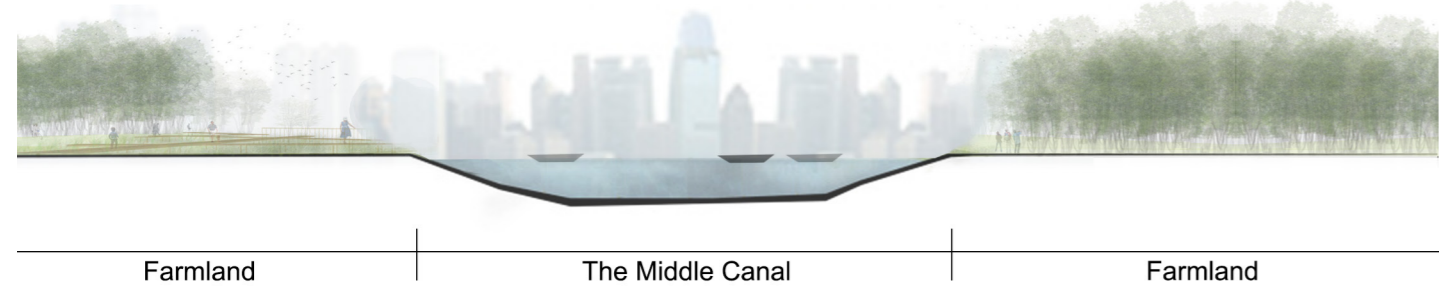
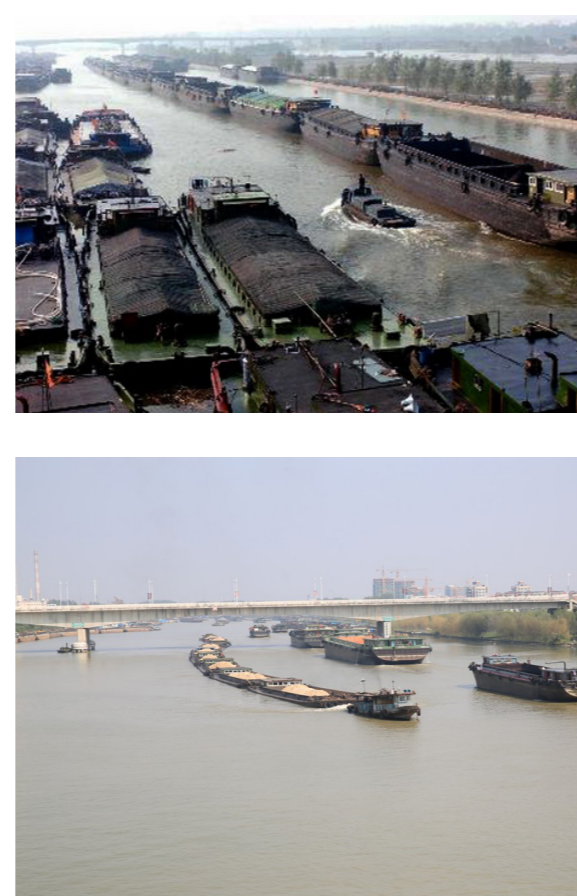
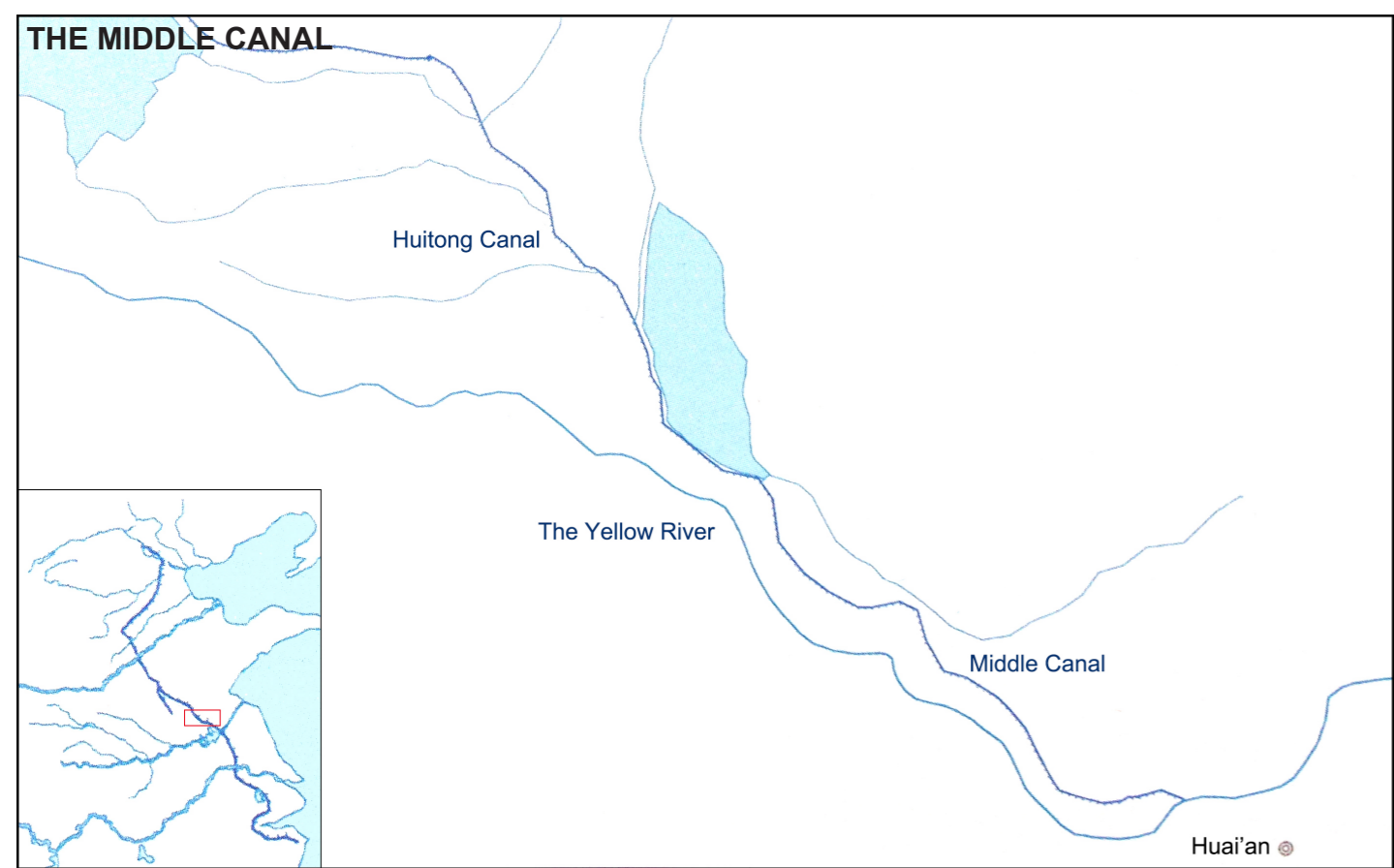
Flood control management for the upstream of the North Grand Canal was strengthened, while four theme parks were constructed in the downstream, undertaking important tasks of flood control, navigation, water diversion and water delivery and also as a place for travel, sightseeing, leisure and entertainment.



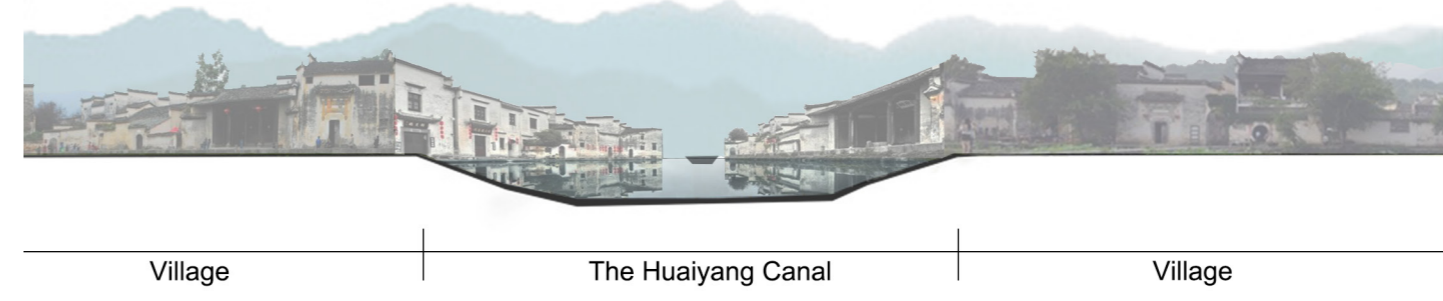
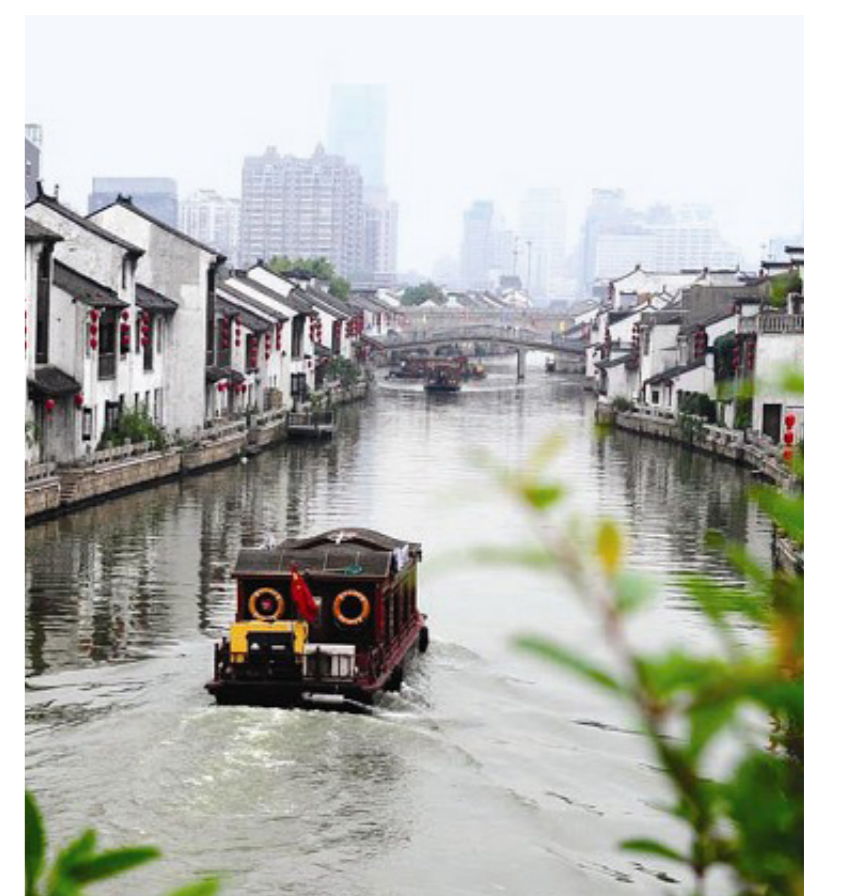
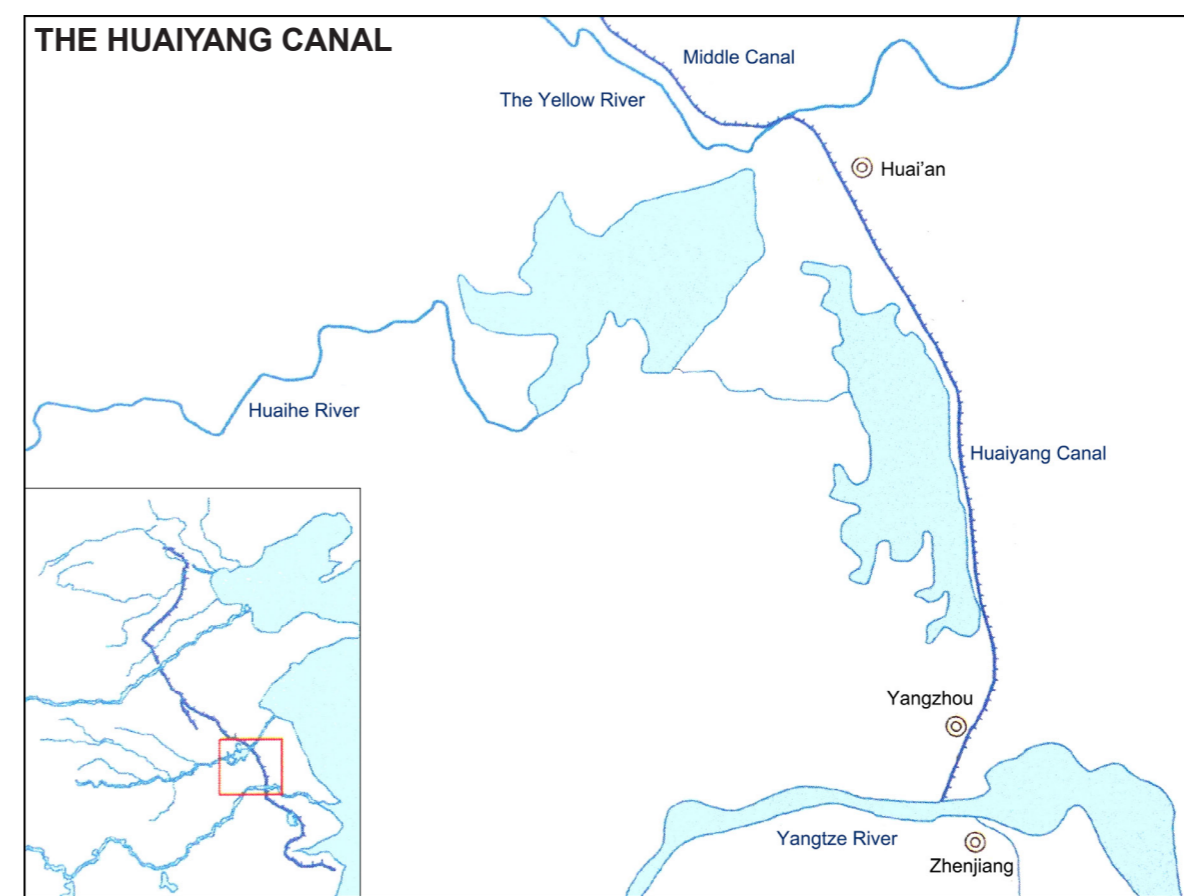
The South Grand Canal was an area suffering severe flood, so a tributary was excavated for this purpose, when Tianjin suffers water shortage, the South Grand Canal can be used as a water delivery channel to guide the water of Yellow River into Tianjin.



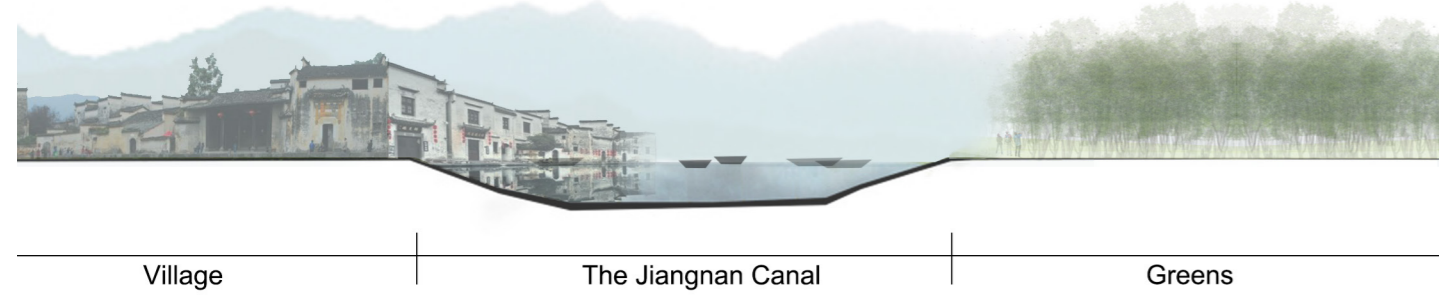
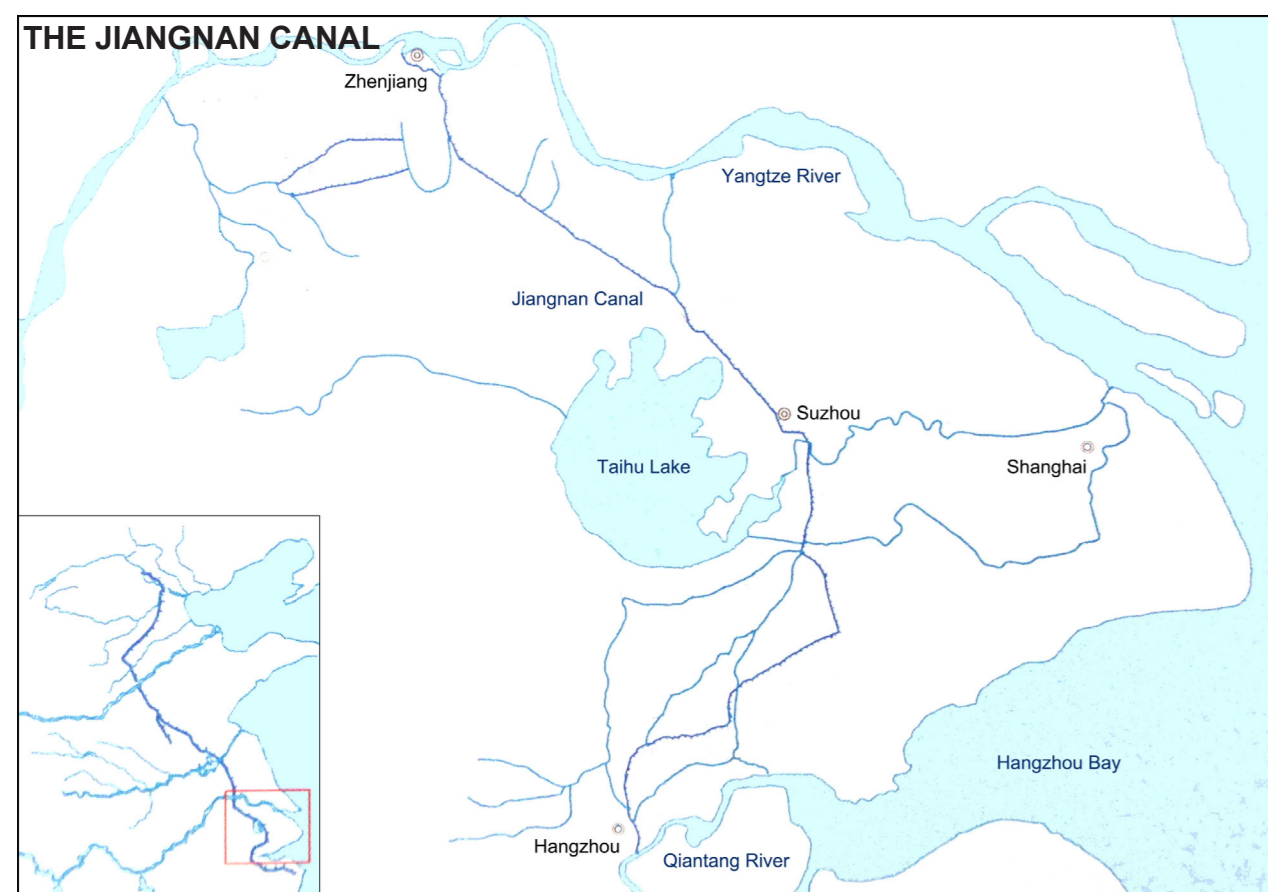
The Huitong Canal after treatment is mainly used for farmland irrigation as well as coal and material transportation. Some of the old channels have been replaced by newly constructed canals, gradually silted up and become farmland, part of the sections after renovation were open to navigation again.



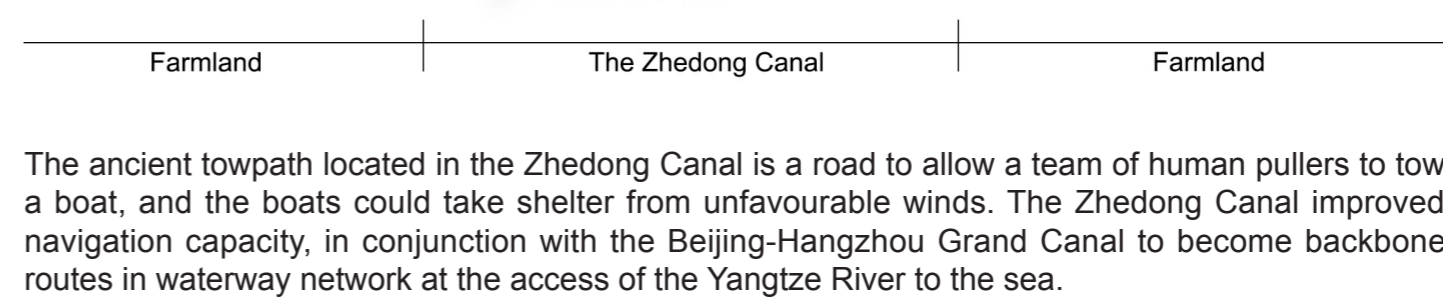
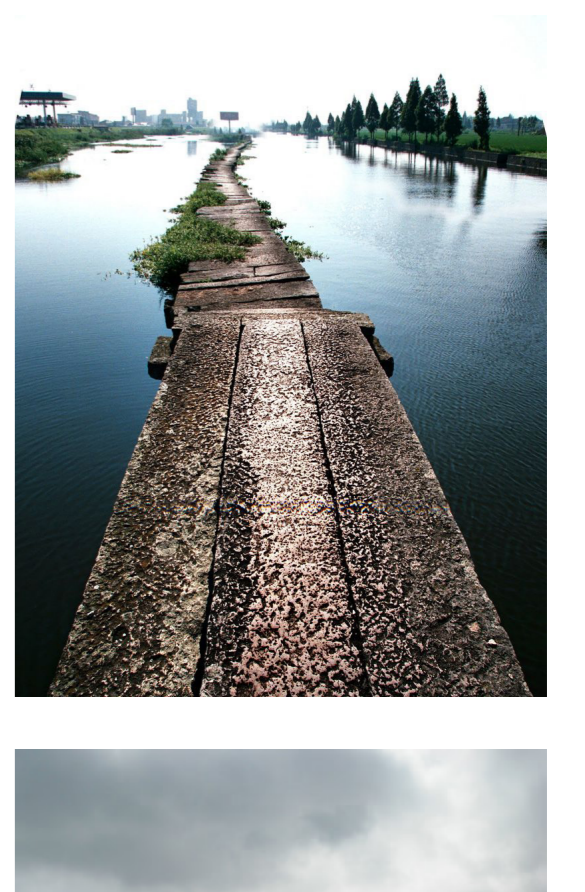
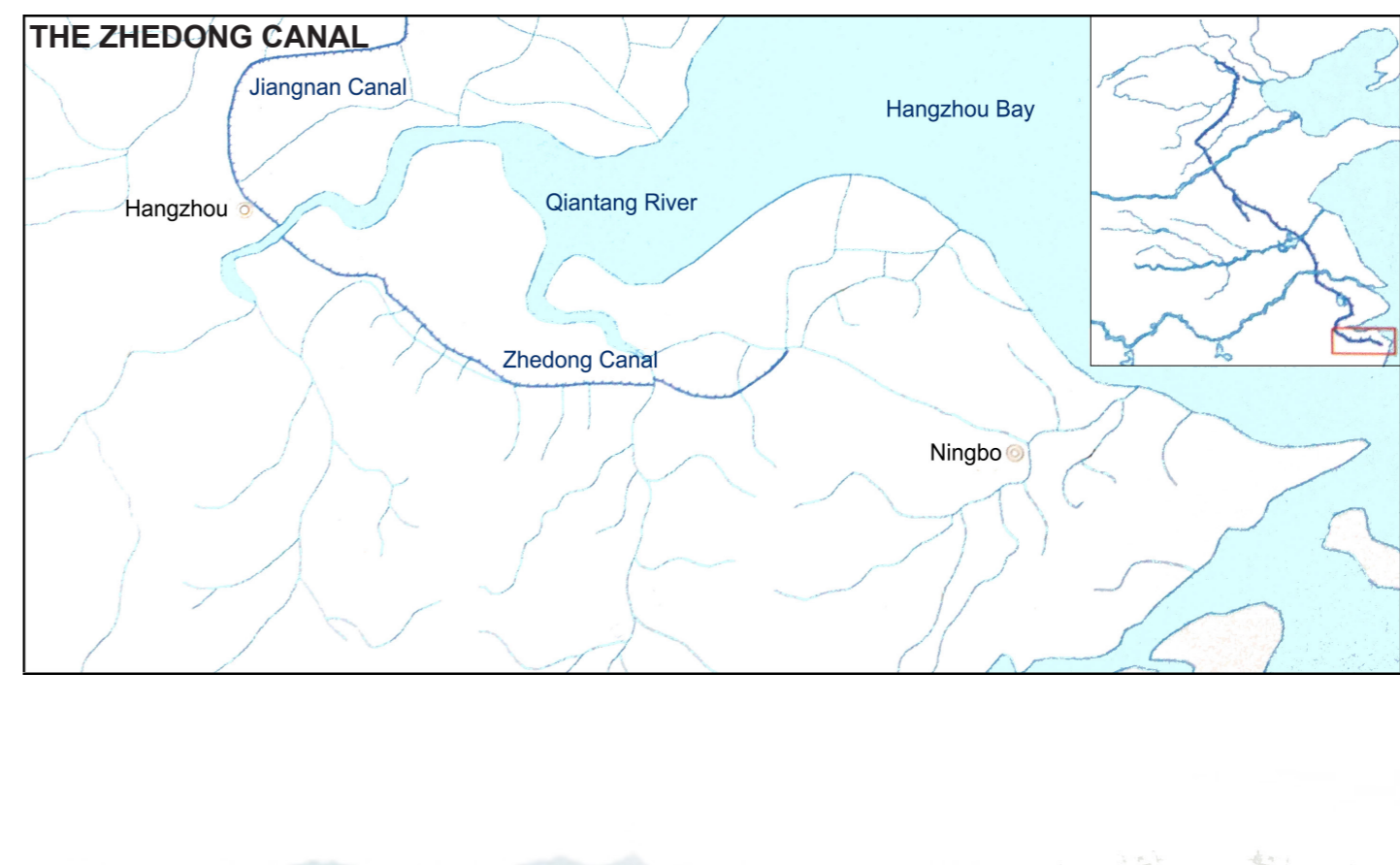
The Middle Canal has become an important channel to transport coal from the North to the South and thus facilitated the economic development along the canal.



The Huaiyang Canal after treatment has still been used as a canal. When it combined with the Huizhou architectures on both sides, shows a harmonious picture.



The Jiangnan Canal is a section of the modern Beijing-Hangzhou Grand Canal with the largest transportation volume and the highest density of ships, in excess of both the Yangtze River and the Canal du Midi in France.

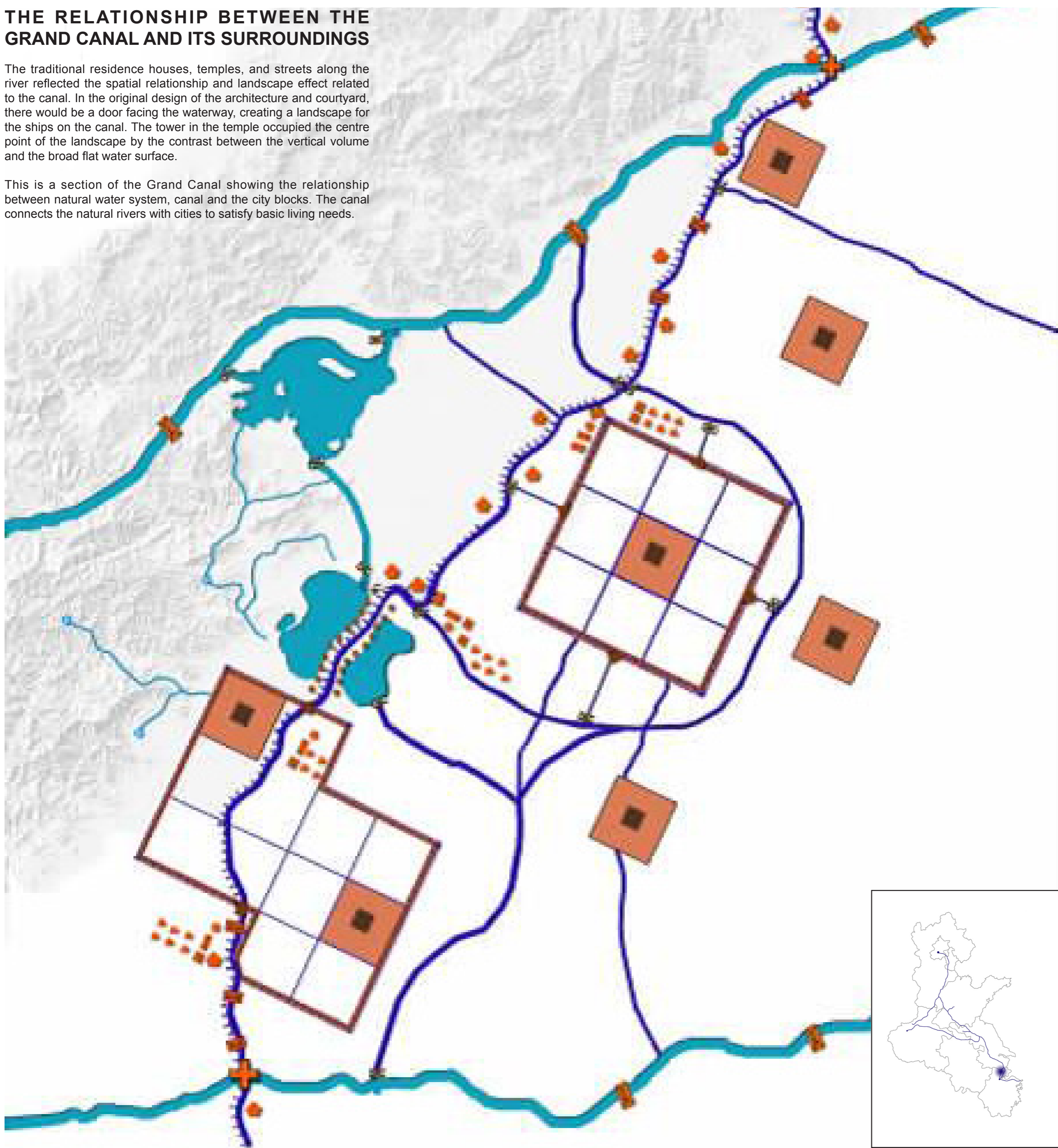


The ancient towpath located in the Zhedong Canal is a road to allow a team of human pullers to tow a boat, and the boats could take shelter from unfavourable winds. The Zhedong Canal improved navigation capacity, in conjunction with the Beijing-Hangzhou Grand Canal to become backbone routes in waterway network at the access of the Yangtze River to the sea.

THE RELATIONSHIP BETWEEN THE GRAND CANAL AND ITS SURROUNDINGS

The traditional residence houses, temples, and streets along the river reflected the spatial relationship and landscape effect related to the canal. In the original design of the architecture and courtyard, there would be a door facing the waterway, creating a landscape for the ships on the canal. The tower in the temple occupied the centre point of the landscape by the contrast between the vertical volume and the broad flat water surface.

This is a section of the Grand Canal showing the relationship between natural water system, canal and the city blocks. The canal connects the natural rivers with cities to satisfy basic living needs.



LANDSCAPE STRATEGY ALONG THE GRAND CANAL



Chatting / Information Point



Playground / Gathering



Grass Field / Camping



Pier / Sightseeing Boat



Nature Landscape / Hiking Area



Sitting / Picnic



Flower Garden / City Scenery



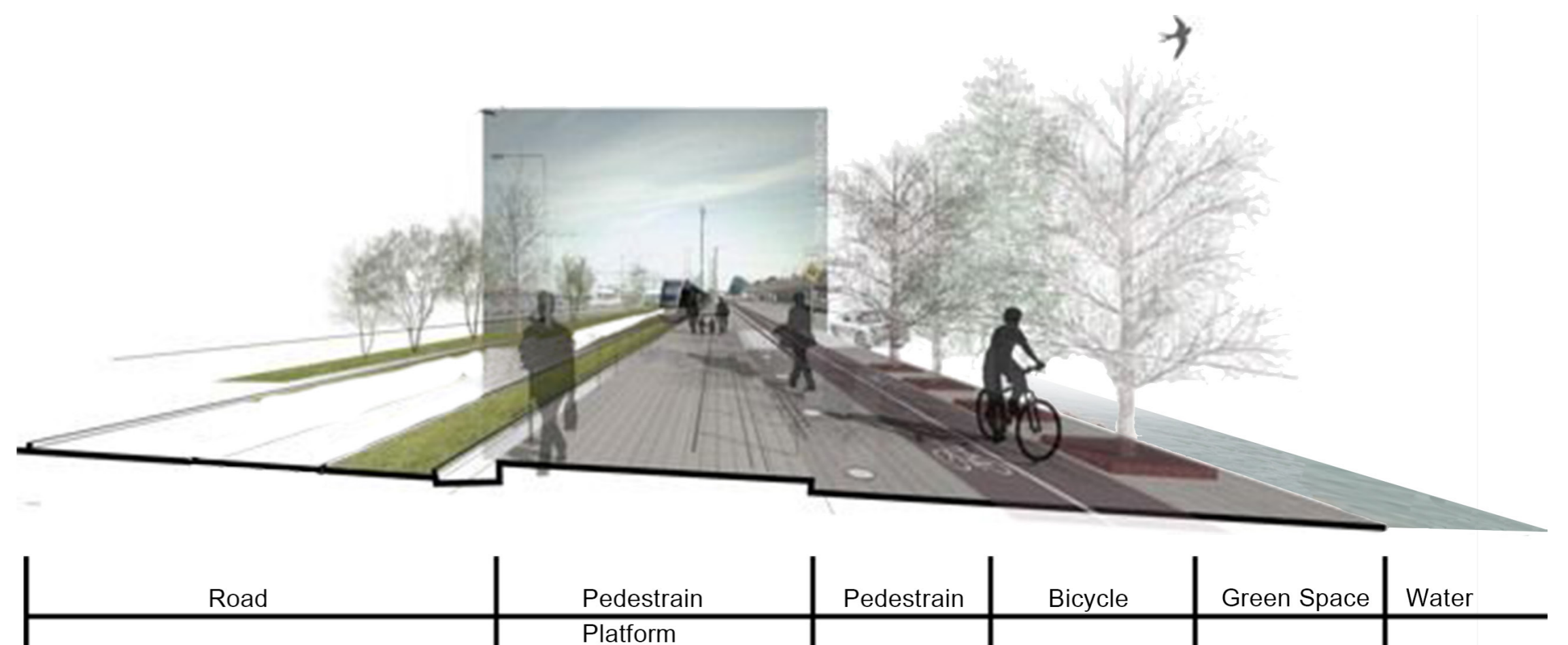
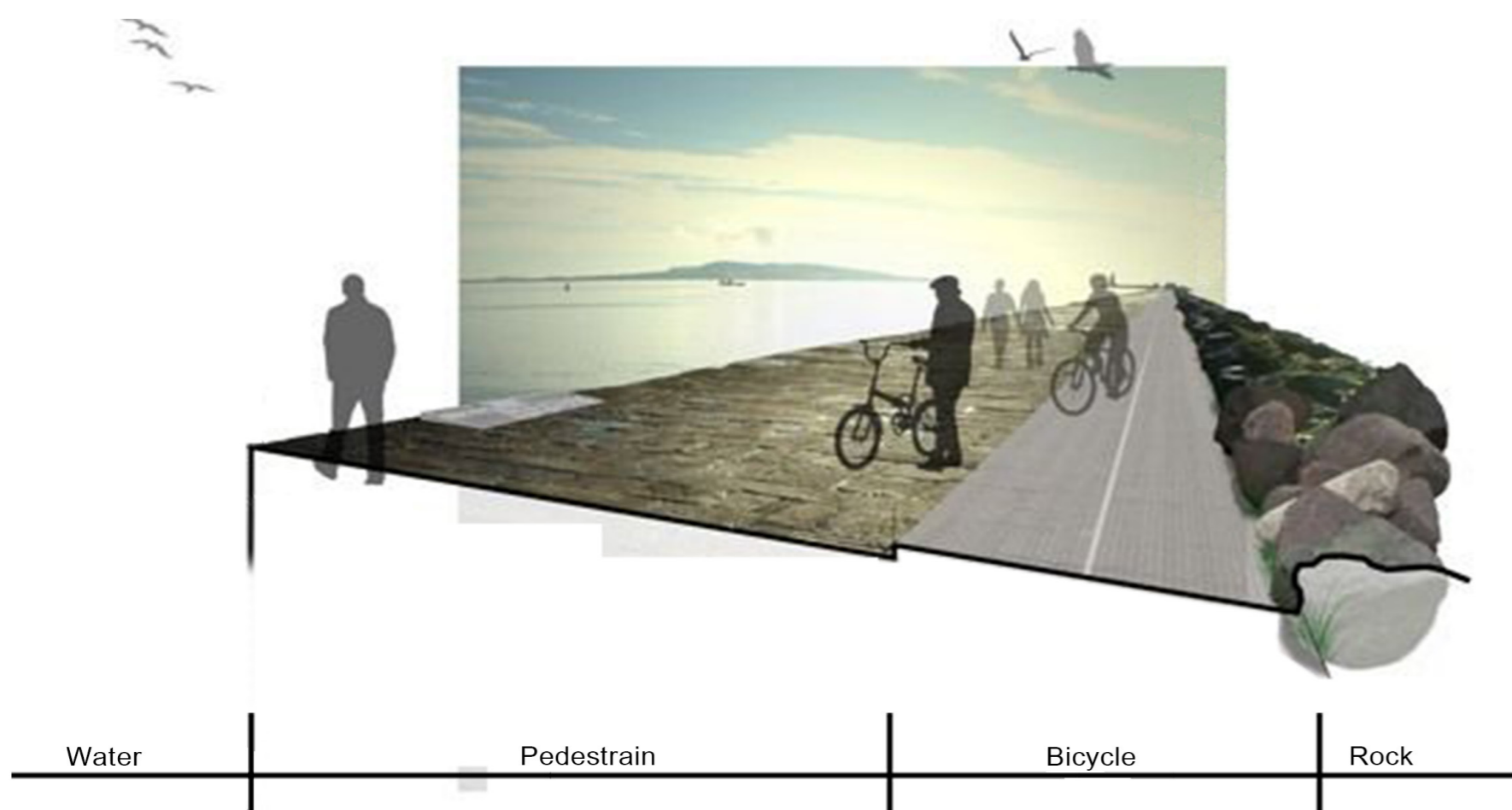
Farmland / Agricultural Market

The Midi Canal referred to its value in the perspective of landscape in the explanations of OUV as a World Heritage. Riquet, the designer, paid attention to combine the technology project with the popular classical architecture aesthetics and landscape design. The landscape design and the sycamores planted on the riverbank sought simplicity, giving expression to the elegance of the French classical garden.

As an important traffic route in eastern China, the Grand Canal linked the most prosperous ancient cities and bustling business districts together. Because of the huge amount of traffic, the canal was wide, with urban landscape and rural landscape staggered.

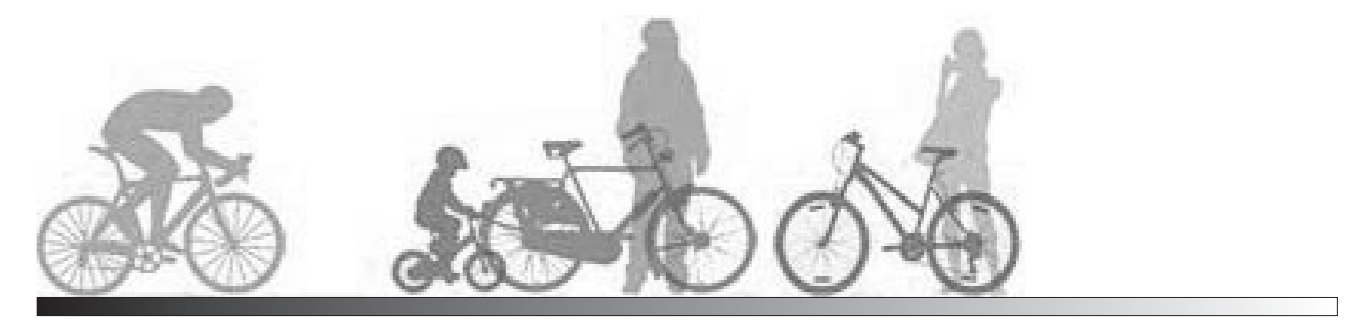
In rural areas, hydraulic facilities were made of wood and timber. The canal showed a natural state, matching with traditional rural landscape like the farmland and villages. Meanwhile, in urban areas, the riverbanks were made of hard stone. Piers, bridges, shops and temples along the canal created the waterfront landscape in the ancient city.

As a huge transportation construction, the Grand Canal owned a design aesthetic reflecting the tendency of the eastern traditional society in the shape of water conservancy facilities, riverside landscape, and the buildings along the water.



GRAND CANAL HERITAGE TREK SYSTEM

The proposal of "Grand Trek", a trail system along the Grand Canal was firstly put forward in 2009. The system planned to develop a pedestrian path along the Canal based on the civilian forces. The trail system was designed only for cycling and walking, to achieve sustainability and less intervention to the heritage. In the construction, no damage would be allowed to the original landscape. And in the proposal plan, it would be more than 3200 Km long after finished. It would link all the single heritage spot and area, and combine with the media and the public participation as a kind of historical trail and a experience route for world cultural heritage. Attached to the Canal, the trail system provides a authentic platform for the public to experience the Canal. The trail system along the canal could be more attractive for tourists than one single spot. The experience of the linear space of the trail system reflected the real space form of the linear cultural route with authenticity and integrity. And the system could be more effective in the participation and experience of local residents. On the other hand, the trail system could be a new platform for the long-term management and comprehensive development. Through the building of the road network, the interpretation system of the trail, and the logo design, the value of the cultural heritage could be re-discovered, and updated.



Site	Function	Location	Year	Criteria
Canal du Midi	Transport canal	France	1667-1671	(i)(v)(vi)
The Augustów Canal (Kanal Augustowski)	Transport canal	Poland/Belarus	1823-1839	Tentative List
Rideau Canal	Transport canal	Canada	1826-1832	(i)(iv)
Shushtar Historical Hydraulic System	Irrigation systems	Iran	3BC-now	(i)(ii)(v)
Aflaj Irrigation Systems of Oman	Irrigation systems	Oman	unknown	(v)
The Grand Canal	Transport canal	China	486BC-1912	(i)(iii)(iv)(vi)
Mount Qingcheng and the Dujiangyan Irrigation System	Irrigation systems	China	256BC	(ii)(iv)(vi)
Lingqu Canal	Transport canal/Irrigation systems	China	218BC	Tentative List (i)(iv)(vi)

The World Heritage List is an international platform, so it requires the value of properties to transcend national boundaries. Which means, the identification of OUV should be analyzed and compared in a broader view. The process of analysis and comparison would also help the state party in finding the most suitable orientation for the property.

Canal du Midi

The Midi Canal referred to its value in the perspective of landscape in the explanations of OUV as a World Heritage. Riquet, the designer, paid attention to combine the technology project with the popular classical architecture aesthetics and landscape design. The landscape design and the sycamores planted on the riverbank sought simplicity, giving expression to the elegance of the French classical garden.

It is the first canal to be included in World Heritage List. Its management system is divided into national level and local level. The national level involved ministries of communications, environment and culture. The certain management was given to Voies navigables de France(VNF). While the local level administrators were the local waterway departments, managing the natural river supplying water to the canal. The landscape, architectures, bridges and other elements were managed by different relevant departments.

Erie Canal

connecting the New York City to the five Great Lakes of North America, the Erie Canalway made great contributions on the transportation and recreational purposes, establishing the network which made New York the "Empire State" and the Nation's premier commercial and financial center.

The canals and adjacent areas are also a nationally significant resource of historic and recreational value, a strong political and cultural ties, proved the depth and force of American ingenuity, solidified a national identity, and found an enduring place in American legend, song, and art.

The Erie Canalway National Heritage Corridor Act was passed in 2000, identifying the canal as a heritage corridor in the protection. The protection of the heritage corridor was part of the national park system. And the certification should be nominated by a special organization or government agency, evaluated by the National Park Service(NPS), and approved by the Congress. After that, the relating protection laws and regulations could be enacted.



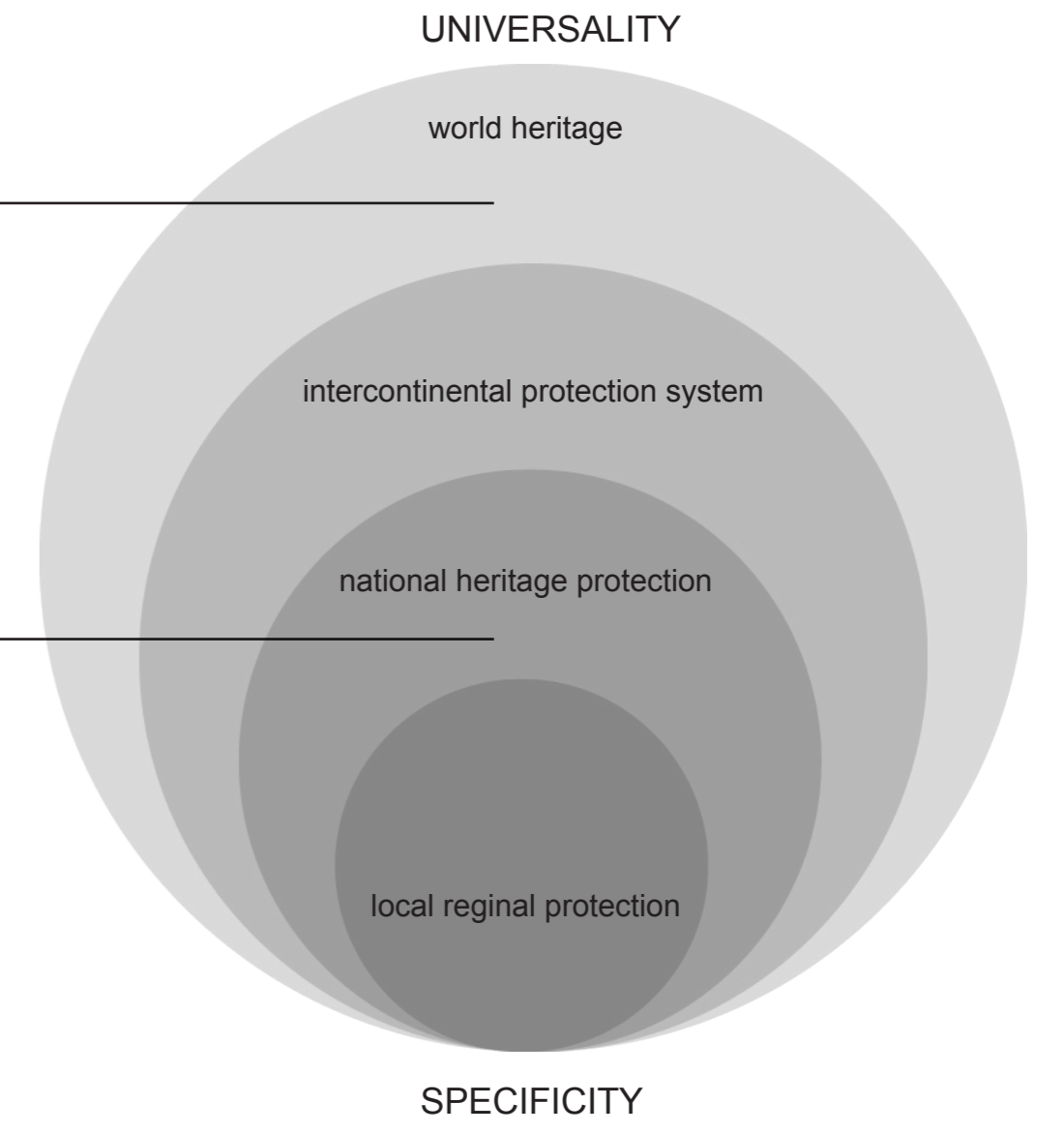
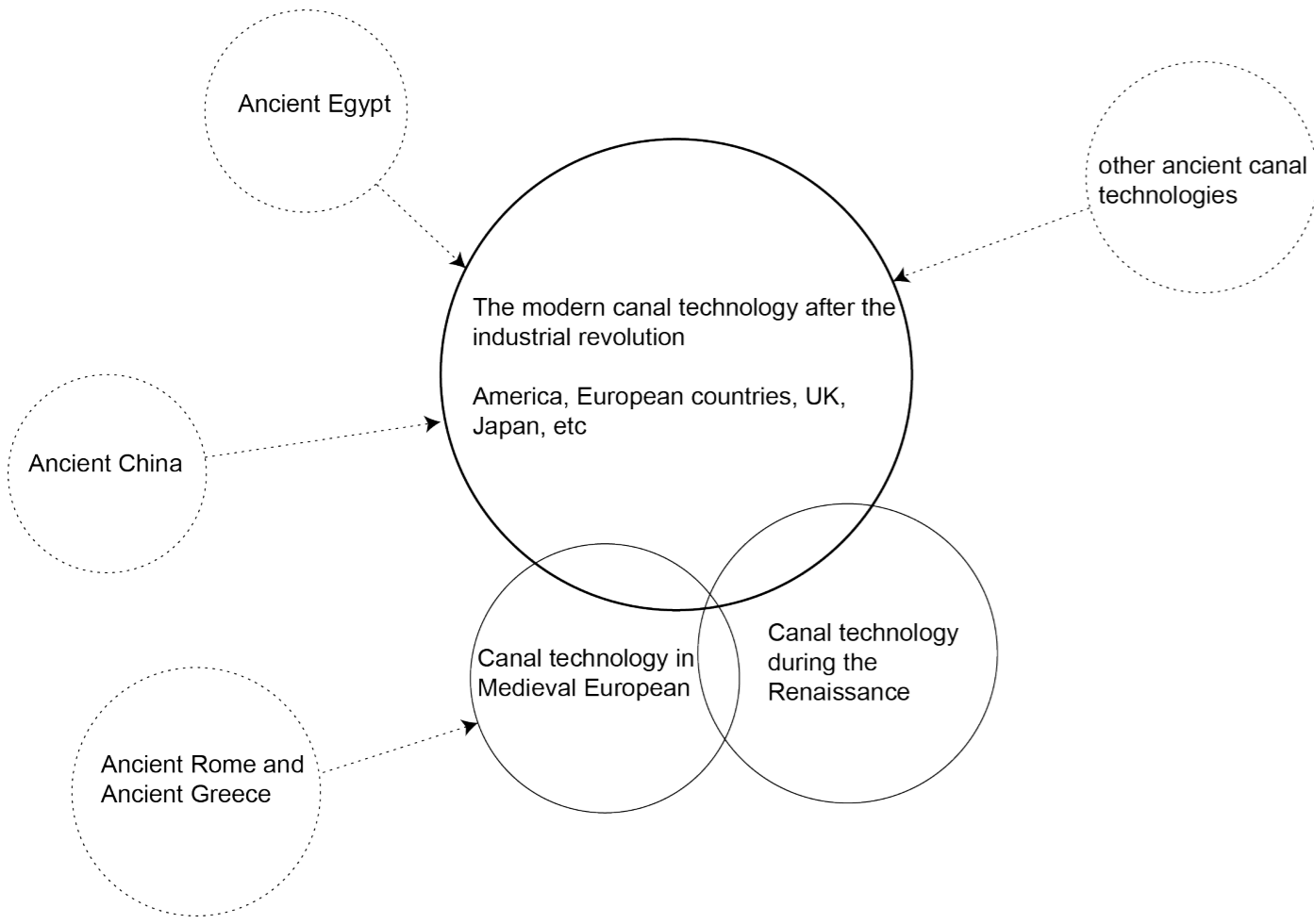
Canal du Midi in Somail



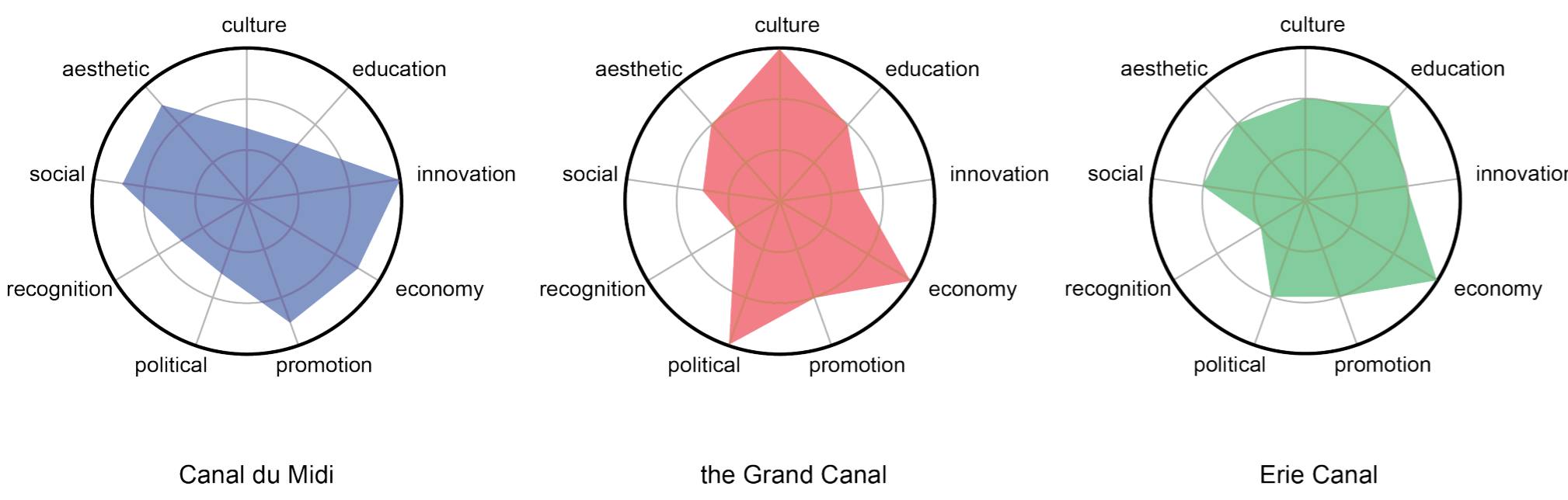
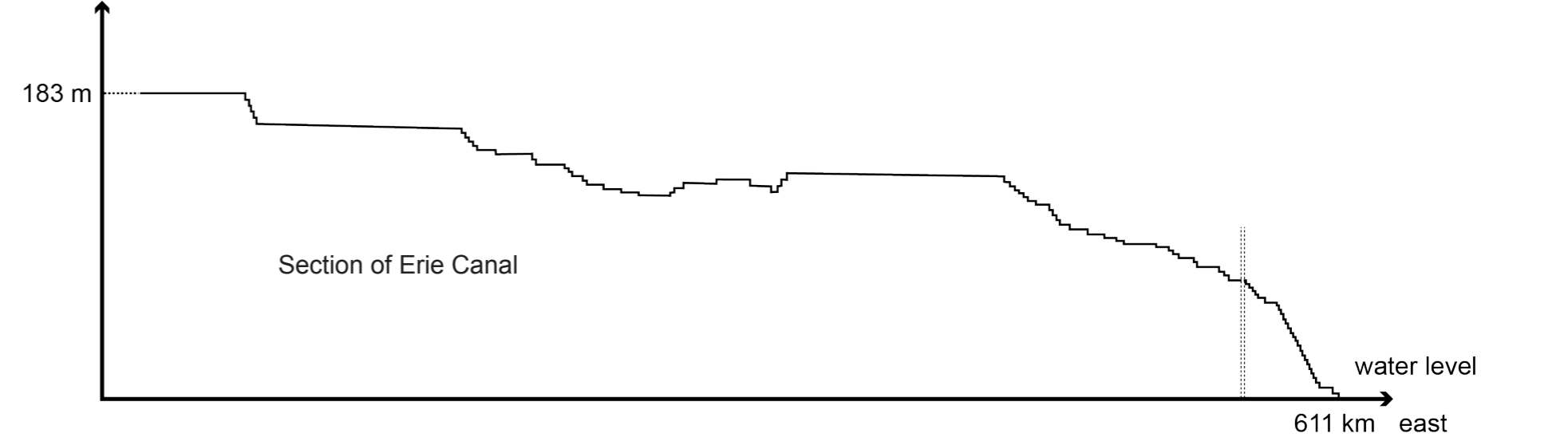
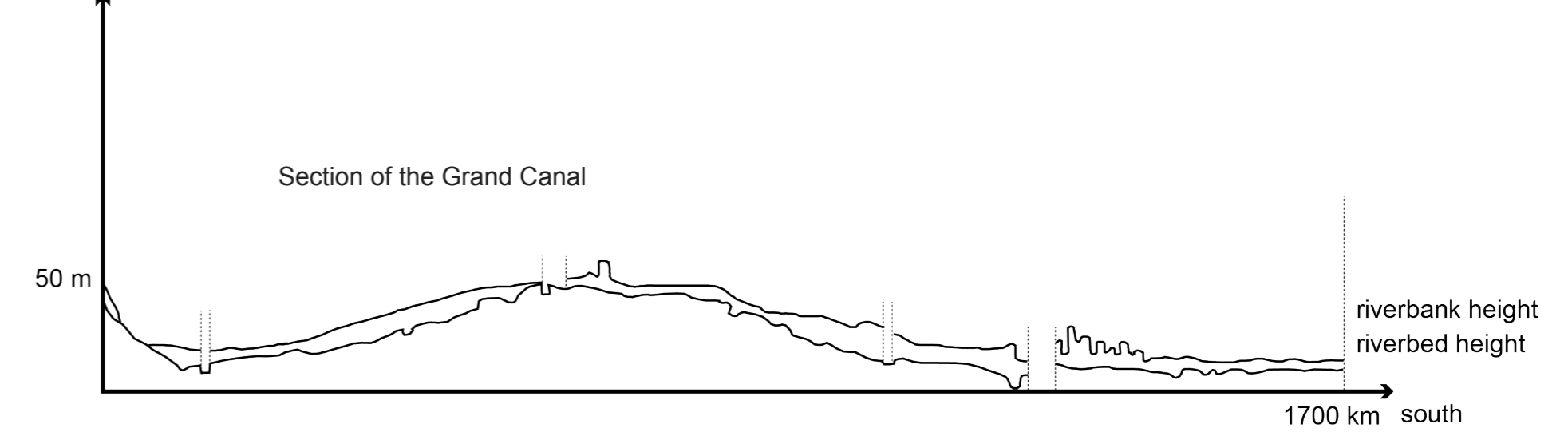
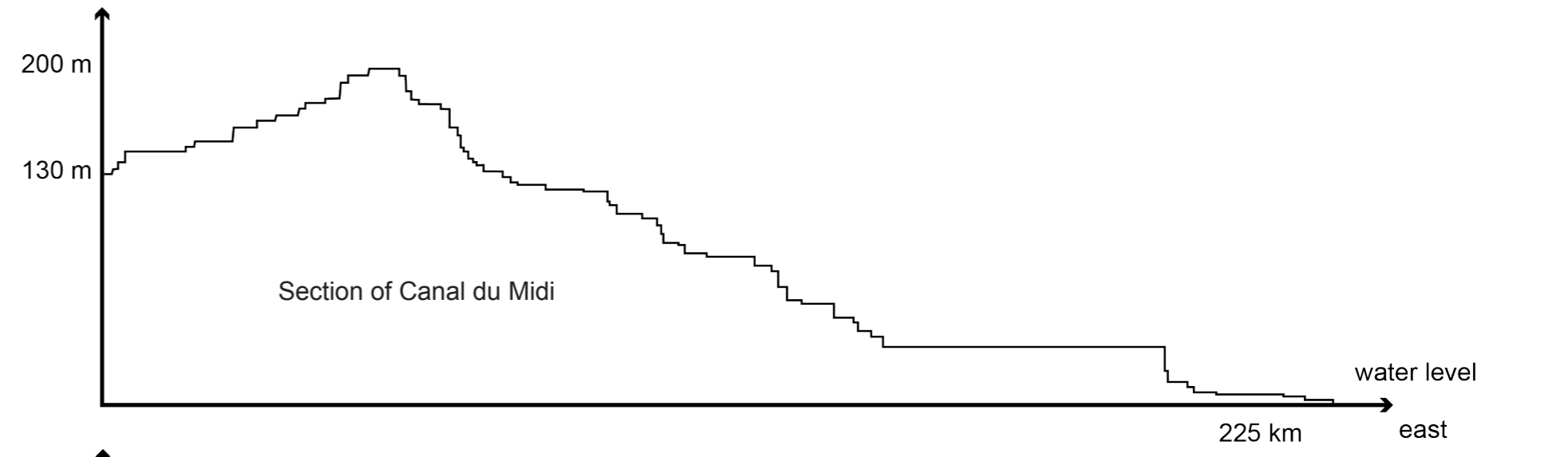
The Grand Canal in the south of China



Erie Canal in Buffalo Harbor



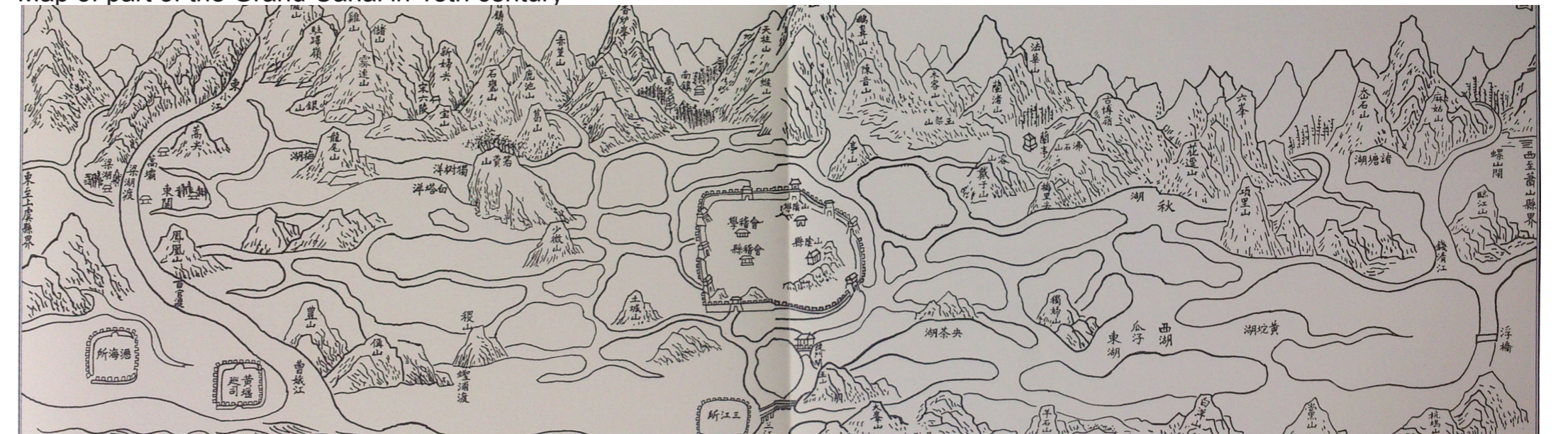
Site	Location	Year	Length	Area	Level
Canal du Midi	France	1667 - 1671	360 km with 328 structures	Property : 1172 ha Buffer zone: 2014 ha	World Heritage
The Grand Canal of China	China	486BC - 1912	more than 2000 km	Property : 20819.11 ha Buffer zone: 55629 ha	World Heritage
Erie Canal National Heritage Corridor	USA	1817 - now	584 km with 83 locks	Property : 1252000 ha	USA National Heritage Corridor



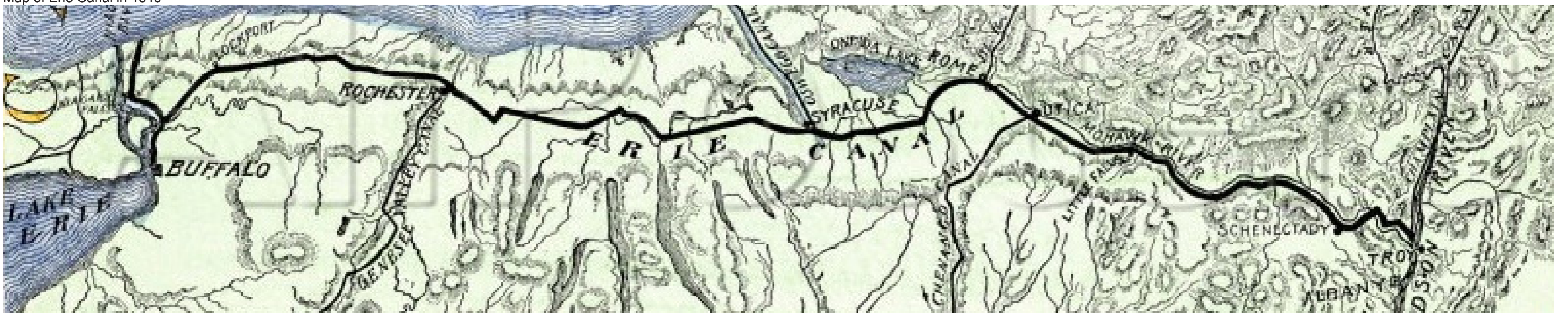
Map of Canal du Midi in 18th century or earlier

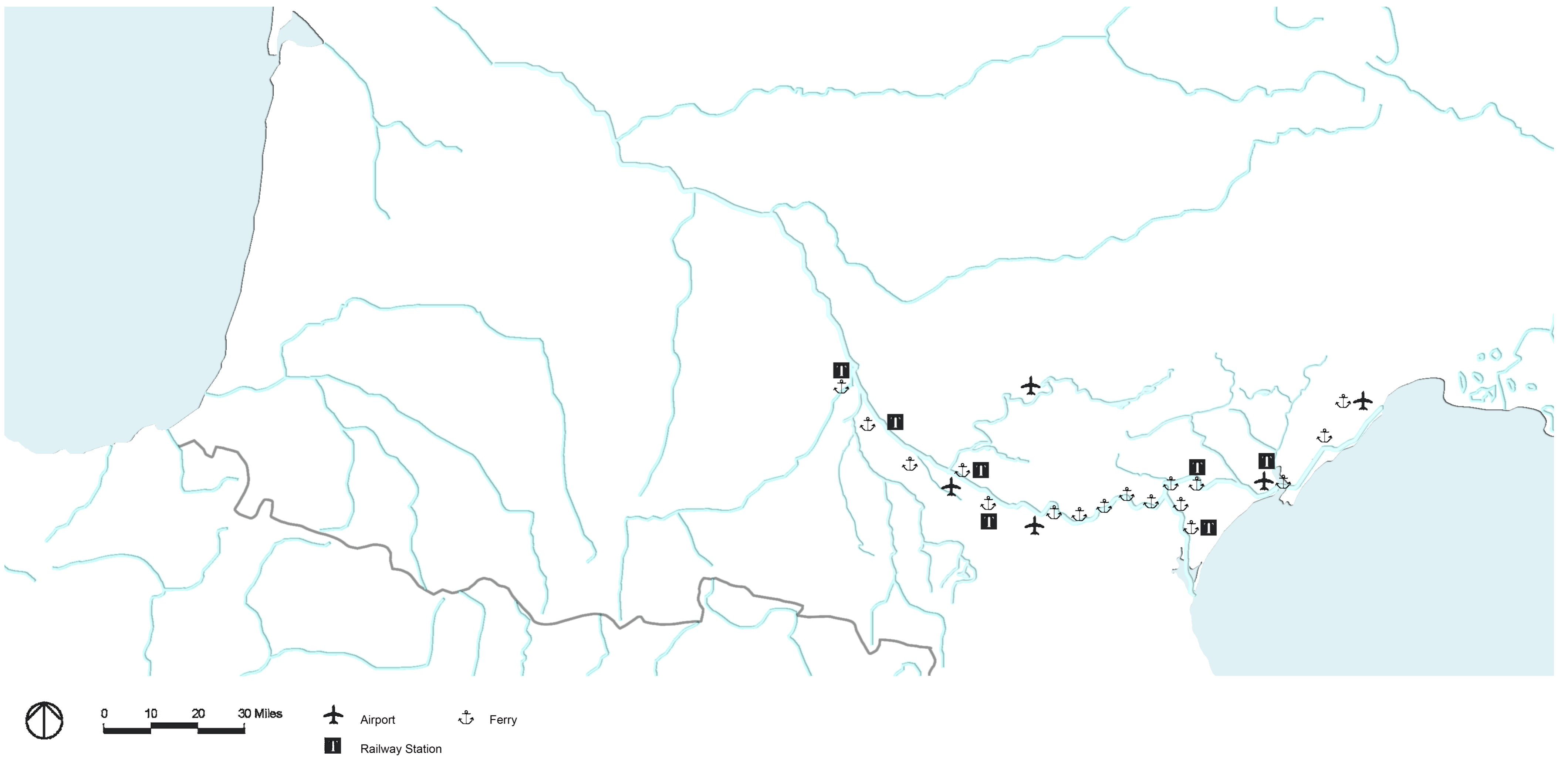
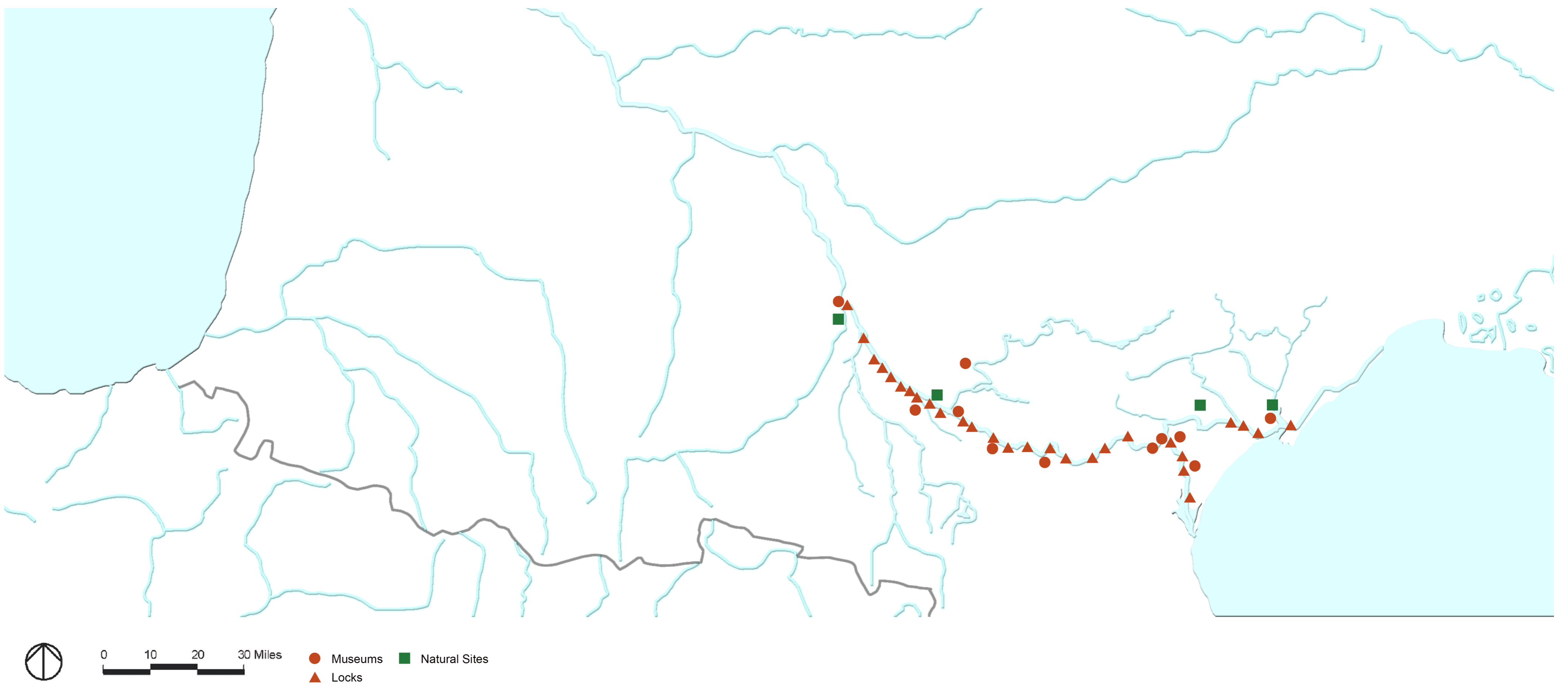
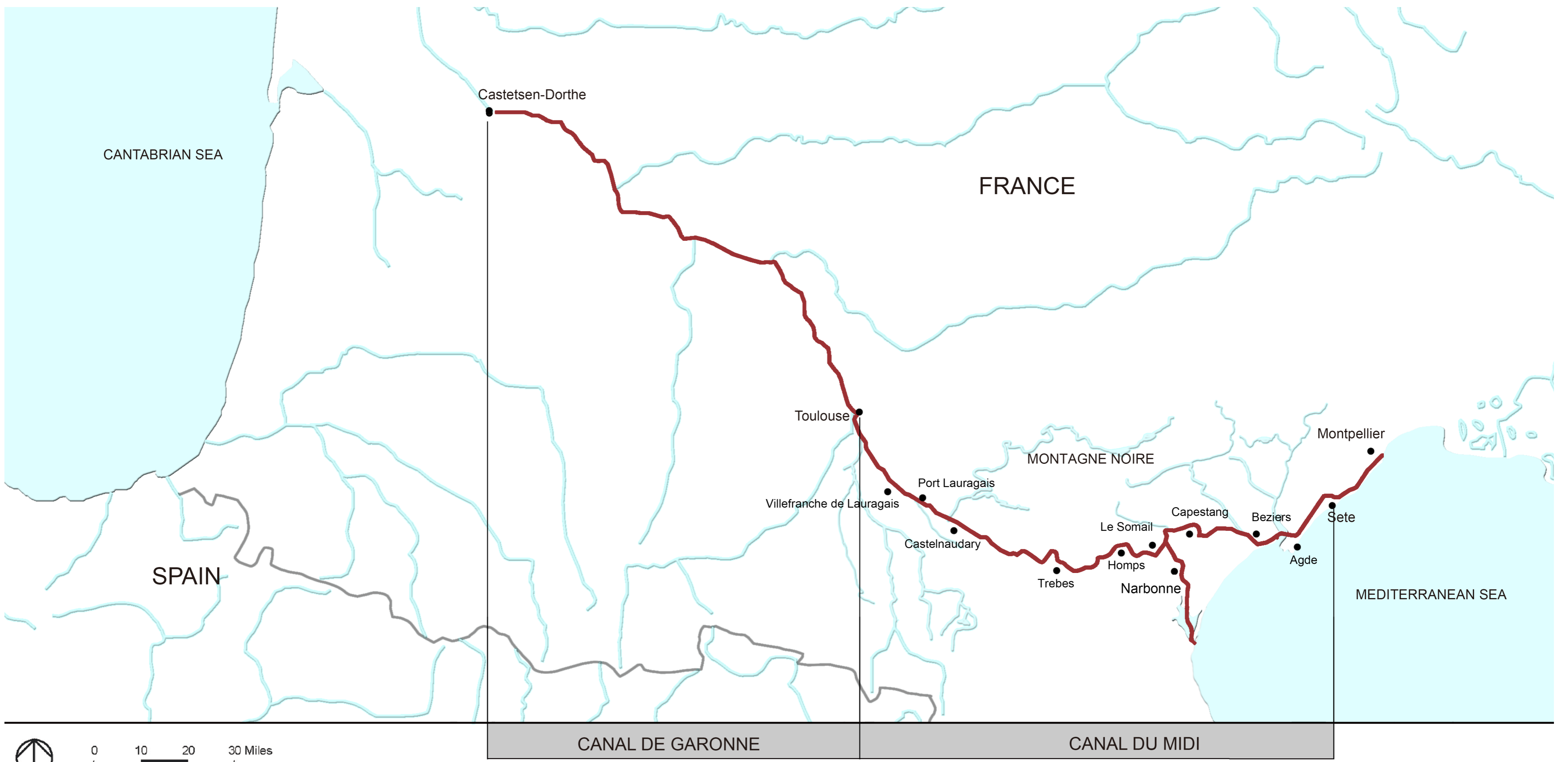


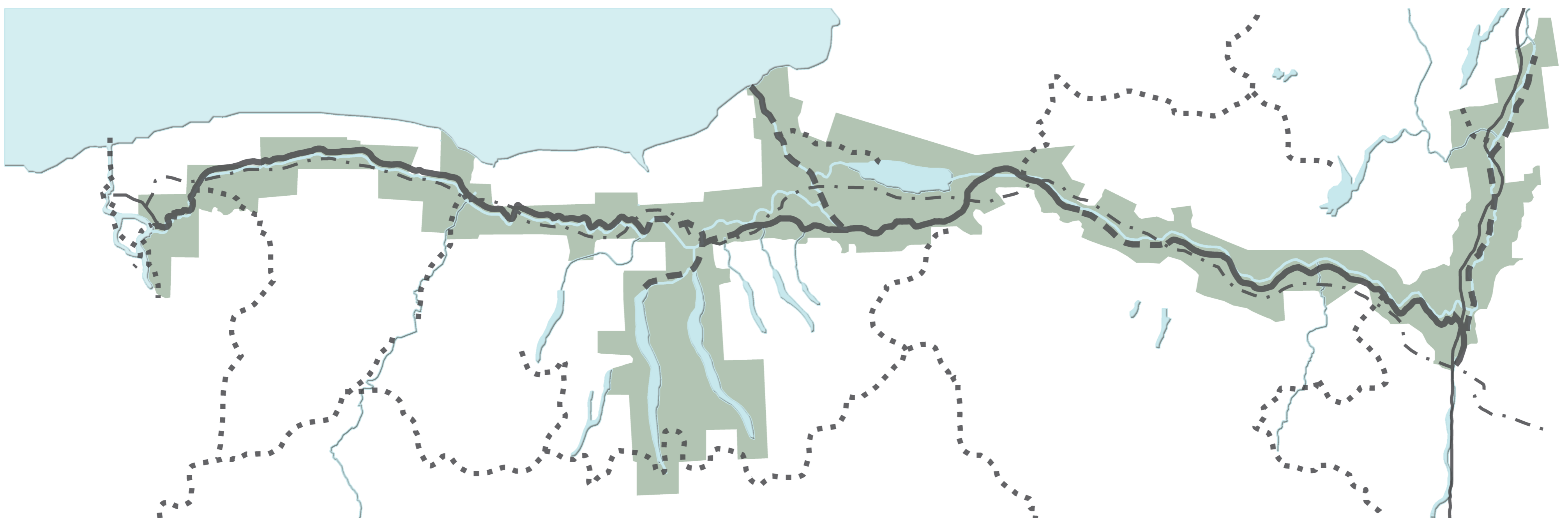
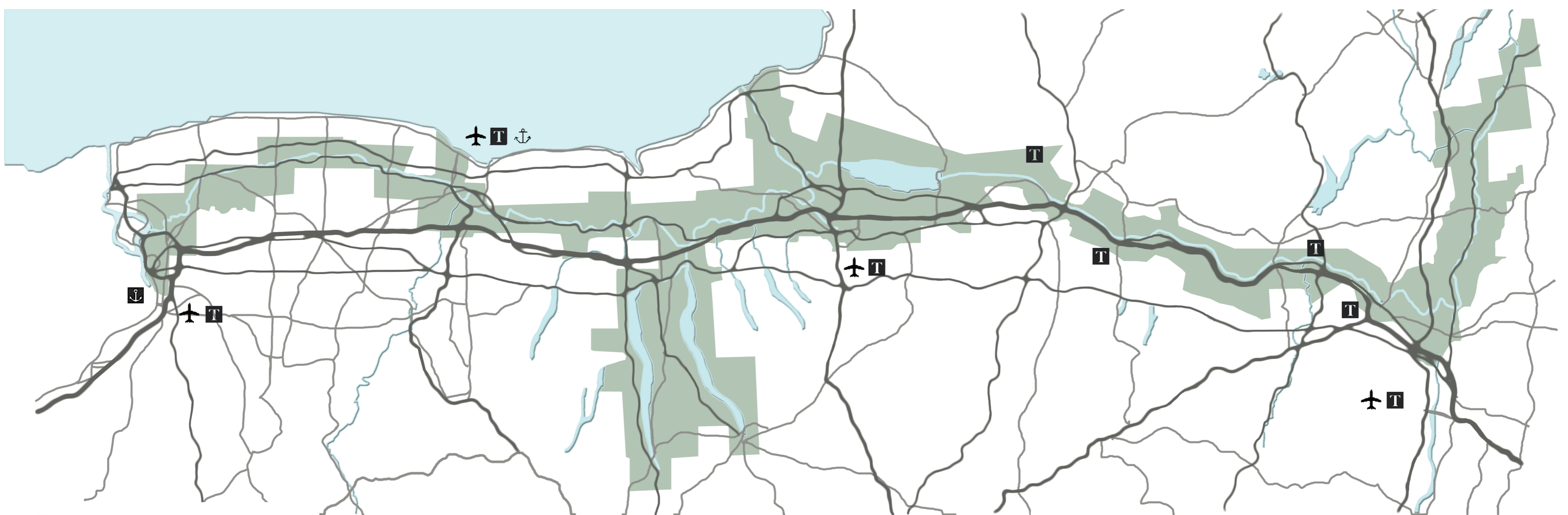
Map of part of the Grand Canal in 18th century



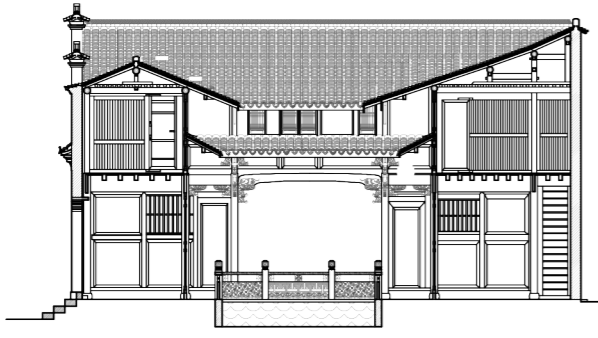
Map of Erie Canal in 1840



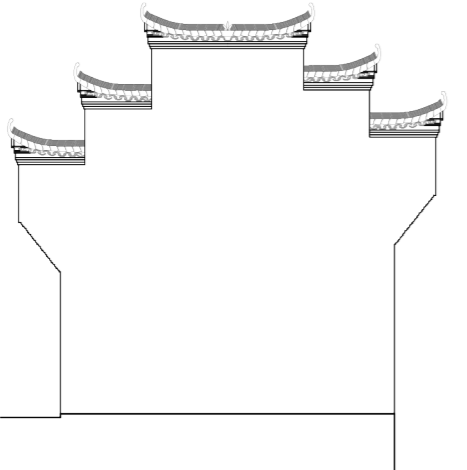
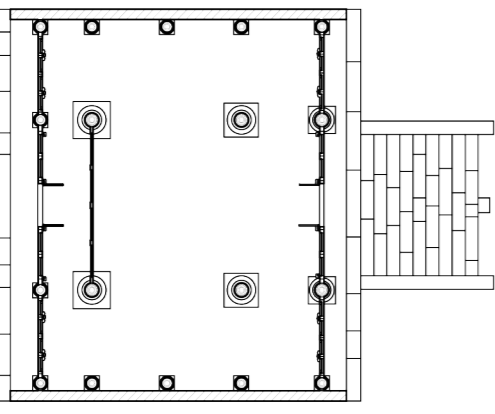
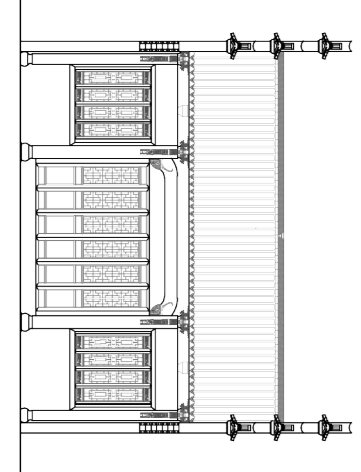
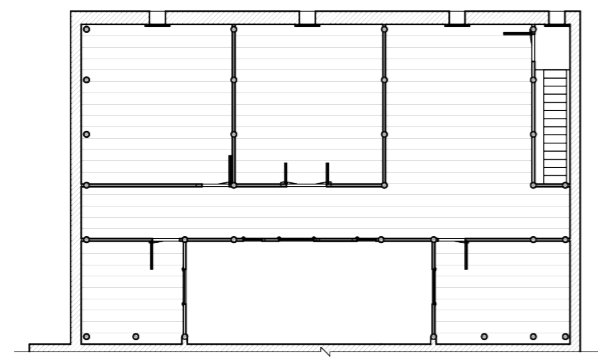
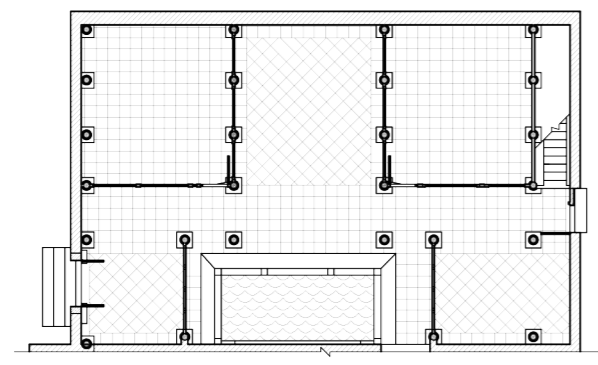
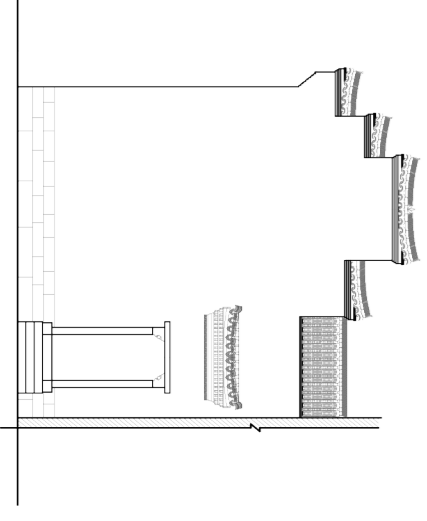
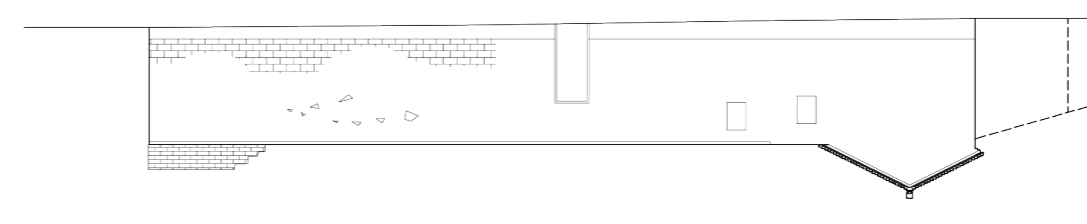




The most common form of traditional residential architecture in the south part of China along the Canal. All the buildings were symmetrical, and constructed around the courtyard with a small sink.

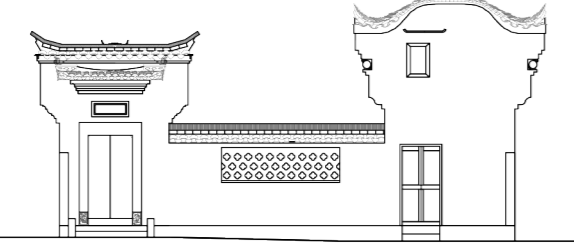
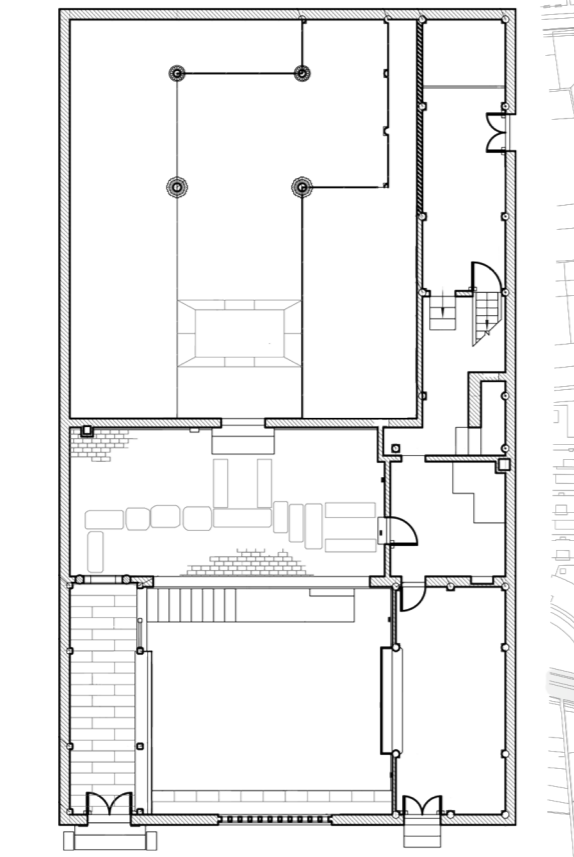
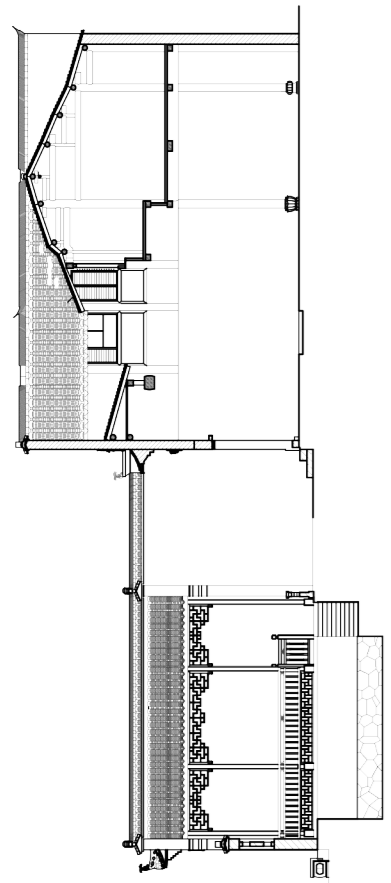
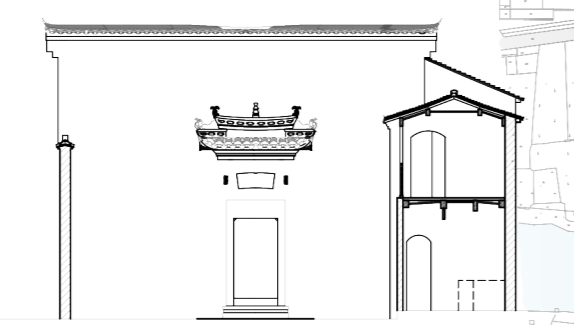
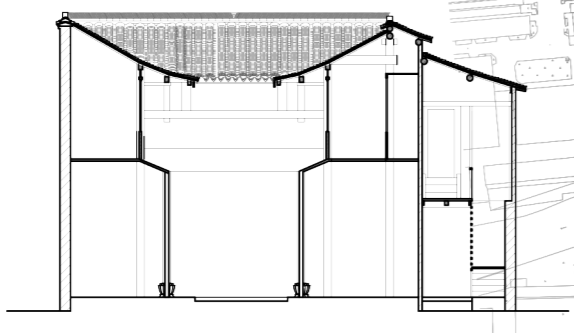


This building had not only a courtyard but also a garden behind. The original structure was wood, and during the past decades it has been preserved with bricks and concrete. And the plan of the rooms were already changed.

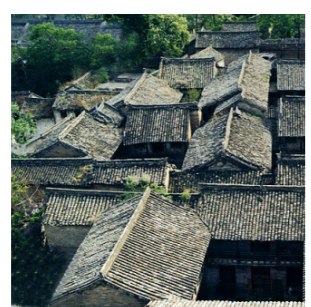


This kind of traditional building were usually used as the front entrance of a public building. It had only one floor and provided a large regular space.

This is also a common form of the traditional residential architecture with a pool in the courtyard. The building was not symmetrical, with rooms on one side and corridor on the other side. The building had one elevation facing to the river, which decorated with bricks and stone work.

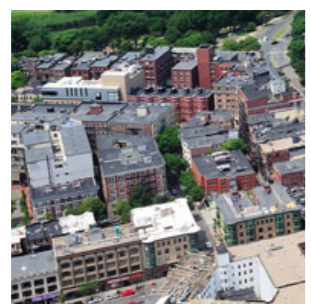
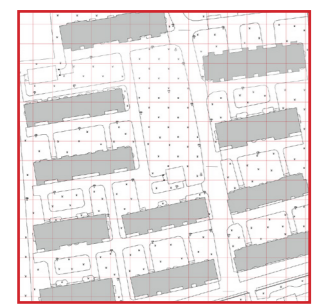


texture in 10 meter grid



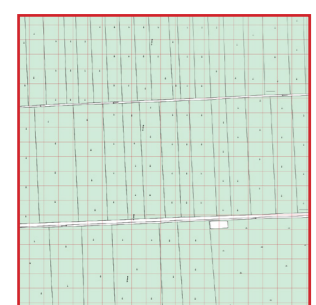
Traditional Buildings

The smallest dimension, one or two floor made by wood and brick. Densely crowded along the river, around the pool. Usually with a atrium.



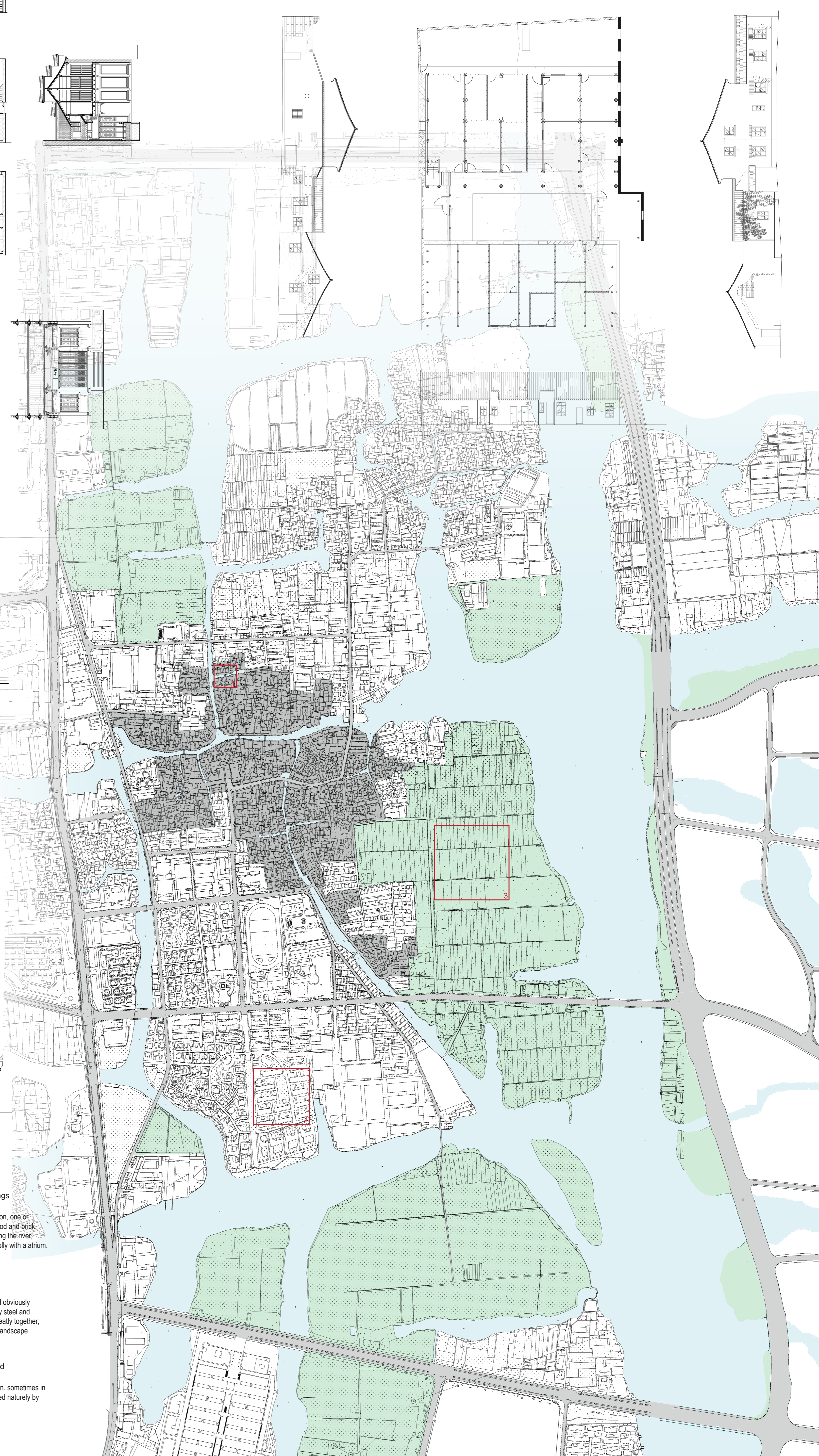
Modern Buildings

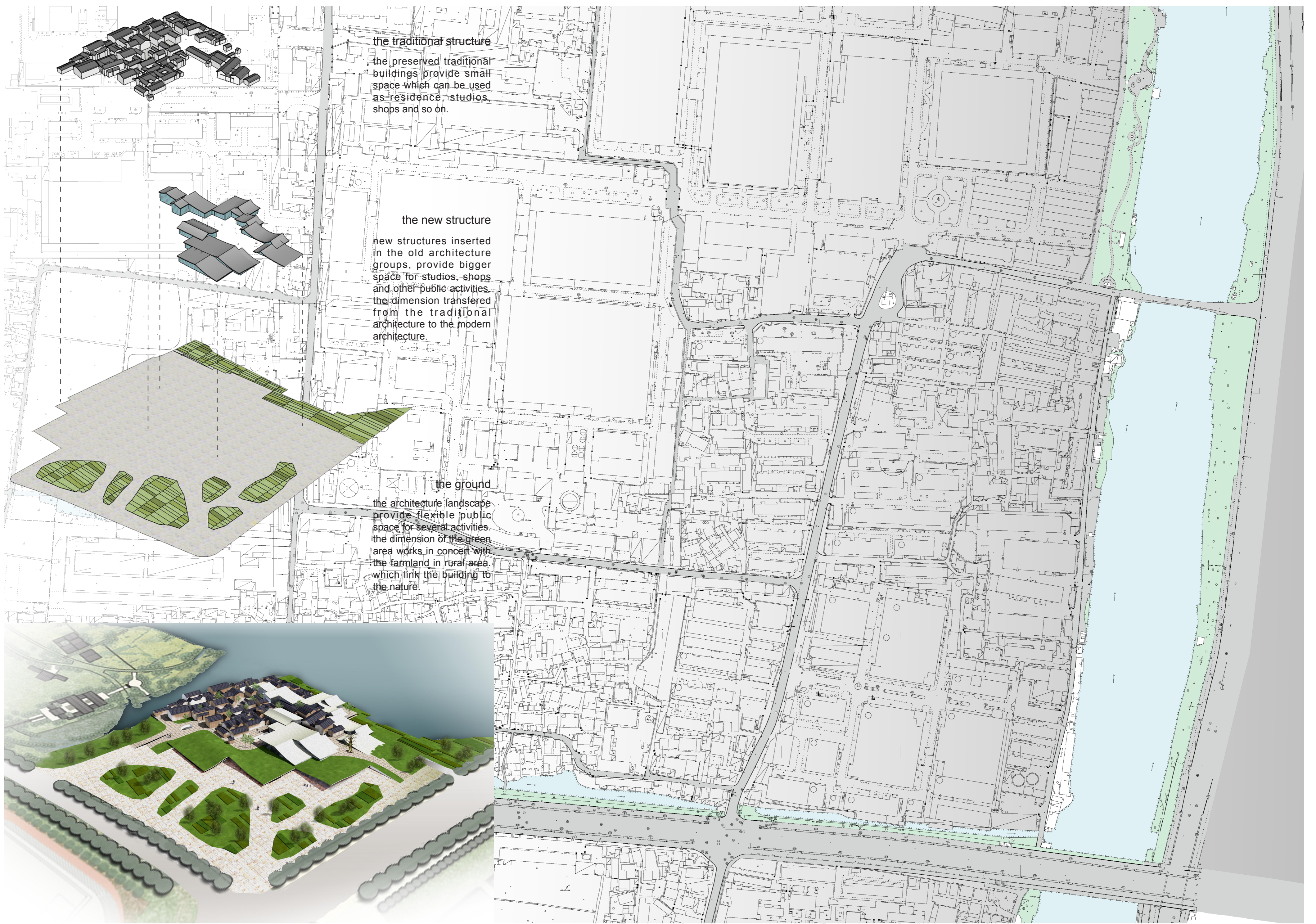
Bigger dimension and obviously higher, constructed by steel and concrete. Arranged neatly together, with designed green landscape.



Ordinary Farmland

The biggest dimension. sometimes in irregular shape. Divided naturally by roads, water, etc.





On the current situation, the traditional form and the modern architecture were pieced stiffly. In the buffer zone, all the buildings, no matter the preserved structures or the new built ones, were required to use the traditional form and the same material. However in the proposal, the new building inserted in the preserved buildings should be recognisable. It provides the link between the traditional form and the modern buildings, both in space, functions and landscape.

