

The Role of Water Culture and Water Landscapes in Modern Hydraulic Engineering Construction

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Abstract: Water, as the source of life, has been closely related to human life since ancient times. Water culture and water landscapes are valuable legacies formed by humans in the long history of coexistence with water. They not only reflect human understanding and utilization of water but also carry rich historical and cultural connotations. In modern hydraulic engineering construction, the role of water culture and water landscapes is increasingly prominent. They are not only important components of engineering but also important carriers for inheriting historical culture, enhancing engineering quality, and promoting regional economic development. Therefore, exploring the development and application of water culture and water landscapes in modern water conservancy is of great significance for promoting the sustainable development of water conservancy.

Keywords: water culture, water landscape, modern water conservancy, role

Introduction

This paper discusses the important role of water culture and water landscapes in modern hydraulic engineering construction, including their development process, close connection with hydraulic engineering, and their value in material and spiritual cultural inheritance. The paper points out some problems existing in the current water culture and water landscapes in hydraulic engineering. Finally, the future development trends of water culture and water landscapes in modern hydraulic engineering are prospected, including the strengthening of ecological and sustainable development, the transformation of intelligence and digitalization, the deep excavation and inheritance of cultural connotations, the integration

of multiple functions and cross-border development, and communication and cooperation under the global perspective.

1. Role of Water Culture and Water Landscapes in Modern Hydraulic Engineering Construction

1.1 Development History of Water Culture and Water Landscapes

1.1.1 Ancient Stage

In the ancient stage, human understanding and utilization of water resources were mainly focused on survival. Water, as the source of life, was indispensable for human life and agricultural production. To meet basic needs, people began to construct various hydraulic engineering projects such as irrigation



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systems, reservoirs, etc., to better manage and utilize water resources. These hydraulic engineering projects not only improved the efficiency of water resource utilization but also enhanced agricultural production conditions, promoting socio-economic development. During this process, people not only focused on the utilization of water resources but also began to appreciate and protect natural water bodies and landscapes. The aesthetic value of water bodies and landscapes was gradually explored, becoming an inspiration for cultural and artistic creation. Natural landscapes such as rivers, lakes, waterfalls, etc., were integrated into various fields such as literature, art, becoming an important part of human culture. For example, classical Chinese poetry contains many works describing the beauty and mystery of water, such as "Li Sao" and "Rhapsody of the Red Cliff."

1.1.2 Modern Stage

With the progress of industrialization and urbanization, the development of water culture and water landscapes entered the modern stage. The characteristics of this stage are the more extensive development and utilization of water resources, accompanied by more serious environmental problems. The increasing demand for water resources led to water scarcity and deterioration of the water environment. To meet the needs of production and life, people accelerated the development and utilization of water resources, constructing a large number of hydraulic engineering projects and factories, leading to over-exploitation and waste of water resources. Industrial wastewater and domestic sewage were discharged into rivers and lakes, causing severe pollution of water bodies and destruction of ecosystems. These environmental problems not only affected human health and quality of life but also threatened the sustainable utilization of water resources. Faced with these problems, people began to realize the scarcity of water resources and the importance of the water environment. The design and construction of water landscapes also began to focus on enhancing aesthetic and ecological values, striving to achieve harmonious coexistence between humans and nature.

1.1.3 Modern Stage

With the rise of environmental awareness and the popularization of the concept of sustainable

development, the development of water culture and water landscapes has entered the modern stage. The characteristic of this stage is the emphasis on the sustainable utilization of water resources and the protection of the water environment, focusing on ecological restoration and natural conservation. In modern society, the utilization of water resources has shifted from simple development to sustainable utilization. People have begun to realize the limitations and fragility of water resources, thus paying more attention to the protection and efficient use of water resources. There has been profound change in the design and construction of water landscapes. Modern water landscape design emphasizes integration with the surrounding environment and providing spaces for leisure, entertainment, and water-based activities for people. Through ecological restoration and natural conservation efforts, people strive to restore the natural state of water bodies, enhance their self-purification capacity, and provide protection for biodiversity.

1.2 The Connection between Modern Water Conservancy Engineering Construction and Water Culture Water Landscapes

The connection between modern water conservancy engineering construction and water culture water landscapes is becoming increasingly close. Water culture, as a product of harmonious coexistence between humans and water and nature, provides valuable ecological and landscape concepts for water conservancy engineering construction. In the planning, design, and construction process, modern water conservancy engineering not only emphasizes engineering safety and functionality but also pursues ecological balance and aesthetic effects. Water landscapes, such as lakes, rivers, and streams, are indispensable elements in modern water conservancy engineering. They not only add natural beauty to the engineering projects but also provide places for leisure and entertainment for people, while also contributing to the improvement of the surrounding ecological environment. The design and application of water landscapes reflect human understanding and respect for water culture. Water culture provides theoretical guidance and practical experience for water conservancy engineering construction, while water landscapes are vivid manifestations of these concepts and experiences. The two rely on each

other and promote each other, jointly driving modern water conservancy engineering to a higher level of development.

1.3 The Role of Material Representation: The Substantial Application of Water Culture and Water Landscapes in Modern Water Conservancy Engineering

(1) Dam Engineering: Dams, as significant water conservancy facilities, primarily function to regulate water flow and store floodwaters. In dam engineering, the application of water culture and water landscapes is manifested in two main aspects: first, by enhancing the aesthetic value of dams through landscape design, such as arranging green belts and observation decks around the dam to make it a place for people to enjoy and relax; second, by integrating cultural elements to enhance the cultural connotation of the dam, such as depicting regional cultural symbols on the dam body to showcase local historical traditions and folk customs.

(2) Lock Engineering: Lock engineering is mainly used to regulate river water levels and flow rates. In lock engineering, the application of water culture and water landscapes can be achieved through optimizing lock chamber structures and adding landscape elements. For example, setting up waterfront platforms on both sides of the lock chamber to allow people to experience the beauty of water up close; constructing observation decks on top of the lock to provide a panoramic view of the river; and placing cultural sculptures or murals around the lock area to showcase the cultural heritage of water conservancy.

(3) Pumping Station Engineering: Pumping station engineering is primarily used for water pumping, drainage, and irrigation. In pumping station engineering, the application of water culture and water landscapes can be reflected in the architectural design of the pumping station and the surrounding environment. In terms of architectural design, traditional architectural elements or modern design concepts can be utilized to create a distinctive appearance for the pumping station; in terms of the surrounding environment layout, pleasant pumping station surroundings can be created through greening and landscaping.

(4) Embankment Engineering: Embankment engineering is an important part of flood control systems. In embankment engineering, the application of water culture and water landscapes mainly lies in

the greening and beautification of embankments. By planting avenue trees, lawns, and other vegetation, a green ecological barrier can be formed; setting up pedestrian paths, rest facilities, etc., on the embankment top to create a leisure and fitness destination for people; and placing cultural signs or monuments at suitable locations to record the history and functions of the embankment.

(5) Water Diversion Engineering: Water diversion engineering is mainly used to address the uneven distribution of regional water resources. In such projects, the application of water culture and water landscapes can be achieved through optimizing water diversion channel designs, constructing ecological corridors, etc. For example, planting protective forest belts on both sides of the channel to form an ecological barrier; setting up observation decks or rest points along the channel for people to enjoy the scenery; and installing cultural signs or sculptures at key nodes to enhance the cultural taste of the project.

(6) Weir Engineering: Weir engineering is an ancient hydraulic facility mainly used for water diversion irrigation and flood control drainage. In modern water conservancy engineering, although the practical value of weirs has decreased, their historical and cultural values are still significant. In weir engineering, the application of water culture and water landscapes can be achieved through the protection and restoration of ancient weirs and the excavation of their historical and cultural connotations. Moreover, ancient weirs can be combined with modern landscape designs to create landscape nodes with historical heritage and modern aesthetics.

1.4 The Role of Spiritual and Cultural Heritage Transmission

(1) Water Culture: As a cultural phenomenon formed during the interaction between humans and water, water culture encompasses people's cognition, utilization, reverence, and praise of water. It reflects the interactive relationship between humans and nature, as well as the multiple understandings and emotional expressions of water by people in different historical periods and social contexts. The transmission of water culture is not only a respect for past history and traditions but also a commitment to and pursuit of future sustainable development.

(2) Water Landscapes: As a specific manifestation

of water culture, water landscapes serve as important carriers for the transmission of spiritual and cultural heritage, with their unique visual beauty and emotional resonance. Whether it is tranquil lakes, rushing rivers, intricate courtyard ponds, or grand hydraulic structures, they all, in their own ways, tell stories about water and convey people's aspirations for a better life and reverence for the natural environment.

2. Current Challenges Facing Water Culture and Water Landscapes in Modern Water Conservancy

2.1 Lack of Sufficient Attention and Insufficient Actions for Water Cultural Heritage Protection

Currently, in many regions, the emphasis on water conservancy projects tends to prioritize engineering safety and functionality, while the attention given to water culture and water landscapes remains relatively low. This tendency leads to neglect of the protection of water cultural heritage, with many historically and culturally valuable hydraulic facilities and monuments not receiving adequate protection and inheritance. The reasons for this insufficient attention are primarily twofold: first, there is a lack of comprehensive value recognition, with insufficient recognition of the significant role of water culture and water landscapes in enhancing the quality of water conservancy projects, promoting regional economic development, and inheriting historical culture. Second, there is a lack of systematic protection mechanisms, with no well-established system for the protection of water cultural heritage, making protection efforts difficult to carry out effectively.

2.2 Need for Improvement in Construction Methods and Depth of Integration with Water Conservancy Projects

During the construction of water culture and water landscapes, some regions face issues such as a single construction method and lack of innovation. These constructions often merely imitate traditional models or replicate designs from other areas without targeted planning and design based on local cultural characteristics and natural environments. The reasons for this problem are mainly twofold: first, there is a lack of professional design teams and technical support, making it difficult to conduct high-level

planning and design. Second, there is a lack of effective communication and cooperation with water conservancy project construction, leading to the absence of a cross-departmental and cross-disciplinary collaborative mechanism.

2.3 Need to Strengthen the Empowering Role of Water Culture and Water Landscapes in Various Aspects of Water Conservancy Projects

The construction of water culture and water landscapes can not only enhance the overall quality of water conservancy projects but also drive the development of related industries and the exploitation of cultural tourism resources. Many water conservancy projects still only serve basic functions such as flood control and irrigation, without fully tapping into the additional value brought by water culture and water landscapes. The reasons for this problem are mainly twofold: first, there is a lack of systematic industrial planning and development strategies, with no formation of an industry chain centered around water culture and water landscapes. Second, there is a lack of effective market promotion and publicity methods, making it difficult to increase the visibility and influence of water culture and water landscapes.

3. Outlook for Water Culture and Water Landscapes in Water Conservancy Construction

3.1 Strengthening Ecological and Sustainable Development

In the future, the construction of water culture and water landscapes will place greater emphasis on ecological balance and environmental protection. In the design, construction, and operation of water conservancy projects, priority will be given to considering the impact on the ecological environment, striving to achieve harmonious coexistence between engineering and the natural environment. Additionally, by using eco-friendly materials and technologies, the burden of engineering on the environment will be reduced to ensure the sustainable utilization of water resources.

3.2 Transition to Intelligent and Digitalization

With the assistance of modern information technology such as the Internet of Things, big data, and artificial intelligence, the construction and management of water culture and water landscapes will achieve intelligence

and digitalization. This will not only improve the efficiency and accuracy of water resource management but also provide tourists with more convenient and personalized services. For example, real-time monitoring systems can be used to grasp information such as water quality and water level, providing support for decision-making; virtual reality technology can be utilized to create immersive water landscape experiences for visitors.

3.3 In-depth Exploration and Inheritance of Cultural Connotations

As an important component of traditional Chinese culture, water culture contains rich historical information and profound cultural heritage. Future construction of water culture and water landscapes will pay more attention to the exploration and inheritance of cultural connotations. By constructing water conservancy museums, organizing water culture activities, and other means, more people will understand and recognize water culture, enhancing national pride and cultural confidence.

3.4 Integration of Multiple Functions and Cross-Border Development

In the future, water culture and water landscapes will no longer exist solely for a single function but will develop towards integration of multiple functions. In addition to basic functions such as flood control and irrigation, they will also incorporate leisure, entertainment, education, scientific research, and other functions. Furthermore, water culture and water landscapes will collaborate and develop with other

fields, such as combining with the tourism industry to create water scenic spots or collaborating with the education industry to promote water culture education.

Conclusion

Looking back on the development of water culture and water landscapes, we cannot help but be amazed by the wisdom and creativity of humanity. Their application in modern water conservancy construction not only enhances the overall quality of engineering but also invisibly inherits historical culture, enriching people's spiritual world. However, water culture and water landscapes still face many challenges in water conservancy projects today, requiring more attention and emphasis from us. Looking to the future, we have reason to believe that driven by trends such as ecological, intelligent, cultural, multifunctional, and globalization, water culture and water landscapes will shine even more brilliantly in modern water conservancy.

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