

REBIRTH OF THE  
GRAND CANAL  
PRESERVATION  
OF THE CANAL  
LINEAR CULTURAL  
HERITAGE  
CORRIDOR AT  
HANGZHOU

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## THE GRAND CANAL AND ITS HANGZHOU SECTION

In the ancient times, there was no express delivery as we have today. Instead, the ancestors pursued the goals of quicker and safer conveyance of goods by using waterways and ships. Where a waterway went, there resources, fortunes and cultures would be. Canals, developed in the form of human-made waterways, reflected the society's wisdom and strength for survival, and usually embody outstanding engineering technologies. Canals emerged in response to the requirements of urban development and they breed and spread brilliant civilizations in their eras. Today, even though some or parts of these civilizations have been destroyed, intangible wealth remains along the canal paths.

While canal construction was undertaken at a national level to facilitate national city-building and strategic objectives, there also were substantial cultural effects. Canal development greatly influenced the lives of the broad masses of people in communities along their routes. For instance, the commercial wealth of the canal promoted the growth of attractive and gorgeous street cultures in towns and cities along the canals. The administration of the canal nurtured the historic Chinese system of the scholar-bureaucrat class. In fact, some historians contend that the cultural side effect of the Grand Canal was similar to that of City States in Medieval Italy, where the rich culture in Florence and other cities led to a Renaissance in Europe (Zheng, 1986; Chen, 2013). Canals brought about economic development, social change, cultural diversity, and other changes which had profound impacts on urban development pattern of later eras.

The Grand Canal, which is also known as the Beijing-Hangzhou Grand Canal.

Figure 1: Bird View of the Grand Canal (Hangzhou Section). Photo Credit: XU Haohao

It is the longest man-made canal in the world with a length of 1,776 kilometers (1,104 miles). Its origin can date back to the Spring and Autumn Period (771-476 BC) in Chinese history, when King Fuchai of Wu dug the Han Canal as part of a plan to push his army northward to conquer the Central Plain (Hsu, 1999). Afterward, other smaller canals were constructed and renovated to run through the middle and eastern regions of China, linking five of the nation's main river basins including the Hai River, the Yellow River, the Huai River, the Yangtze River and the Qiantang River together (UNESCO, 2014). During the period of the Sui Dynasty (561-618 AD) these different canals were eventually combined, creating the Grand Canal.

Starting at Beijing in the north and ending at Hangzhou in the south, the Grand Canal passed through the coastal regions of eastern China, the richest areas of that time, and connected the national political center and the national economic center (Chen, 2013). For more than two thousand years, it provided uninterrupted long-distance conveyance and provided the vital functions of water supply, irrigation, flood control, among others.



Figure 2: The Grand Canal and Canal Cities in Hydrological Map of China (partial). Source: Hangzhou Urban Planning Bureau

A proverb about old Beijing says, “the City of Beijing came through floating along the canal”. To facilitate construction in Dadu<sup>i</sup> or Beijing, during the Ming and Qing Dynasties, enormous timbers, bricks and stones were transported

<sup>i</sup> The capital of the Yuan Dynasty, in what is now the center of modern Beijing.

from the southern areas of China to these Imperial Cities through the Grand Canal. Beijing, at the “beginning of the Grand Canal”, is generally recognized for its political status as the long-term capital of the nation.

Hangzhou, the southern terminal city of the Grand Canal, grew to prominence because of the canal and today is the capital city of Zhejiang Province. Located in the northern area of that city, the Gongchen Bridge, spans across the Hangzhou Section of the Grand Canal, marking the end of the canal. Over the centuries, this ancient stone bridge witnessed numerous busy shuttling ships on the canal, and even till today we still can imagine the scenery through its majestic profile.

In addition to the conveyance of building materials, a distinctive characteristic that differentiate the Grand Canal from other canal heritages, is summarized in the term “caoyun” which means “transporting grain and strategic raw materials, supplying rice to feed the nation” (UNESCO, 2014). To support caoyun many practices were implemented such as the construction and maintenance of watercourses, and the construction of various hydraulic facilities and storage facilities. The supporting management system, established at the same time, evolved into one of the most important economic and social mechanisms in ancient China. Rich cultural heritages remained today.

Yet the goods transported to Beijing through the canal not only included grains and building materials, it also included tea. Hangzhou is one of the most famous tea-growing areas, famous for the Longjing variety of tea. After arrival in Beijing, some of the tea began to be traded for horses (Jenkins, 2010; Chen, 2013), a practice which resulted in the formation of the Tea Horse Road. Additionally, the route of the Shaanxi-Gansu Tea Horse Road became part of the Silk Road. Thus, cargo from the City of Hangzhou and other locations along the Grand Canal, moved throughout the world due the miraculous internal connections between the Grand Canal, the Tea Horse Road and the Silk Road.

Converging great technologies of every dynasty, the Grand Canal was the “national highway system” or “national high-speed rail system” of ancient China. The canal was designated a UNESCO World Heritage Site in 2014.

## **PRESERVATION FOR THE LARGE-SCALE LIVING LINEAR CULTURAL HERITAGE CORRIDOR**

From a global perspective, the Grand Canal was the earliest, longest and most complex canal in the world. It linked five of the nation’s main river basins and traveling across boundaries in the north and the south of China. The Grand Canal promoted a unified, magnificent national pattern of politics, economy, society and culture. It was one of the most significant achievements in water transportation engineering before the industrial revolution. It embodied the outstanding wisdom of our human ancestors to adapt to, transform and harmoniously coexist with nature. Its cultural heritage, reflective of its great age and spatial scales, are expressed in the very plentiful heritage sites of wharfs, ship locks, bridges and dams, government office buildings, official warehouses and feudal guild houses standing along the waterway. The core cultural values of the Grand Canal can be defined and summarized as:

- The living historic cultural heritage
- The important urban functional lifeline
- The flowing and thriving interconnected place
- The corresponding urban green corridor for the city

Even today, the Grand Canal, consisting of the tangible and intangible cultural heritages, maintains a strong vitality. It is a place where the ancient meets the modern, which is the canal's most precious fortune. The urban agglomerations along it are one of the most important arteries of economic development in China.

Today's Hangzhou is a historical and cultural city not only famous for its gorgeous natural and humanistic sceneries, but also well-known for the emerging technology hub. The city leads the revolution of smart economy by building a smart city in contemporary China. It is home to booming e-commerce and Internet finance industries, many of which incorporate cloud computing, big data and other Internet of things (IOT) technologies. The city is becoming prominent as the global center of e-commerce. As a result, the City of Hangzhou hosted the eleventh G20 Summit in 2016, and has been selected to host the Asian Games in 2022. It also aims at being the national innovation center of Internet finance by 2020.

In such an IOT era of e-commerce and Internet finance industries with today's rapid progress in aviation, high-speed railways, highways etc, we have a totally new transportation system. Compared with these modern methods of carrying goods and information, the transportation function of the Grand Canal is gradually waning. In addition, fast-paced modern urban construction have resulted in a series of serious challenges to the ancient canal. There are fewer and fewer interactions between the canal, the city and the people. The City of Hangzhou, which became prosperous because of the Grand Canal, has become alienated from it. From the perspective of the surrounding urban environment along both banks of the Grand Canal, especially for its Hangzhou Section, the key problems we are going to focus on are:

- **Isolation of the styles and features** between the ancient and the modern structures along both banks of the Grand Canal;
- **Isolation of the spaces** between the Grand Canal and the City of Hangzhou;
- **Isolation of the sightseeing activities** between the sceneries of the Grand Canal and those of the City of Hangzhou.

Consequently, it is now time to consider how we can leave the great canal for our descendants in another millennium. It is time for thoughtful consideration about how and what preservation work should be undertaken in the context of accelerated urbanization.

We propose that preserving the cultural heritage of the Grand Canal has its own characteristic which can be summarized into three specific key words; one is "*large-scale*", one is "*living*" and the other is "*linear*" (3 "L"). The key word "*large-scale*" indicates the grand scale of the canal, both in time and space. The key word "*living*" indicates that the canal is still carrying on the important urban functions of conveyance (coal transportation from north to south), water supply (South-to-North Water Diversion Project), irrigation, flood control and so on (Xinhua Daily, 2012). Finally, the key word "*linear*" indicates the specific form of the regions' cultural heritages in relation to the canal. In fact, the concept of a "*linear cultural heritage*" is an emerging field in international cultural heritage preservation. The term enhances the conceptions of "*cultural route*" and "*cultural heritage corridor*". It mainly refers to tangible and intangible cultural heritage groupings located in linear or zonal regions. These groupings represent the movement routes of human beings,



and they embody the development routes of regional cultures (Shan, 2006). Accordingly, we can define the Grand Canal as a “*large-scale living linear cultural heritage corridor*” (Shan, 2009; Yu, et al., 2009).

Because of the canal’s specific circumstances, preservation requires different ways and methods compared with those for traditional cultural heritages. There are three perspectives regarding this issue:

- **The historical perspective** - It is necessary to consider preservation for the cultural heritage of the canal from the views of *authenticity* and *integrity*. The preservation work should keep the collective memories and emotions for the tens of millions of people living, and who have lived, along both banks of the Grand Canal. It should focus at efforts to maintain the vibrant historical features of cultural and industrial prosperity to ameliorate the identical appearances of today’s cities that often lack individual characteristics.
- **The developmental perspective** - It is necessary to enhance the internal relationships between the canal and the urban environment from the views of *dynamics* and *reciprocity*. The preservation work should closely connect the economic and social development of the cities and the towns distributed along both banks of the Grand Canal, aiming to achieve better life qualities for local communities by promoting their physical environments.
- **The systematic perspective** - It is necessary to guide landscape construction from the views of *systematization* and *interactivity*. The preservation work should establish a system of sceneries and sightseeing activities going on along both banks of the Grand Canal. This system should aim at revitalization efforts for the activities that are relevant with the canal, to restore the extraordinary vitality in concert with management and planning work for the post-application era as a UNESCO World Heritage Site.

The “Grand Canal” in the following paragraphs specifically refers to “the Hangzhou Section of the Grand Canal”.

Figure 3: Daily Activities along the Banks of the Grand Canal (Hangzhou Section). Photo Credit: XU Haohao

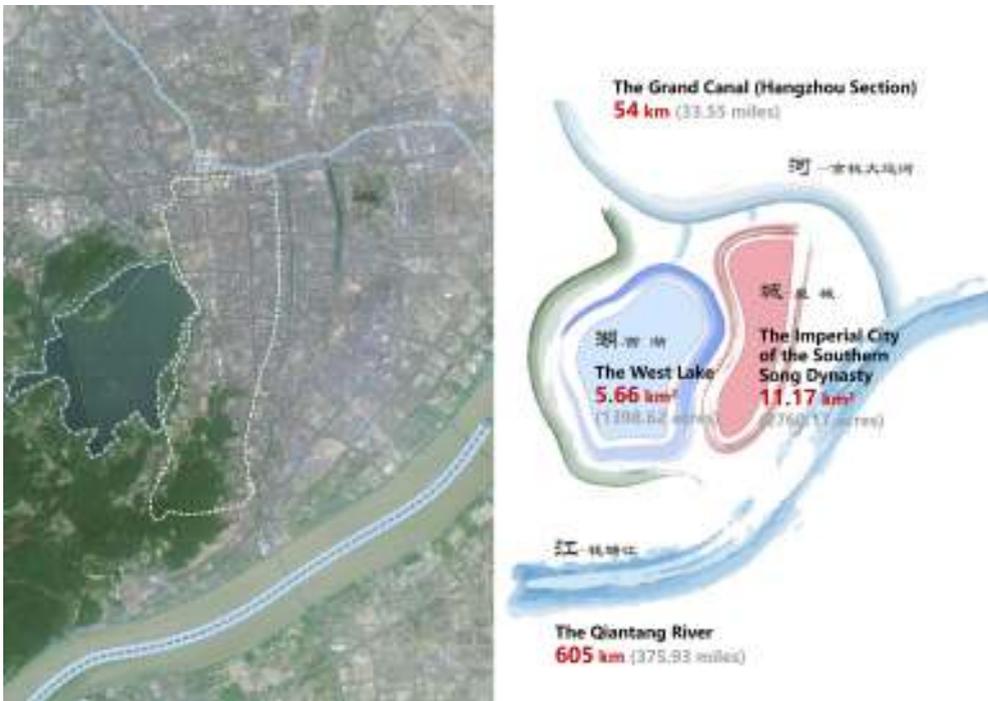
## THREE MAPS: THE CANAL, THE CITY, AND THE PEOPLE

### DEFINITION OF THE PROJECT AREA

*The Urban Landscape Promotion Project along Both Banks of the Grand Canal (Hangzhou Section)* consists of both a focused area and a research area. The focused project area, where maintenance, promotion and revitalization work will occur, is a 90km<sup>2</sup> area along both banks of the Grand Canal (also known as the Hangzhou Section). It starts at the Sanbao Ship Lock in Jianggan District in the south and extends north to reach the municipal boundary of Hangzhou. It includes the middle and eastern watercourses of the canal for a total length of 54 kilometers (33.6 miles). The fields along both banks have project area widths ranging from 500 meters (1,640 feet) to 1,000 meters (3,280 feet) based on actual site situations.

We have also identified a 160km<sup>2</sup> research range in the main city of Hangzhou. This area consists of the fields, located to the south of the highway around the city (offset one block) and to the north of the highway, together with surrounding elements of wetlands, roads and mountains.

Figure 4: Locational Relationship and Size Comparison between the Grand Canal (Hangzhou Section), the West Lake, the Imperial City of the Southern Song Dynasty and the Qiantang River



### OBJECTIVES OF THE PLAN

With the intent to rebirth the Grand Canal to benefit the local communities, the *objectives* of the project are:

- To solve the three key problems which are: isolation of the styles and features between the ancient and the modern; isolation of the spaces between the Grand Canal and the City of Hangzhou; and, isolation of the scenic sight-seeing opportunities between the canal and the city;
- To provide design solutions for each of the three key elements “*the canal*,



- the city, and the people*" which will also maintain interrelations between each element; and,
- To discuss the dynamics and relationships between the historical characteristics, the city-canal interactions, and the sightseeing activities.

Figure 5: Bird View of the Urban Landscape Promotion Project along Both Banks of the Grand Canal (Hangzhou Section)

### CONCEPT FOR THE PLAN

We envision incorporating the objectives for each element (the canal, the city and the people) by developing a general design framework which produces a landscape blueprint to capture the following concepts:

- **The canal relates to a history of thousands of years:** five-water<sup>ii</sup> system leads to unite the lakes and the harbors;
- **The city embraces urban spaces interacting with the canal:** six urban cores converge to shape the urban ecological corridors;
- **The people sightsee both the landscape of the canal and that of the city:** eight active arteries and veins interweave to reveal the vibrant communities.

Based on the proposal of the project, the 54-kilometer long canal serves as the routes to enjoy the urban landscape and constitutes an important part of the urban landscape itself.

The three following maps will illustrate our concept. These maps were developed through nine technological methods as well as Global Positioning System (GPS) and Geographic Information System (GIS) technologies. An additional feature of the concept is its role to enhance the City of Hangzhou as a new livable smart city, while positioning the local communities along both banks of the Grand Canal as new vibrant smart communities.

<sup>ii</sup> "Five-water" illustrates the five categories of water blended in the natural basis of the City of Hangzhou, which shape Hangzhou as a mountains-and-waters type city, i.e. sea (the East Sea), river (the Qiantang River), lake (the West Lake), stream (the Xixi Wetland) and canal (the Grand Canal).



Figure 6: Master Plan of the Urban Landscape Promotion Project along Both Banks of the Grand Canal (Hangzhou Section)

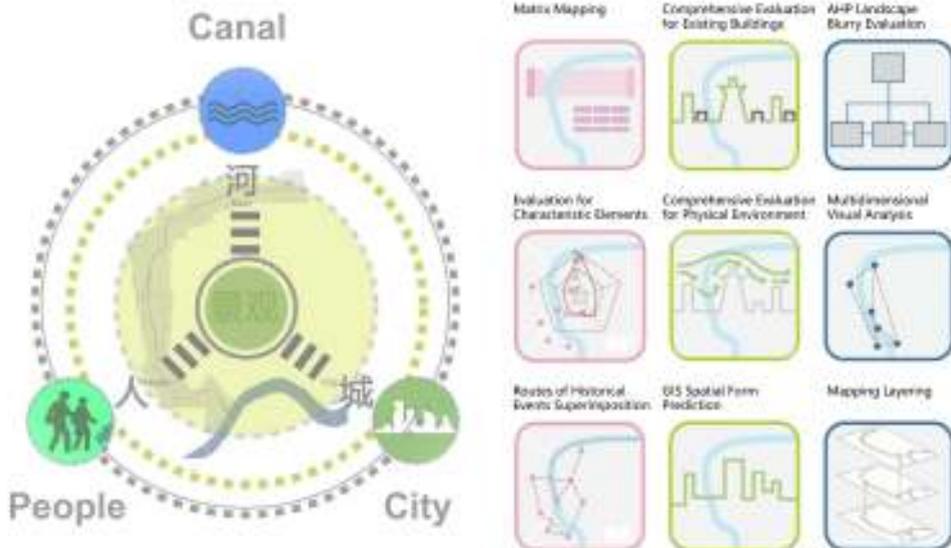
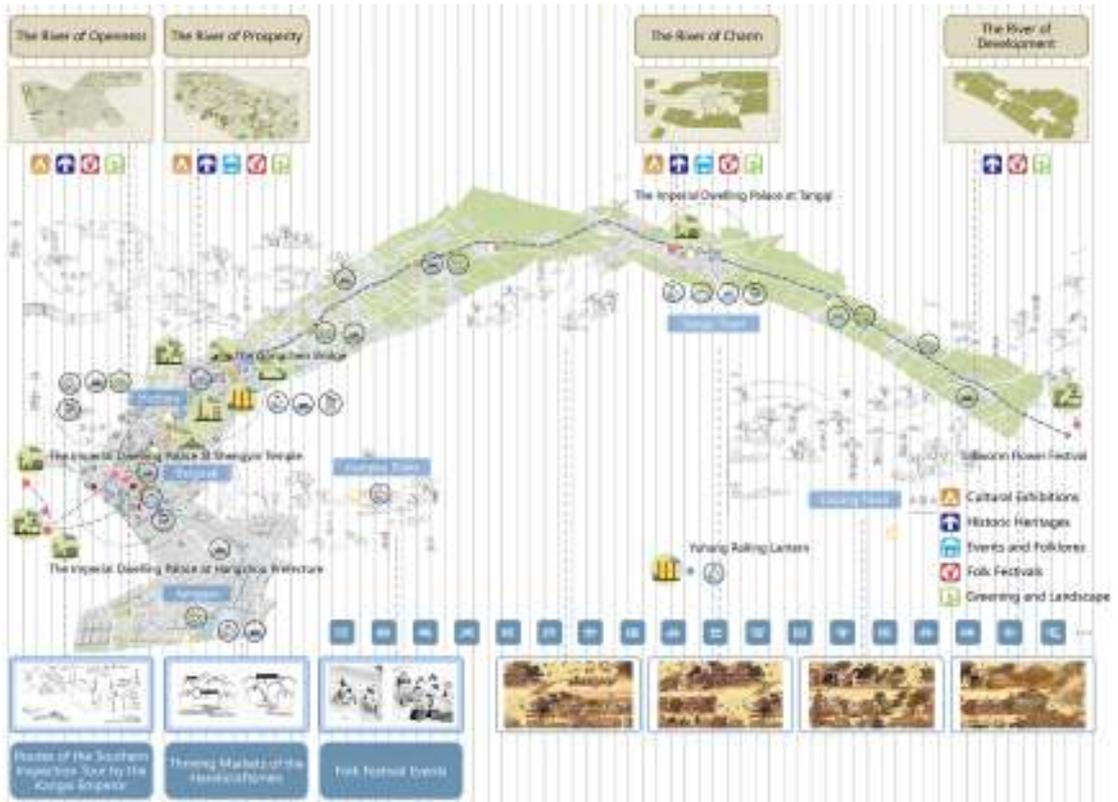


Figure 7: Concept for the Plan and the Nine Technological Methods



### THE FIRST MAP: THE CANAL RELATES TO A HISTORY OF THOUSANDS OF YEARS

The first map is *the Holography System Map of the Image of the History*. “The canal relates to history of thousands of years” by incorporating and adopting the core values, characteristic elements and historical events which occurred since its construction. These have been recorded into a holography system map which serves as the image of the history. It is used to show preservation areas and land use utilization of historic landscapes along the Grand Canal. The map provides a global vision of the Grand Canal, and was produced by incorporating three methods:

**Method 1. Matrix Mapping:** The position of the Hangzhou Section of the Grand Canal (compared to other sections within other cities along the canal) was defined through research and analysis of three parts types of data base: 1) the hydrological system in China including both the canal system and the five-water system; 2) the basin length and the age of construction for each section of the canal; and 3) the total GDP and the quantity of heritage points in cities along the canal.

Compared to the other canals that have been listed as UNESCO World Heritage Sites, the Grand Canal is the oldest and the longest canal. It is also one of the canals with the largest engineering features and the only canal with the signature of “*caoyun*”. Compared to other canal cities, Hangzhou is the historical and cultural city where the ancient meets the modern. From the point of view of Hangzhou urban pattern, illustrated

Figure 8: The Holography System Map of the Image of the History

by the five-water system, the Grand Canal is the origin of prosperity and openness for the city. This matrix identified the three core values of the Grand Canal from a global perspective.

**Method 2. Evaluation for Characteristic Elements:** We identified five categories of characteristic spaces for the canal, which could be described as “two islets, three branches, three harbors, four coves, and seven joints”. In addition, within the eighty-one historical elements of the Grand Canal, the planning scheme extracted twenty-two categories of characteristic spaces, including such diverse categories as bridges, ports, ship locks, dams, and etc. The distribution of the existing characteristic elements was used to identify historic blocks, such as found in Tangqi and Qiaoxi, as well as the three clusters located to the south of the Wulin Square.

**Method 3. Routes of Historical Events Superimposition:** The planning scheme endowed the spatial forms of the Grand Canal with humanistic feelings which strengthen the place characteristics of historical events. For instance, the routes of the southern inspection tour by the Kangxi<sup>iii</sup> Emperor prompted the establishment of markets and trade centers by numerous handicraftsmen. The inspection also influenced folk customs and festivals.

## THE SECOND MAP: THE CITY EMBRACES URBAN SPACES INTERACTING WITH THE CANAL

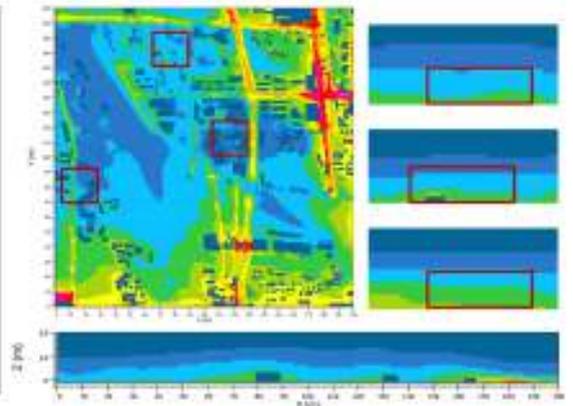
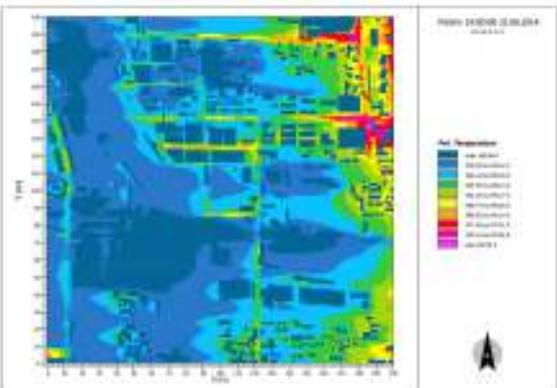
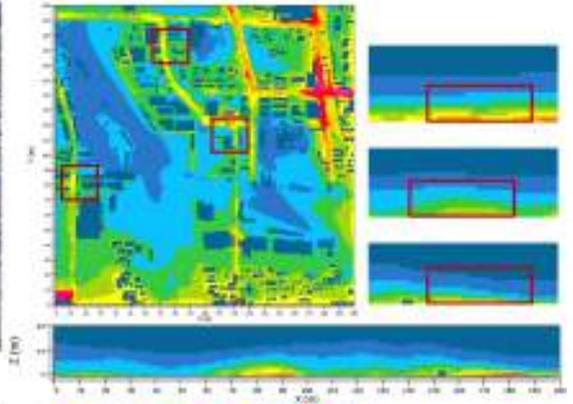
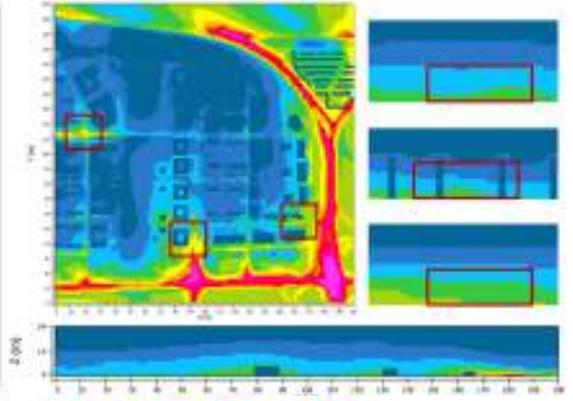
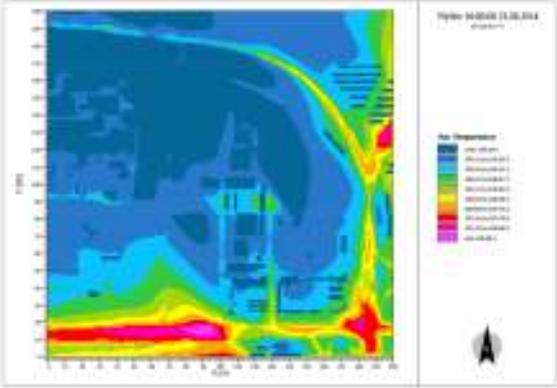
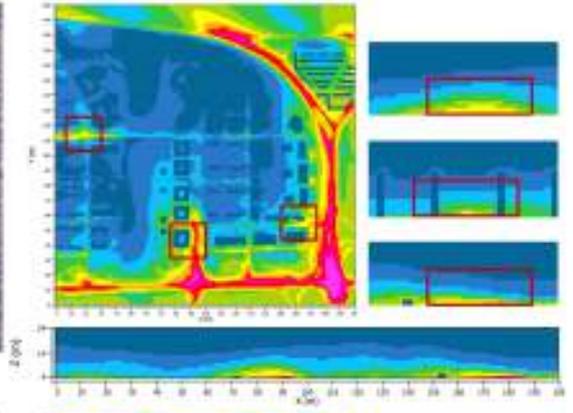
The second map is *the Morphology System Map of the City-Canal Spaces*. It is intended to illustrate how “the city embraces urban spaces interacting with the canal”. To exhibit this city-canal interactive relationship, we created a morphology map for comprehensively displaying superimposed reconstructions of existing buildings and simulations of future spatial forms, which had been optimized for the physical environment of the city-canal spaces. The map visualizes the ideal model of urban forms along both banks of the canal from the perspective of city-canal interaction. It was constructed using the following three methods (labeled Methods 4 to 6):

**Method 4. Comprehensive Evaluation for Existing Buildings:** For the comprehensive evaluation for existing buildings, the project excluded lands where construction was prohibited. This development-excluded zone had a total area of around 39km<sup>2</sup>, including lands designed for ecological conservation (mainly in the Tangqi Wetland), historic cultural heritages, green parks, and etc., as well as the lands with planning schemes approved with a total number of 153 blocks. We then evaluated the existing buildings on the remaining land which could support development. During this process, we identified the lands where demolition should occur, areas where reconstruction or partial redevelopment might occur, as well as areas to support future development.

<sup>iii</sup> The Kangxi Emperor, 1654-1722 AD.

Figure 9: (next page) Simulation and Analysis of Physical Environment in Guanjiayang

Figure 10: (next page) Simulation and Analysis of Physical Environment in the Heritage Park of the Refinery



**Method 5. Comprehensive Evaluation for Physical Environment:** The Grand Canal should play an important role in improving and promoting urban physical environment of the City of Hangzhou, as it is such a large-scale linear open space. We conducted research to determine the thermal, wind and acoustic properties along the canal to assist in assessment of canal zones' physical environment. Simulation and analysis of the thermal environment was carried out using the software platform of Ecotect, which is based on the principles of computational fluid dynamics (CFD). The simulation and analysis of wind was accomplished using the software platform of Fluent, while the simulation and analysis of acoustic environment was done by the software Raynoise. The resulting information was used to promotion strategies for the physical environment including the control measures for the spatial forms along the Grand Canal.

**Method 6. GIS Spatial Form Prediction:** Our examination of ideal urban landscape forms along both banks of the Grand Canal was based on both existing circumstances and the prediction of future spatial intensity. Therefore, the planning scheme simulated intensity and height of the future spatial forms along the Grand Canal based on the GIS technological platform. Buffer analysis, Kernel density estimation and Kriging interpolation calculation were applied to superimpose and analyze eight factors of the index system, including urban land prices, urban center systems, and rail transit stations. We used the resulting information to inform our judgment as we developed optimal spatial forms along the Grand Canal.

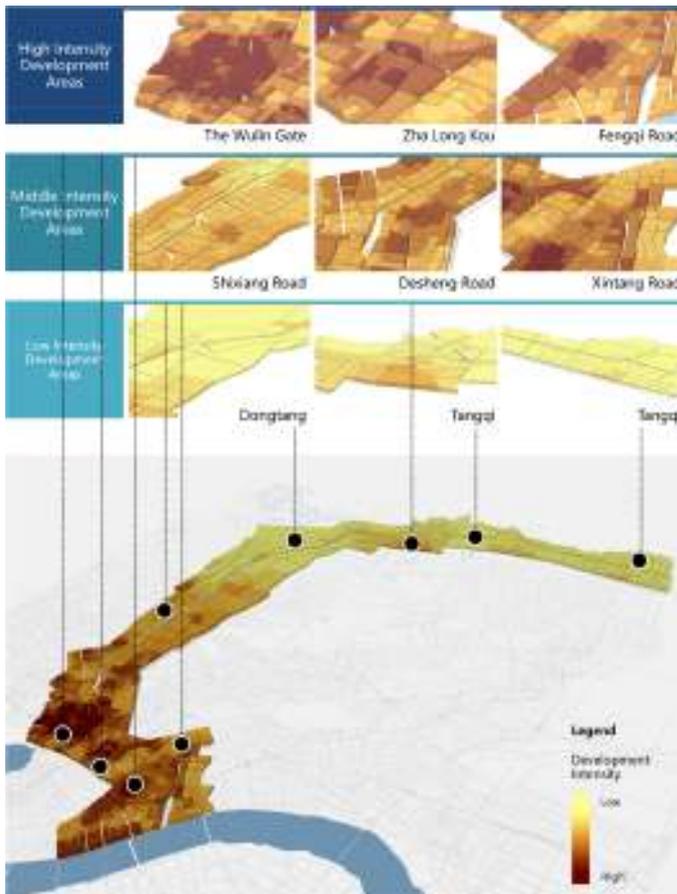
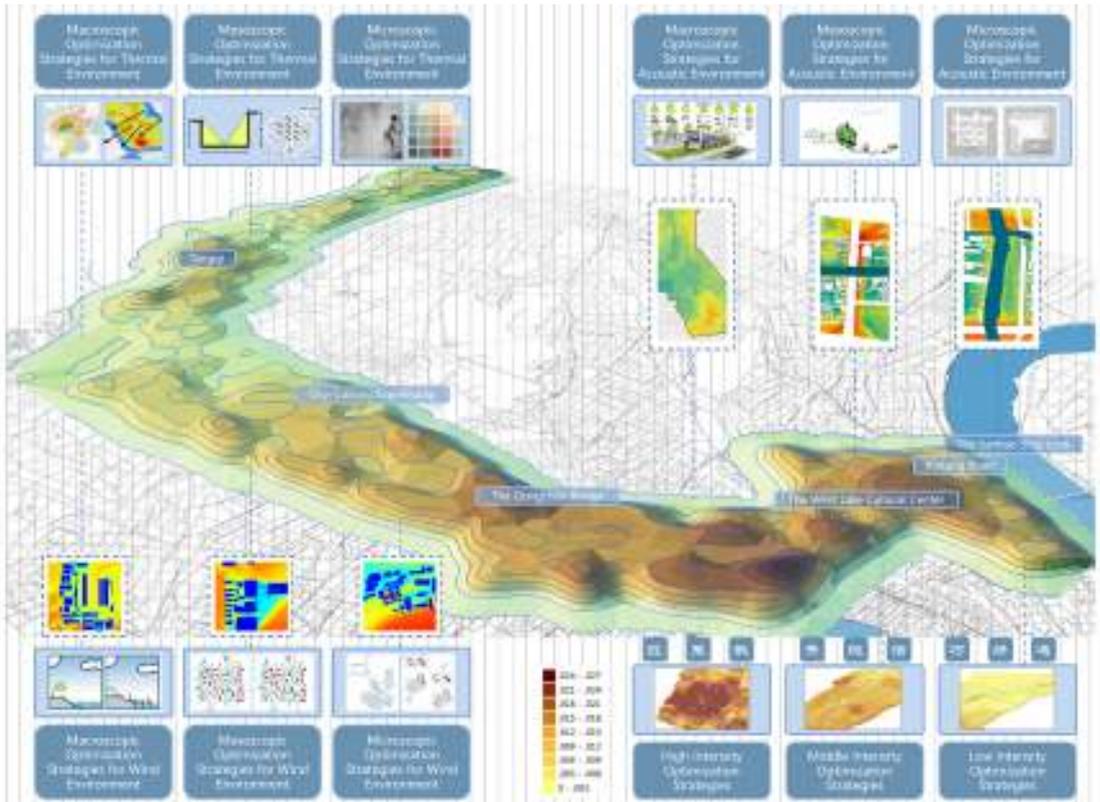


Figure 11: Prediction of Future Spatial Intensity based on the GIS Technological Platform



### THE THIRD MAP: THE PEOPLE SIGHTSEE LANDSCAPE OF THE CANAL AND THE CITY

The third map is *the Sightseeing System Map of Dynamic Optesthesia*. This map organizes and superimposes evaluation results of the visual landscape, the overlooking system and the dynamic sightseeing system to identify the sightseeing system map. It displays a dynamic optesthesia to exhibit the interactive relationships between the people and the canal. It focused on two key scientific issues. The first is the sightseeing system for the Grand Canal based on sightseeing modes from different speeds, trajectories, and visual angles of people, vehicles and boats. The second promotes the urban features along the large-scale living linear cultural heritage corridor.

Previous efforts to develop a sightseeing plan based on landscape features in China and abroad paid more attention to a single movement-oriented circumstance, where the visual perception changes were generated by movement. This kind of sightseeing perception research always put the serial static viewpoints as the starting points. However, the experiences and feelings of the same landscape from the same visitor in different sightseeing systems are not entirely the same. The elements which affect people's visual perception also include movement speeds and movement trajectories, sightseeing distances, and visual angles from the ornamental object. As a result, the sightseeing system would not be a single existence even in the same landscape.

We argue that the composite and dynamic sightseeing model we used in this project is an improvement compared to the static sightseeing model, especially in large-scale landscape environments. Our resulting map made

Figure 12: The Morphology System Map of the City-Canal Spaces



Hangzhou based on the two main viewpoints of the Grand Canal near the West Lake. Consequently, the Wulin Gate, the Sanbao Ship Lock and the New City of Grand Canal would be the cluster areas of high-rise buildings which should be given priority to construct.

**Method 9. Mapping Layering:** Dynamic sightseeing is one of the main characteristics of the sightseeing activities related to the Grand Canal. Hence, we built landscape intention models under different speeds, based on interaction relations between the sightseeing perception and three movement modes including boating, walking and bicycling.

## THE FUTURE-ORIENTED CONCEPTION AND STRATEGIES

Based on our three analytical maps about the canal, the city and the people, we proposed an urban landscape plan for the Grand Canal based on the conception of “*one grand heritage area*”. This plan consists of nine design strategies, six focused planning districts, twelve action plans, and twenty-four-section designs.

The conception of “one grand heritage area” not only sets forth the single heritage domain of the Grand Canal, but also integrates the characteristic cultural and natural heritages resources in the Grand Canal, the West Lake, the Imperial City of the Southern Song Dynasty<sup>v</sup> and the Qiantang River from the holistic layer of Hangzhou. The canal is proposed to be the sightseeing vehicle to communicate with the slow traffic system of green corridors. It is intended to cascade the sightseeing and recreation system, to build up the heritage preservation platform, and to establish the spatial framework incorporating the conception of grand heritage area with “one canal, one lake, one city, one river” for the City of Hangzhou.

The nine urban landscape promotion strategies could be summarized based on the project and relevant research as:

- 1) **Perfection strategy** for five-water system *on the layer of canal landscape promotion*: This strategy establishes the Grand Canal as the vehicle to advance the interactions between the city and the canal in Hangzhou. It uses the Canal, as the fifth water body, to unite the four other kinds of water bodies, which include sea, river, lake and stream by means of tour routes and which weave through the water system and between the proposed green corridors.
- 2) **Exhibition strategy** for culture diversity along the canal. This strategy calls for the exhibition of the multi-cultures along the canal including a deep analysis of the canal culture and its historical, industrial and urban cultures germinating by the canal.
- 3) **Combination strategy** for planning and heritage monitoring. This put forward the relevant ideas and methods for a heritage monitoring program of the canal. It is envisioned that this strategy will be the basis for the post-application era of the West Lake as a UNESCO World Heritage Site.

<sup>v</sup> The Southern Song Dynasty, 1127-1279 AD.

4) **Optimization strategy** for the city-canal structure *on the layer of urban landscape promotion*. This program optimized the spatial relations between the city and the canal from three aspects. It proposes the optimal distribution for high-rise buildings along both banks of the Grand Canal. It offers construction guidance for waterfront buildings. And finally, it establishes overlooking corridors.

5) **Improvement strategy** for quality of public spaces. This work guides the systematic construction of waterfront public spaces; optimizes the physical environment of public spaces, and includes the planning for night scenes along the canal. It lays emphasis on the spatial relations between the canal and public spaces, such as public green spaces, squares, waterfront pedestrian streets, portal nodes, boulevards, ecological corridors, landscape parks, and so forth. It also improves the thermal, wind, and the acoustic environment by calling for the construction of wind corridors, traffic calming zones and the optimal forms of high-rise buildings. Furthermore, the promotion strategies were put forward 24-hour scene-planning of the Grand Canal.

6) **Shaping strategy** for architectural features and characteristics. This strategy sorts architectural features along the canal into five categories for guidance, i.e. the old city areas, the ancient towns, the countryside areas, the industrial areas and the new towns. The architectural features and characteristics were shaped holistically based on the distribution of colors along the canal and landmark buildings in the point-and-plane integration manner.

7) **Construction strategy** for green slow traffic systems *on the layer of sightseeing activity promotion*. This program organized the slow traffic systems depending on waterfront spaces and public greening. It afforded sightseeing routes for the citizens and tourists as recreation places for fitness activities and leisure.

8) **Revitalization strategy** for canal vitalities. This section of the overall plan calls for planned activities, incorporating traditional sports, folk performances, special cuisines and tourism, along the canal in order to illustrate an in-depth perception of canal vitality through multi-layer tour experiences ranging from half-day tour, one-day tour to multi-day tour.

9) **Creation strategy** for the new “Ten Sceneries of the Grand Canal”. This strategy advances landscape coordination in the grand heritage area. It proposes the creation of the ten sceneries along the Grand Canal, while echoing the West Lake across the distance.

Additionally, the planning scheme proposes six focused planning districts and twelve action plans. The role of these special areas is to transform the static ultimate blueprint to an action plan that could be effectively operated and implemented. The twelve action plans included the preservation action for city-canal structure, the renovation action for waterfront development, the perfection action for five-water system, the experience action for canal cul-

ture, the planning action for architectural features and characteristics, etc. It proposed to push forward urban landscape promotion along both banks of the Grand Canal in a planned way with annual specific plans.

Besides, the planning scheme of the project, we divided the design range of the Grand Canal into twenty-four design sections. Within each section specific planning and design standards would be used for water, landscape along the canal, waterfront buildings, open spaces, sightseeing systems, etc. From the perspective of history and culture, each section has preservation measures of exhibition, consolidation, combination and extension. From the perspective of urban space, each sections has optimization measures of controlling, assembling, hiding and greening; and finally, from the perspective of canal sightseeing, each design section has sightseeing measures of connection, touring, overlooking and vitalization.

## CONCLUSIONS AND DISCUSSIONS

The Grand Canal is a large-scale living linear cultural heritage corridor. Overall, the urban landscape plan along both banks of the Grand Canal (Hangzhou Section) integrates a dynamic and complicated evolutionary process which includes resources and endowments of the Grand Canal (including sceneries of the canal and scenes of the city) and the sightseeing system, into a three-layered systems embodying the canal, the city and the people. The systematic design contained the conception of “*one grand heritage area*”, including three objectives and images as well as nine design strategies. It identified six focused planning districts, twelve action plans, and twenty-four-section design for the Grand Canal.

In summary, the core issues of the *Urban Landscape Promotion Project along Both Banks of the Grand Canal (Hangzhou Section)* and its relevant revitalization work are intended to coordinate heritage preservation, urban design and sightseeing organization efforts. The project integrates research with design, seeking to achieve innovation embodied in three aspects:

- It proved to be platform to innovation planning theories and technologies. The urban planning and design proposed land use controls for large-scale spatial forms and used evaluation theory for landscape visions of the future based on the forecasted urban landscape preservation and enhancement along both banks of the Grand Canal. It constructed the urban form model for the project by using digital platforms such as GIS.
- It innovatively utilized the design method of interaction between “sceneries” and “sightseeing” to produce the urban planning and design along the full 54 km<sup>2</sup> (13,344 acres) project. It put forward twelve action plans and design guidelines for twenty-four sections to achieve dynamic implementation, baseline control, long-acting management.

However, as a large-scale living linear cultural heritage corridor, preservation work for the Grand Canal is multielement and multidimensional. The work processes we used are not only dynamic and complicated, but also holistic and consecutive, which has made it very difficult to inherit the soul of its cultural connotation. Also, the interdisciplinary cooperation in urban planning and design and the incorporation of advanced conceptions and technologies, many on frontiers of practice, make the institutional framework very essential. Good governance and public participation will facilitate the work from various perspectives.

In addition to the Grand Canal, there exist other similar linear cultural heritages in China which are various in forms and contents, such as the Tea Horse Road, the Silk Road, and the Straight Road Site of the Qin Dynasty. We hope that *The Urban Landscape Promotion Project along Both Banks of the Grand Canal (Hangzhou Section)* can serve as an example and an entry point to discuss preservation for these other large-scale living linear cultural heritage corridor.

Finally, we hope that the scientific attitudes and methodology which produced the plan for the Grand Canal can finally contribute to the common societal objective to promote sustainable development towards a smart city. The Grand Canal as one of the most precious cultural heritages, containing the collective memories and emotions of tens of millions of people, and we hope that it will still be vital for our descendants in future millennium.



Figure 14. Bird View of the Grand Canal (Hangzhou Section).  
Photo Credit: XU Haohao

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