

Innovation in the landscape design of the cultural heritage of China's Grand Canal: Exploring multidimensional patterns of public space

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Abstract: The Grand Canal, as a World Heritage Site in China, boasts profound historical and cultural significance. It inherits and showcases the cultural heritage of a thousand years, playing a crucial role in promoting and developing the Chinese civilization and improving the images of cities along its route. This paper, by analyzing the historical value, aesthetic function, and practical importance of the cultural heritage of the Grand Canal, aims to explore a design approach that organically combines cultural inheritance and functional aesthetics in practice and provide reference for working out more instructive strategies. For these purposes, it analyzes classic cases from the perspectives of ecology and geography, history and culture, and function and society, and summarizes the application and effects of innovative design strategies and practical cases based on existing achievements.

Keywords: The Grand Canal; cultural heritage; landscape design; multidimensional patterns; public space

1. Cultural Heritage of the Grand Canal from Multiple Dimensions

With the rapid development of the social economy, landscape design has received increasing attention. As a comprehensive research field that integrates aesthetics, ecology, science and technology, innovation in landscape design plays a crucial role in fostering eco-friendly environments and improving the quality of living environments. During the process of design, how to choose the appropriate perspective and find suitable innovative approaches has become a focus of attention of more and more designers. Examining the rich cultural heritage and development achievements of the Grand Canal from a multidimensional perspective has significant reference value for the design of public space.

The so-called multidimensional pattern, also known as multidimensional space, often refers to a composite space composed of multiple interrelated dimensions combined in a certain way, but it is not the concept of space in a narrow sense. Originating from fields such as mathematics and physics, this approach has been applied in research across various disciplines, including modern social sciences, culture and art, and business management. In other words, the term “multidimensional pattern” is not rigidly defined. In research, what's important is to analyze and study the research subject from multiple interrelated dimensions needed. Such approaches and research methods have a long history in fields of public space utilization and landscape design. Early in 1964, Foley introduced the “four-dimensional concept” of spatial structure. Chinese scholars are also consistently exploring applicable theories. These include theories on comprehensive research across multiple dimensions, such as the “social-economic-natural” urban complex ecological system proposed by Ma Renjun and Wang Rusong, as well as the theoretical framework for the science of human settlements and the concept of “five major subsystems and five major functions” proposed by Wu Liangyong. This indicates that as the research on spatial dimensions in the academic world is deepening, research on single-dimensional elements can no

longer satisfy the need of people to explore and analyze a certain area. Increasingly subdivided, multi-level, and interconnected spatial dimensions have started to become focal points in people's research endeavors. The multidimensional pattern is characterized by diversity, with each dimension interconnected and changing dynamically. Various spatial dimensions such as geography, society, function, ecology, culture, politics, economy, and virtuality mutually constrain and influence each other, collectively forming the multidimensional pattern of public space.

Of course, the perspective for examining the multidimensional pattern of public space aligns with the principles that landscape design needs to follow. Modern landscape design advocates collaborative innovation across multiple disciplines, fields, and levels, ultimately aiming to achieve coordination between landscape design and culture, society, economy, ecology, and the people's livelihood, rather than solely catering to aesthetic appreciation needs.

Public space is a relatively complex concept. Setha Low (2022) defined this term from the perspectives of individuals, culture, and urban design, which encompasses dimensions such as physics, ownership, governance or management authority, capital, control and impact, symbolism/historical significance, and political activities (Setha Low, 2022). Simultaneously, with the progressive advancement of the urbanization process and people's continual optimization of functional regions within cities, various forms of design and planning for public spaces have emerged. The importance of landscape design in society is on the rise, influencing everything from local spatial transitions between regions to the coordinated development of various regions and industries. Landscape design is no longer confined to simple urban layout and green spaces in parks, but rather a combination of multi-level spatial utilization and resource allocation. The book *Innovations in Landscape* also points out that the changing and expanding nature of "landscape" has prompted landscape architects to consider innovation as a crucial component of forward-looking development, which is now more important than ever (Jonathon Anderson & Daniel Ortega, 2016).

Based on the above analysis, the area surrounding China's Grand Canal and its adjacent basin boasts an abundance of resources, with a long history of civilization. These exploitable resources exist in various types and forms, including natural heritage such as naturally formed topography, landscapes, and ecosystems, as well as material cultural heritage such as historical sites and cultural relics from the past, and intangible cultural heritage such as festivals and customs. From both a natural and humanistic standpoint, these resources are invaluable treasures, embodying diverse values. Therefore, when utilizing resources around the Grand Canal and its adjacent basin, we should assess their inherent value and their potential to generate extended value from a multidimensional perspective.

Cristiana Achille and Fausta Fiorillo (2022) pointed out that cultural heritage includes the cultural relics, monuments, architectural complexes and sites, as well as museums which possess diverse values. These values include symbolic, historical, artistic, aesthetic, ethnographic or anthropological, scientific, and social significance (Cristiana Achille & Fausta Fiorillo, 2022). The *Introduction to the Cultural Relics Protection Law* of China (2002) pointed out that there are different definitions of cultural heritage in China's academic world. Despite this, scholars generally agree that cultural heritage originates from social practice and encompasses all the wealth created and left behind by human beings throughout history in their practices. Such heritage has historical and artistic significance, comprising both material and spiritual

treasures (Li Xiaodong, 2002). According to the *Measures for the Protection and Management of Grand Canal Heritage* (2019), we can see that heritage of the Grand Canal actually includes the remains of hydraulic structures of the Sui-Tang Grand Canal, Beijing-Hangzhou Grand Canal, and Eastern Zhejiang Canal, as well as various associated historical remains, historic districts and villages, and related environmental heritage (Zhang Qiu, Bai Bing, 2019). Yao Di, Zhu Guangya, and Dai Desheng found in their research that the material cultural heritage of the Grand Canal can be specifically divided into four categories, i.e., hydraulic engineering and related cultural heritage, settlement heritage, other material cultural heritage, and ecological and landscape environments (Yao Di, Zhu Guangya, Dai Desheng, 2014). This shows that the cultural heritage of the Grand Canal not only includes the historical sites and folk customs well-known to the people, but also includes the spiritual civilization derived from the natural and ecological environment mentioned above, such as poems written by scholars inspired by the scenery and paintings of the river created by artists. From this perspective we can see that the dimensions of ecological environment and geographic space are indispensable in the development of cultural heritage. The final development outcomes of such heritage will be applied to society, and passed down through generations, serving as a link between the past and the future in history.

Therefore, this paper will provide a brief analysis of the issues worth considering during the development and utilization of the cultural heritage of the Grand Canal from the perspective of the multidimensional pattern of public space, and make analysis of practical achievements in the following part to derive guiding strategies.

Firstly, from the perspective of ecological environment and geographical space, the Grand Canal and its surrounding areas extend widely, characterized by a highly complex natural landscape. Urgent restoration and protection efforts are imperative for the ecosystems in certain regions, while other regions benefit from favorable natural conditions. The unique ecology and landscapes of the Grand Canal intertwine with the surrounding cultural architecture, constituting an indispensable part of the cultural heritage of the Grand Canal. Ian McHarg (2006) pointed out that we'd better plan and design our occupation and alteration of the earth based on meticulous consideration of its ecological and landscape attributes (Ian McHarg, 2006). During the protection and restoration of the cultural heritage of the Grand Canal, how to develop and utilize it to achieve a win-win situation of environmental protection (lucid waters and lush mountains) and economic prosperity is essential. This question must be effectively resolved within the landscape design process, as it forms the cornerstone and prerequisite for all development and utilization efforts.

Secondly, from the perspective of social space, the book *Construction and Use of Urban Landscape and Public Open Space* points out that public spaces play a crucial role in the urban landscape in people's daily life, and are significant for the social, economic, health, and psychological dimensions of all residents. Public spaces also allow residents to express themselves, thereby strengthening their sense of collective identity to seek recognition, and afford them the opportunity to be heard and recognized by others (Mohammed Al-Khanbashi, 2020). Silvia Cerisola (2019) also pointed out that culture, history, religion, and identity play an important role in the development potential of any region, and the positive impact of cultural heritage on economic development has been receiving more and more attention (Silvia Cerisola, 2019). This shows that the development of cultural heritage bears considerable social

significance and has undeniable importance in areas such as social identity, economic development, and livelihood issues. Conditions along the Grand Canal and its surrounding areas are different. Meanwhile, the needs and interests of different communities in social public spaces also differ from each other. The development status of towns along the Grand Canal is different, and even areas with similar levels of development may exhibit different social land use requirements. From the perspective of individuals, urban residents and visiting tourists may have different expectations for the same public space, which inevitably becomes a challenge in landscape design. The ultimate goal of design is to ensure practicality, and to make the results of landscape design meaningful, we need to address the issues related to dimensions of social space effectively.

Thirdly, from a historical and cultural perspective, the development and utilization of the cultural heritage of the Grand Canal are of great importance for both cultural inheritance and cultural transmission. Cultural inheritance, just as its name implies, is the continuation and elevation of the spiritual and cultural achievements accumulated over thousands of years, and the development of all cultural heritage shall follow the principle of prioritizing inheritance. The transmission of culture requires the promotion of the individuality of local culture. The Grand Canal basin covers a vast area and is characterized by diverse regional cultures and folk customs. How to explore the infinite spiritual and cultural wealth and the humanistic care hidden in it, promote the local characteristics, and achieve unique yet common prosperity is always a question worth pondering.

2. Cases of Landscape Design in Public Spaces along the Grand Canal in China

Through landscape design, we can achieve the harmony and optimization within public spaces and enhance the flow of resources between regions. With the urban green spaces in the Beijing Section and the cultural tourism related to the Grand Canal in the Jiangnan Section as the research objects, this paper will conduct a brief analysis from the perspectives of geography, space, ecology, and historical culture to explore the innovative points of classic cases in terms of visual effects, experiences, and functions as well as the lessons that others can learn from them.

2.1 Beijing Section: An urban green space with clear waters

Beijing released the *Grand Canal Heritage Protection Plan (Beijing Section)* when China officially submitted an application for recognizing the Grand Canal as a World Heritage Site in 2014. This plan specifies the scope of the Grand Canal heritage in Beijing Section, as well as the objects of heritage protection, rights and liabilities of the entities tasked with heritage protection, basic principles for heritage protection, and methods for protecting different types of heritage. It has significant reference value for the development and construction of the Beijing Section, as well as the utilization of resources along the entire Grand Canal. Research on the development achievements of the Beijing Section is indispensable for understanding how to effectively cultivate the cultural heritage of the Grand Canal.

At the same time, from the perspective of the symbiotic relationship between the Grand Canal heritage and urban development, the Beijing Section (as shown in Figure 1) undoubtedly serves as an exceptional case for examining urban green spaces. The most representative site of the Grand Canal in the Beijing Section is undoubtedly the Beijing Grand Canal Forest Park (as shown in Figure 2). According to the research of Gao Wenxiao (2024), this park is located in the urban section of North Canal in

Tongzhou New Town, Tongzhou District, Beijing. It extends from Luyang Bridge at the Sixth Ring Road in the north to Wuyao Bridge in the south, and stretches from Binhe West Road in the west to the flood embankment of the North Canal in the east, covering a total area of 713.33 hectares. The water surface area is approximately 2500 mu (1 mu is roughly equal to 0.067 hectares), and the green area is about 8200 mu (Gao Wenxiao, 2024). The design concept for the Grand Canal Forest Park prioritizes green landscapes, with water features serving as the soul, and emphasizes the interaction between forests and water bodies. With the river, banks, six parks, and eighteen attractions as core elements, this approach not only effectively preserves ancient canal culture but also establishes an urban forest park where humans and nature coexist harmoniously during the restoration and protection of the local environment. From ecological and geographical perspectives, the Beijing Grand Canal Forest Park efficiently mobilizes local population, facilities, and resources, harmonizes various elements of the ecological environment in public spaces, and reflects the landscape design that emphasizes sustainable development and fosters harmonious coexistence.



Figure 1: Yudaihe Bridge spanning the Grand Canal, photographed in Tongzhou District, Beijing

Data source:

<https://baijiahao.baidu.com/s?id=1745998631777711478&wfr=spider&for=pc>



Figure 2: Grand Canal Forest Park in Tongzhou District, Beijing

Data source:

<https://baijiahao.baidu.com/s?id=1745998631777711478&wfr=spider&for=pc>

In terms of the design of natural ecology, stunning public landscapes infused with rich cultural connotations are crafted in this park, and during this process, priority is given to its protection. In visual design, special emphasis is placed on the innovation concept that prioritizes inheritance. According to *A park conveys the profound history of the Grand Canal*, the park is home to over 400,000 trees and shrubs of various kinds, including 276.93 hectares of newly cultivated green space and 141.95 hectares of renovated green space (Anonymous, 2022). By integrating the local historical culture with the existing ecological vegetation, the designer has crafted a park landscape rich in poetic and picturesque oriental charm. In the Mingjing Yizhou scenic area (as shown in Figure 3), the vegetation contrasts pleasantly with river water. Towering poplar trees mingle with low willow trees, casting a verdant reflection on the calm and gentle water surface. As described in the famous lines of Emperor Kangxi, “when people row a boat on the mirror-like surface of the water, they can see the lush green willow trees and hear the chirping of birds”. This design technique draws inspiration from traditional Chinese garden landscaping methods, yet transcends mere inheritance. Instead, it seamlessly integrates fundamental urban public space design principles with traditional techniques. In the book titled *Innovative Landscape Design: a Case Study of Chongqing Garden Expo Park*, which takes the innovative landscape design of the Chongqing Garden Expo Park as the research object, such innovation based on the inheritance of traditional culture is referred to as “original innovation” (Feng Yimin & Chen Lin, 2013).



Figure 3: Mingjing Yizhou Scenic Area in the Grand Canal Forest Park in Tongzhou District, Beijing

Data source: <https://travel.qianggen.net/2020/0504/74843.html>

In terms of historical culture design, designers also pay great attention to the preservation of folk culture. Take the Shipping Start Festival, a unique intangible cultural heritage of Tongzhou, as an example. According to the *Tongzhou Annals*, the Shipping Start Festival was a cultural event of the Tongzhou Shipping Guild during the Ming Dynasty. At that time, the shipping industry along the Grand Canal thrived. In order to maintain order in transportation, the shipping guilds collectively

established a regulation which mandated that ships arriving in Tongzhou around the first day of the third lunar month must promptly return within ten days. Consequently, a grand ceremony called “offering sacrifice to the dam” was held annually around this time by water transport officials and crews of major shipping guilds, thus giving rise to the name Shipping Start Festival among the locals. Near the west gate of the Grand Canal Forest Park stands a gigantic relief sculpture crafted by the designer. The relief portrays a cargo boat navigating through the turbulent waves of the canal. In the middle, two boatmen stand at the bow of the boat, while in the lower left corner, two porters are carrying grains. The scene is incredibly lifelike. Every citizen who visits this place for relaxation can immerse themselves in the enlightenment of traditional culture and folk customs.

Taking into account the social and practical values, various scenic routes with unique features have been planned in the park (as shown in Figure 4). In the park, there are two hiking trails approximately five to six km in length, offering picturesque scenery along the way. Additionally, there is a cycling path of about 20 km, on which motor vehicles are strictly prohibited, linking numerous attractions of various sizes. Inside the scenic area, sightseeing battery carts and bicycles are provided for the convenience of both citizens and tourists.



Figure 4: Tour route of Grand Canal Forest Park in Tongzhou District, Beijing

Data source: <https://www.k1u.com/jingdian/78451.html>

Mohammed Al-Khanbashi (2020) pointed out that public spaces make urban life meaningful. There, people can enjoy their leisure time and engage with others, thereby strengthening the social bonds among them. Public spaces also showcase diversity, fostering strong senses of belonging and affiliation among people, making them places of use, experience, and identification (Mohammed Al-Khanbashi, 2020). The designers of the Grand Canal Forest Park in the Beijing Section have effectively put this idea into practice. They incorporated existing ecological vegetation, hydrological geology, and historical relics such as the Lighthouse Pagoda, canal wharf, and ancient bridge on the canal into the design plan (as shown in Figure 5). With the forests along both banks of the Grand Canal as the foundation, the designers added essential urban infrastructure needed by city residents, successfully achieving a seamless integration between the natural scenery of the canal and the vibrant urban space. This approach not only protects the diverse natural ecology but also expands urban green spaces, providing citizens with the necessary ecological green areas.



Figure 5: Photo of the Lighthouse Pagoda and the Grand Canal in Tongzhou District, Beijing

Data source: <https://www.vjshi.com/watch/9728477.html>

Compared to conventional scenic area development, the success of the Grand Canal Forest Park in the Beijing Section is attributed to the innovative attempt by designers to harmonize urban expansion with ecological preservation. This signifies an innovative approach rooted in both visual aesthetics and experiential enrichment. Of course, the innovative design of urban green spaces also entails important functional innovations and practical values. For example, more innovative technologies such as energy conservation, emission reduction, and cyclic utilization are integrated in the design and construction process, which can facilitate resource conservation and environmentally friendly development. This not only fulfills crucial ecological functions such as mitigating urban green island effect and haze issues but also serves substantial social functions. For example, Helena Nordh and Katinka H. Evensen (2022) pointed out that research findings suggest that the utilization of green spaces can alleviate the adverse impacts of social distancing during the COVID-19 pandemic (Helena Nordh & Katinka H. Evensen, 2022).

The successful case of the Grand Canal Forest Park in the Beijing Section suggests that in the process of developing the cultural heritage of the Grand Canal, the preservation and restoration of natural ecology do not necessarily clash with the exploration of the potential value of ecological and landscape heritage. Instead, they can mutually reinforce each other. Even when located in urban land areas, the cultural heritage of the Grand Canal can be developed with due consideration to its protection. Innovations in experiences and visual effects can enhance the social value for the city. Meanwhile, this approach can offer a more accessible and convenient way for cultural inheritance (as shown in Figure 6), and broaden the potential functions of public landscapes (as shown in Figure 7). Undoubtedly, the Beijing Section stands out as one of the most successful cases of Grand Canal development in China. It not only embraces design innovations in visual effects and experiences, but also makes attempts at functional innovation.



Figure 6: Pleasure-boat sail through the Grand Canal Business District in Tongzhou District, Beijing

Data source: <https://www.vjshi.com/watch/9728477.html>



Figure 7: A corner of the Grand Canal Cultural Scenic Area in Tongzhou District, Beijing

Data source: <https://www.vjshi.com/watch/9728477.html>

2.2 Jiangnan Section: Integration of ancient sites and new cultural tourism

Of course, to explore the functional innovation and even the innovation made in regenerating abandoned landscapes and buildings, we have to delve into the development of the canal cultural heritage in the Jiangnan region (the region south of the Yangtze River) of China. The term “Jiangnan Section” is a general term that essentially encompasses multiple sections, including the Hangzhou Section in Zhejiang Province, as well as the Suzhou, Changzhou, and Yangzhou Sections in Jiangsu Province (as shown in Figure 8). It is a general concept referring to sections of the Grand Canal within the water system in the Jiangnan region. The Jiangnan region enjoys a strategically advantageous geographical location in China, coupled with a rich history of water transportation. In addition to a large number of navigation

infrastructure including ponds, weirs, dams, sluices, gates, bridges, seawalls, ferries, docks, and ports, the Jiangnan region also boasts a concentration of remarkable talents and abundant humanistic resources. Consequently, the cultural heritage resources of the Grand Canal in these areas are exceptionally abundant. Take Jiangsu Province as an example. According to the *Provincial-Level Cultural Heritage Assessment Report (2022)*, among the 50 ancient cities, 79 ancient towns, and 71 ancient villages publicly announced, 29 ancient cities, 55 ancient towns, and 48 ancient villages are located along the Grand Canal (Jiangsu Provincial Civil Affairs Department, 2022). Meanwhile, Jiangsu Province has long released a list of landmark cultural and tourism attractions along the Grand Canal, known as the “Hundred Scenes of the Canal”, which includes distinctive tourism products such as tourist villages and cultural and historical museums in thirteen cities with subsidiary districts. Generally speaking, the development strategy of the Jiangnan region focuses more on attracting visitors from other areas by leveraging its internal resources. Seizing the opportunity to establish a new cultural and tourism belt along the Grand Canal, it has effectively enhanced the economic, educational, and tourism functions of public spaces.



Figure 8: Canal Sanwan Scenic Area in Yangzhou, Jiangsu Province, China

Data source: <https://www.vjshi.com/watch/9728477.html>

In the development of the cultural heritage of the Grand Canal, the utilization of artificial landscapes is an unavoidable issue in the landscape design process. In her paper *Landscape Architecture and Novel Ecosystems: Ecological Restoration in an Expanded Field*, Catharina Sack (2013) pointed out that these landscapes shaped by human activities can serve as ideal platforms for designing novel ecosystems. These novel ecosystems not only have ecological functions and system conveyance capabilities but also exhibit profound aesthetic influences (Catharina Sack, 2013). The development experience regarding functional innovation in the Hangzhou Section of the Grand Canal has significant value for reference. According to Wen Naixin (2023), the total length of the water network system in the Hangzhou Section spans 261 km. Among them, the canal sections designated as World Heritage Sites, including Hangzhou Pond, Shangtang River, Zhong River, Longshan River, and Xixing Canal, have a total length of 110 km. The heritage protection plan for the Grand Canal (Zhejiang Section) encompasses canal sections such as Yuhangtang River, Xitang River, and the Sanbao Section of the Canal, totaling 49 km in length. Additionally, it also includes nationally controlled canal sections such as Dongtiao Creek, Hangzhou-Ningbo Canal, and the Second Passage of the Canal, with a total length of 102 km (Wen Naixin, 2023).

Along the entire Grand Canal route, the Hangzhou Section is one of the earliest artificial canal sections excavated in China. Situated in an area with convenient transportation, it possesses significant historical and cultural significance and benefits

from its prime geographical location, thus having tremendous potential for tourism development. In the areas along the Hangzhou Section of the Grand Canal, cultural heritage of the Grand Canal is deeply explored from the dimensions of social space and dimensions of historical culture, thereby creating harmonious public spaces. According to research conducted by Xu Ying (2019), in 2017, Hangzhou issued the first local regulation concerning the protection of Grand Canal heritage, known as the *Regulations on the Protection of Grand Canal World Heritage Site in Hangzhou*. This regulation sets forth fundamental principles and a management framework for the preservation of canal heritage, delineates the responsibilities of management departments, and provides a legal foundation for the protection of canal heritage (Xu Ying, 2019). In recent years, Hangzhou Grand Canal Group has invested a total of over RMB 20 billion to build the Grand Canal National Cultural Park (see Figure 9), dedicated to developing new forms of cultural and tourism industries centered around the Grand Canal in Hangzhou. Meanwhile, various areas along the Hangzhou Section have also strengthened resource development and cultural tourism promotion. Among these efforts, the most noteworthy is the reuse of abandoned landscapes and buildings along the Hangzhou Section. Due to various historical and geographical reasons, the shipping function of the Hangzhou Section of the Grand Canal gradually declined, and the landscape resources along the route were somewhat damaged. The riverside factories, which flourished once in modern times, have mostly fallen into decay, leaving behind a wasteland. In recent development activities, the local government has explored the industrial cultural resources of modern industrial production, and engaged in protective development of tangible cultural heritage left behind from the development of modern national enterprises, such as cotton mills and paper mills, transforming them into a series of nostalgic museums and cultural tourism attractions.



Figure 9: Planning map of Grand Canal National Cultural Park (Hangzhou Section)

Data source:

https://hznews.hangzhou.com.cn/chengshi/content/2020-12/31/content_7884681_0.html

In China's landscape design innovation cases, there have always been instances of transformation and innovation of abandoned sites. When the World Expo was held in Shanghai, the transformation of urban wastelands and the application of green innovation technologies brought people great surprises. The transformation of abandoned modern factories along the Hangzhou Section of the Grand Canal not only

preserves cultural heritage but also promotes the reuse of urban spaces and the sustainable development of cultural and tourism resources. At the same time, it has brought significant benefits to people's livelihoods. When night falls, the night markets along the riverbank can not only promote the city's economic development but also enrich the nightlife of the residents. According to Wenjing Yin (2021), the establishment of nighttime public art landscapes serves as a clear symbol of the rapid development of modern cities. Combining practical functions, artistic expression, and cultural significance, these nighttime public art landscapes have imbued urban nightlife with symbolic meaning and are continuously expanding the boundaries of art, culture, society, economy, and lifestyle (Wenjing Yin, 2021).

The construction of the Shaoxing Section leans towards the organic integration between landscape design and education to enhance the role of public spaces in cultural dissemination and ideological education. The Shaoxing Section refers to the section of the Grand Canal in the eastern part of Zhejiang Province, stretching from Hangzhou to Ningbo through Shaoxing (as shown in Figure 10). This section of the Grand Canal is characterized by rich cultural features and profound cultural heritage. It is said that the history of manipulating water resources by the people in eastern Zhejiang Province can be traced back to the ancient legend of Yu the Great, who is renowned for his efforts in controlling floods. In this section of the canal, literature, history, and the cultural heritage of the Grand Canal are combined leveraging the cultural legacy of Shaoxing, and East Zhejiang Grand Canal Museum covering a gross floor area of 34 thousand m² (as shown in Figure 5) has been established. The museum exhibits notable cultural treasures including the Grand Canal culture, Wuyue culture, the spirit of Yu the Great, culture of Tang poetry, and the traditions of the Eastern Zhejiang School. The museum also revised materials such as text part and image part of the *Special Research on the East Zhejiang Canal* and assembled them into a book with about 1 million words, titled *From River to Sea: Prosperity Along the Canal—A Textual Interpretation of the East Zhejiang Grand Canal Museum*, which introduces the value, significance, history, and characteristics of the East Zhejiang Canal. Both the local government and business entities are committed to developing multiple educational and cultural tourism products, and have introduced a new form of canal cultural tourism known as “study tours”. This initiative is a significant achievement of the functional innovation in landscape design, which integrates functions such as tourism and education into landscape design. While ensuring the development and utilization of the cultural heritage of the Grand Canal, it also provides functional support for the development of innovative teaching models such as research-oriented learning and travel.



Figure 9: Effect drawing of East Zhejiang Grand Canal Museum

Data source: https://www.sohu.com/a/627920496_99960016



Figure 10: Aerial photograph of a section of the East Zhejiang Canal

Data source: https://www.sohu.com/a/627920496_99960016

The development of the cultural heritage of the Grand Canal is not an isolated activity conducted within a closed area. Instead, it should be undertaken in accordance with local circumstances and timing, aiming to foster coordinated interaction between the local area and other regions. In the process of landscape design, people should not only consider the efficient use of local resources but also know how to better develop the latent functions of limited resources. The establishment of diverse landscapes and industrial development in the cities along the Jiangnan Section has provided innovative ideas for developing the cultural heritage along the Grand Canal, that's incorporating more possibilities in economy, tourism, education, and aesthetic influence into it with a focus on functional innovation.

3. Landscape Design Techniques Incorporating Innovation Based on Inheritance

Through an analysis of the characteristics and values of the cultural heritage of the Grand Canal and the study of classic cases, we can easily discern that strategies such as ecological restoration and conservation, symbiotic development, inheritance and promotion of historical culture, infusion of regional characteristics and spirit of the times are all important for innovating landscape design techniques. Behind it lies the public space pattern spanning various spatial dimensions——ecological, social, cultural, historical, and functional. The innovation in its design techniques mainly manifests in three aspects: experiences, visual effects, and functions.

Taking into account the distinctive ecological conditions and historical significance of the Beijing-Hangzhou Grand Canal, as well as various challenges and historical experience during its development, all innovative landscape design techniques should be based on the principle of ensuring ecological restoration with priority given to ecological conservation. This is an indispensable and crucial guideline that cannot be overlooked. Besides, the principles of cultural inheritance, public participation, and sustainable development are also key points that need attention when examined from various dimensions.

From the perspective of the ecological environment and geographical space, during

the process of landscape design, we should fully consider the restoration and protection of the original ecological environment, and follow important ecological principles such as ecosystem integrity and biodiversity to ensure the effective protection of ecological elements such as water quality of the canal and vegetation along its banks. On this basis, the potential value of ecological landscape heritage should not be overlooked. The cultural elements embedded in the natural landscape should be uncovered to achieve a sustainable and harmonious integration between humans and nature. For example, the Canal Culture Park along the Beijing Section covers a total area of 3.68 million m², with the water surface covering 920 thousand m², boasting an overall greening rate of 95%. Although the landscape renovation area has exceeded 1 million m² over the years, no damage is caused to the ecological environment. Instead, it has bolstered the protection of both cultural and natural resources.

From the perspective of dimensions of social space, landscape design aims in essence to meet people's usage requirements. Therefore, the requirements of different populations should be thoroughly grasped and satisfied on the basis of social equity and inclusiveness. The Grand Canal basin covers a vast area. Economic development levels, resource allocation, total population, and population distribution vary among riverside towns. Each city boasts its unique advantages and has distinct requirements for landscape land use. Designers engaged in the cultural heritage development of the Grand Canal need to consider several aspects, including providing the public with diverse spaces for leisure, tourism, education, parent-child interaction, fitness, etc., and enhancing people's participation in understanding the cultural heritage of the Grand Canal as well as their satisfaction with landscape design. Optimizing the layout of public facilities, coordinating the allocation of cultural and natural resources, and appropriately planning existing spaces are all innovative means for meeting the needs of the people.

From the perspective of historical and cultural dimensions, the dimensions of cultural space emphasize the cultural inheritance and innovation in public spaces, as well as the diversity and sustainable development of cultures in different regions. Therefore, we should advocate a landscape design philosophy that integrates the local culture with open-mindedness and promotes the co-development of inheritance and innovation. The public space, being inherent in society, has inevitable political and humanistic significance, and its multidimensional pattern naturally encompasses the dimensions of political space and virtual space. Therefore, during landscape design, we should not only coordinate the participation and collaboration of different stakeholders such as the government, enterprises, and social organizations but also consider the intersection and integration of social media, internet, and other virtual environments with physical spaces. With the development of internet technology, technical means such as remote sensing, GIS, and BIM are no longer novel. At the same time, the artistic practice of online virtual landscape construction has become increasingly feasible. This emerging trend might warrant attention as a potential development direction for future landscape design and the development of cultural heritage along the Grand Canal.

From these perspectives of examining the cultural heritage resources of the Grand Canal, we can easily identify the innovative design ideas behind the successful experiences of classic cases in the development of the cultural heritage of the Grand Canal. Firstly, in terms of innovative design experience, urban extension is

organically integrated with environmental protection, bringing completely new experience for the user groups. This is valuable experience gained from the development of urban green spaces in the Grand Canal Forest Park along the Beijing Section. In terms of the innovation from a visual perspective, the Beijing Section also has significant reference value. Mei Liu and Steffen Nijhuis (2020) proposed the following methods when exploring how to map landscape spaces through manual and modern technologies: zoning analysis, 3D landscape, grid unit analysis, visibility analysis, landscape indicators, and eye-tracking analysis (Mei Liu & Steffen Nijhuis, 2020). From the perspective of the design ideas for the Grand Canal Park, designers place more emphasis on the integration of traditional techniques used in Oriental garden landscaping with modern urban green space design methods. They make the most of existing natural resources and ecological environments to present the unique poetic charm of Eastern culture with the help of design ideas for Chinese style gardens, aiming to make people experience the aesthetic pleasure of appreciating paintings or poetry when enjoying the landscape. In addition to innovation in visual effects and experiences, functional innovation is of significant importance in practicality. Yue Cheng, Jiayin Chen, Jiahua Li, Lin Li, Guanhua Hou, and Xuan Xiao (2023) pointed out that with the acceleration of urbanization, public art is playing an increasingly important role in urban landscape design (Yue Cheng, Jiayin Chen, Jiahua Li, Lin Li, Guanhua Hou, and Xuan Xiao, 2023). The attention from managers in the Jiangnan region to the functions of Grand Canal cultural heritage in terms of tourism, education, and cultural dissemination is of great reference value. Take the data from Qiaoxi Historical and Cultural Block on the bank of Gongchen Bridge in the Jiangnan region as an example, it receives 12 million visitors annually. This has not only generated economic value for the local area but also provided abundant resources to meet the tourism demand. While ensuring practicability, it has improved the aesthetic level of public landscapes, ensuring that the design outcomes do not deviate from their nature in society. This measure has maximized the economic role of public landscapes, promoted local economic development, and empowered education and cultural transmission. With education and training, it has deepened people's understanding of cultural heritage and raised their awareness of cultural heritage protection, which not only plays a positive role in promoting the protection of cultural heritage, but also achieves the development of more functions intentionally during the protection process and improves the utilization efficiency and practical value of public spaces.

The public landscape design of the Grand Canal cultural heritage has unlimited development potentials, such as, alleviating urban green island effect and promoting the popularization of low-carbon lifestyles, on which designers are focusing. However, challenges such as accelerated urbanization process, the spread of empty cities, and deteriorating global climate are gradually increasing, presenting greater difficulties and demanding higher landscape design standards. Therefore, it's anticipated that future landscape design innovations must prioritize the resolution of these challenges and the creation of endless possibilities. According to the website of Global Drain Technologies (2023), low-carbon landscape design is increasingly popular in recent years. In this trend, priority is given to the cultivation of native plants, especially herbs, vegetables, and fruits, aiming to reduce carbon footprint (Anonymous, 2023). In addition, numerous emerging or still developing technologies identified during case analyses are expected to contribute to landscape design practices. Tools such as Geographic Information System (GIS), remote sensing, and Computer-Aided Design (CAD), as well as technologies like Virtual Reality (VR) and

Augmented Reality (AR), will become increasingly prevalent. Concepts such as green infrastructure, Low Impact Development (LID), and sponge cities will become more popular. Rain gardens, green corridors, clean energy inner circular facilities, etc., will also emerge as focal points requiring attention in future landscape designs.

In summary, the landscape design of the Grand Canal is a systematic project that requires comprehensive planning in various aspects, including protecting the ecological environment, exploring historical culture, and addressing the needs of the people. We should, based on scientific principles, fully understand and reasonably utilize the multidimensional pattern of public spaces, make innovation in dimensions such as visual effects, experience, and functions. This approach will help us organically integrate the cultural inheritance and functional aesthetics of the Grand Canal, and improve the quality of public spaces in the cities along its route, thus providing more instructive references for the landscape design of public spaces.

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