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Planning Strategies for Cultural and Creative Industrial Parks in Urban Waterfront Spaces: A Case of Huai'an City's Li Canal

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Abstract: As the base of urban resources, the water system is a solid foundation for the integrated development of “ecology, production, and life” in the city. Taking Huai'an Li-Canal as an example, we defined the problems of Li-Canal planning and proposed planning strategies for similar cities in China by combining the successful experiences in China through the detailed interpretation of the current situation of the Li-Canal waterfront space. The results provide a reference for the construction planning of similar urban waterfronts in China. We proposed optimized strategies to enhance the water space along the Canal of Huai for the future construction of a research framework considering the economic values of the Canal. The strategies can be used to evaluate the optimal effect of water spaces on the Canal.

Keywords: Urban waterfront spaces, Li canal, Strategy

1. Introduction

The national “14th Five-Year Plan” states to improve the quality of urbanization development and the quality of cities by implementing urban renewal actions and optimizing urban spatial structure and quality improvement. Urban renewal refers to the rational transformation and redevelopment of the built space in the city. Major decisions were made to improve the quality of urban development. Current research on urban renewal actions focuses on traditional city-building, spatial characteristics and planning, international experience, and management governance design. Thus, it is necessary to understand the connotation and significance of urban renewal actions and implement urban renewal actions to build cities with homes where people and nature live in harmony.

Urban construction is not only an important carrier for the new development concept but also an important fulcrum with a new development pattern. For renewal, urban structure and quality need to be adjusted and optimized, and the mode of urban development and construction needs to be transformed to comprehensively improve the quality of urban development. Then, the growing needs of the people can be met for a better life and healthy economic and social development can be sustained. The overall goal of urban renewal is to build livable, green, resilient, smart, and humanistic cities, and improve the quality of the urban living environment, quality of life, and urban competitiveness. Urban development with Chinese characteristics needs to be promoted for urban renewal and construction. The re-planning and development of urban renewal, especially the urban waterfront space renewal is important. Urban waterfront space provides areas for public activities and the openness of the urban space. At present, urban waterfront space is used for transportation and navigation, ecological conservation, and economic development. However, empirical research on the role of the space is insufficient.

With the continuous improvement in the living quality of urban residents, the urban environment has been unable to meet the needs of modern cities and residents' life expectations. The importance of the waterfront space has been highlighted for public leisure activities. The waterfront space is also important in tourism and urban culture, highlighting economic, social, and cultural vitality and promoting social and economic development. The construction of urban public space needs to benefit residents from ecological and economic standpoints. However, the development of urban waterfront space lacks clear guidance and innovation, which leads to stereotyped development. Therefore, it is necessary to study the successful cases of urban waterfront development for more effective development of waterfront cities.

Scholars have explored development strategies, heritage protection, planning norms, and other issues and discussed transformation and development mechanisms. The layout of urban waterfront space has been studied for its coordination, planning,

design, and control by integrating history and culture. The results allowed for the openness, hydrophilicity, and accessibility of the spaces. Recently, space production and redevelopment have been regarded as important, and various methods such as analytic hierarchy processes, sample surveys, and cost-benefit analyses have been used for the related study.

From the late 1950s to the early 1960s, the USA launched the urban waterfront reconstruction and redevelopment to promote and revitalize the urban economy. By the 1980s, such developments had become popular and contributed to the local economy, culture, and urban landscape. However, there has been limited discussion on the integration of the use of the waterfront space and cultural creativity, which necessitates further research on the development planning, control, multi-element inheritance, and integration of the waterfront space. Thus, we analyzed urban waterfront public spaces in China and evaluated their functions using a measurement system. Huai'an River was chosen for this research to explore urban waterfront space and cultural characteristics.

2. Literature Review

Urban waterfront spaces are adjacent to rivers, lakes, and oceans [1]. They belong to the urban space environment and public areas by water. It contains natural, social, and spatial elements related to water. Previous research has focused on transformation and development in the process, mode, motivation, mechanism, and effects. Jones believed that the lack of leisure and entertainment in the real estate-oriented and commercial-oriented models led to the integration of commerce, real estate, and entertainment in the late waterfront redevelopment [2]. Gunay et al. discussed the culture-led transformation model in their study [3]. Erbil and Cook found that the lack of public participation in the decision-making process was a common phenomenon [4,5]. The spatial layout of waterfront space is generally created for the organization of elements. Under the macro-spatial sequence, the urban waterfront space and human flow activities are unified, and the flow of mainstream is taken into account to ensure the aesthetic of the landscape. It is required to improve the availability and development of land in the waterfront space design. Jin divided the waterfront space into commercial, public, and natural leisure spaces with the characteristics of publicity, culture, and ecology [6]. Jiang analyzed the spatial layout and structure of waterfront landscapes in the Hangzhou West Lake Scenic Area [7]. Zhang used space syntax to analyze the spatial characteristics of the Shanghai Huangpu River at four historical stages and suggested an evolution law and dialectical relationship between waterfront space and social development [8]. Wang used remote sensing and the geographical information system (GIS) to monitor and analyze the change in land use along the coast and provided the results as a reference for scientific land allocation [9]. Research on urban waterfront space has been focused on the process, mode, motivation, mechanism, and effect of space transformation. From the perspectives of spatial composition, characteristics, evolution, and development mechanisms, case studies were carried out in different regions where a long history and cultural heritage are preserved along with developed economies such as Suzhou and Shenzhen. As there is a lack of case studies on urban waterfront spaces with a medium level of economic development we investigated the Huai'an Urban Canal for the optimization and improvement of waterfront space through urban renewal.

3. Huai'an Li Canal

Huai'an, known as the "capital of canals," is the origin of the Grand Canal. In 486 BC, for military grain transportation, King Fuchai of Wu ordered the excavation of a river between Huai'an and Yangzhou to connect to lakes, the Yangtze River, and the Huai River. Huai'an Canal has unique historical and cultural significance. The Li Canal is the first developed section of the Beijing-Hangzhou Grand Canal in the Jiangsu Province section. The Grand Canal starts from Qingjiangpu to the Guazhou Ancient River and joins the Yangtze River. From north to the Middle Canal, and from the south of the Yangtze River to the Jiangnan Canal, a total length is 170 km (Fig. 1).

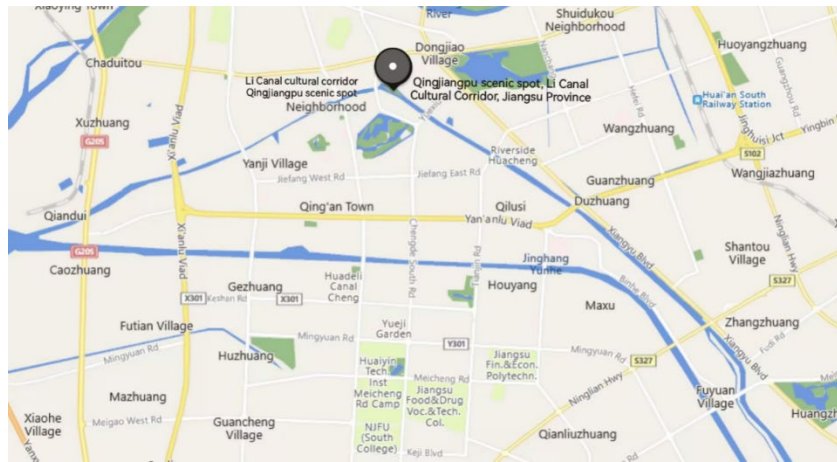


Fig. 1. Geographical location of Li Canal.

The Li Canal shows the historical development of Huai'an. Based on the function of the Li Canal, the planning for development and transformation has been established to preserve its culture and history. The Canal has Qingjiangpu scenic spot, Canal City scenic spot, Shanyang Lake scenic spot, and River Ancient Town scenic spot. According to "The Municipal Government's Special Research to Promote the Planning and Construction of the Grand Canal," Huai'an City was designated as the green modern shipping demonstration area of the Beijing-Hangzhou Canal in 2020 and was renovated over the 16-kilometer Huai'an Lock to Jiulong Lake Park. Since 2021, Huai'an City has renovated the Hua'an section under the overall planning of land and water, the linkage of water and shore, and the integration of water and green for environmental remediation. Embankment and road connecting, waterway engineering, and port construction were conducted for clear water, green bank, and beautiful scenery. cultural prosperity, and clean port. In 2023, to implement the spirit of the twenty, Huai'an City launched the "Key Project Plan for Central City Construction in 2023" to implement a series of urban construction projects including the Li Canal Gallery. Highlighting the ancient canal culture and sustainable development, the urban waterfront space was renovated to serve people's livelihood and develop the green economy for the growth of the Huaihe Economic Belt.

4. Waterfront Space Planning of Huai'an Li Canal

The Li Canal is located between the central city of Huai'an and the ancient city of Chuzhou, running through the two cities. The canal starts from Qingjiang Dazhakou in the north and Huai'an District to Tangzi Lane in the south. Its length is 15.6 km from north to south. The construction land area is 10.84 km², and the expanded research area is 45 km². Its surroundings are rich in world cultural heritage, a superior ecological environment, and rich water resources (Fig.2). In 2021, the municipal government studied the Li Canal waterfront space and constructed the Grand Canal and the Li Canal as "two rivers and four banks." Using the advanced concept of riverside public space and multi-functions, the theme, integrity, and system were defined to effectively tell the canal story. The planning of the Li Canal Cultural Corridor in Huai'an City was based on the analysis and design of urban waterfront space centered on historical and cultural characteristics, and modern urban functions. The plan followed the principle of "one axis, two belts, and three districts" (Fig.3). The central axis of Huai'an City and the two sides of the Li Canal belong to the development belts that are divided into historical, cultural, ecological, and commercial areas of "Qi," "Cheng," "turn," and "together" for Qingjiangpu cultural business and leisure, Haikou Road Canal cultural theme park, Shanyang Lake Canal Cultural international exchange center, and Hexia-Xiaohu ancient town cultural tourism area (Fig.4).

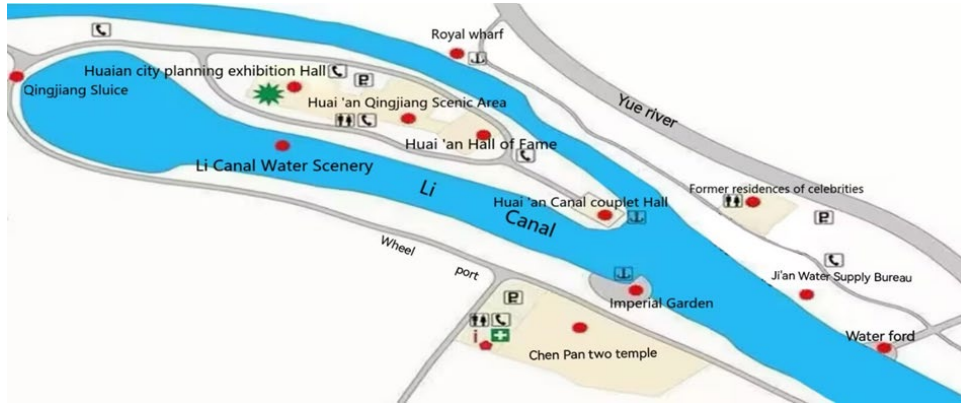


Fig. 2. Current planning map of Huai'an Li Canal.



Fig. 3. Diagram illustrating "one axle, two belts, three zones".

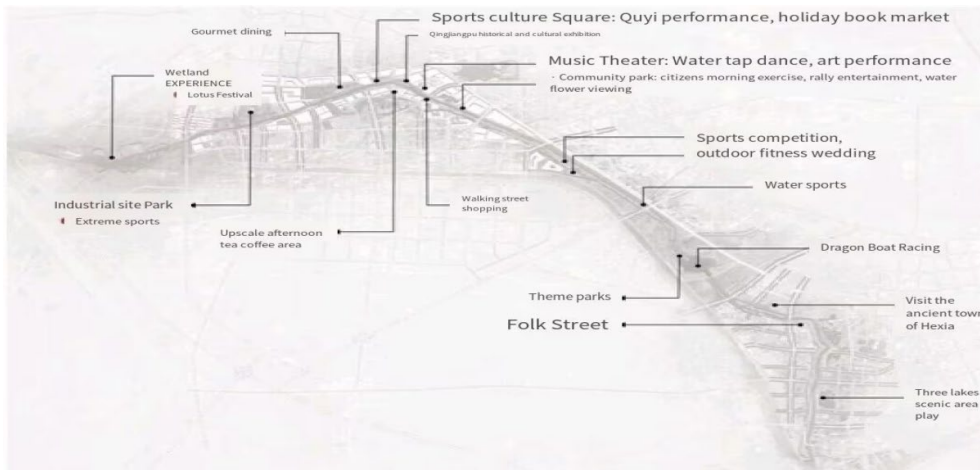


Fig. 4. Past plan of Huai'an Li Canal.

Through the design and planning of the spatial relationship between water, roads, buildings, greening, and other elements, the needs of tourists for comfort, vision, perception, and space were improved and satisfied, and a layered and changeable urban landscape was created. Based on the history and culture, the Huai'an Li Canal has four functions: starting, carrying, turning, and joining. For the origin of canal transportation, the leading function is to improve the commercial culture and tourism industry of the Li Canal. By tracing back the history of the South Ship and the North Horse, cultural tourism is formed as the background to revive the old city. Qingjiang Dazhakou, the most abundant landscape in the Li Canal area, was restored in its historical texture and style.

The low-end and chaotic commercial structure was improved by combining the Pulous Sauce and Vinegar Factory, oil storage, and other scenic spots. Through the planning of tourism and cultural activities, the protection of intangible cultural heritage was enabled for tourism. Its function is to form a cultural tourism with the theme of water transport. Between the new and old canals of the Huai'an Canal with continuous development, tourists can enjoy a creative city-type theme tourism which is a new mode of Huai'an Canal cultural tourism. Due to the loss of the culture in the Li Canal, the river of the Li Canal section was discharged to make full use of the Qingan River, construct canal water streets, and restore the canal transport culture. The grain transport was the essence of the Beijing-Hangzhou Canal culture. Therefore, to restore the tourism of the Li Canal, cultural tourism with the theme of the grain transport culture must be planned in the gateway section of the Li Canal so that tourists can experience the essence of the grain transport culture in the five parks system. Combined with history and culture, tourism and commerce, and leisure and entertainment, four-dimensional implementation and development of areas are required.

An international exchange center of the canal culture is necessary in the core area of Huaian's low-carbon ecological civilization city construction. The new city district is designed to present the soul of ecological life. The Shanyang Lake section is the historical site of Banzha ancient town and Qiaoguan. The ancient town disappeared but the ruins of Jiaoguan still exist. Located in the central area of the two cities, this section has a multi-cultural development model of the Huai'an ecological new city. With canals and low-land areas, Shanyang Lake can be renovated as a permanent site for the International Forum of Canal Culture. The canal culture with diverse characteristics can be exhibited in the Huanshanyang Lake area to promote cultural exchange and development for Li Canal cultural tourism. Harmony needs integration and development so the ancient city needs to be integrated with cultural tourism in the historical and cultural Huai'an, an ancient city. The ancient city of Huai'an on the east side has the former residence of Zhou Enlai and the ruins of the Governor of the Canal. On the north side is Hexia Ancient Town (Water Transport—Huaibei Salt Distribution Center), there are a factory and schools. The plan was made to protect the canal remains and update the ancient city by preserving the waterways, street veins, salt merchant gardens, and salt port culture and building the Xiaohu cultural tourism area. Then, rock salt mining can be preserved in Huai'an. On the west bank of the canal, a salt-themed area can be built for leisure and entertainment. Four different theme features are highlighted for the traffic and public space on both sides. Along the river, tourists are guided to the riverfront. The layout of buildings along the river needs to be retreated from the canal.

5. Problems of Huai'an Canal Planning

In the north of Li Canal Hexia Ancient Town, there is a hard river bank, and the traffic is the main feature of its architectural design. The waterfront space is neglected, which affects the cultural atmosphere and vitality. The cultural and artistic themes must be integrated into the construction to stimulate the unique vitality of Li Canal (Fig. 5). The south bank is an ecological riverbank, lacking the creation of the waterfront space with incomplete infrastructure (Fig. 6). To address this problem, a commercial and cultural promenade towards the waterfront space was planned to allow tourists to enjoy the culture and the scenery of the canal. In addition, an extended waterfront space is constructed at the riverbank so that tourists can experience the cultural waterfront space of the canal.



Fig. 5. Hydrophilic space.



Fig. 6. Riverbank.

A feedback mechanism for community residents for the Li Canal in planning is necessary. When people participate in management, the attachment of individuals to the local society and environment can be strengthened. Therefore, planning must be people-oriented and be based on the perspective of the public to create a waterfront space suitable for residents' living, leisure, and

entertainment. Residents and tourists can be attracted by enhanced images of Huai'an City, which promotes it as a charming city. By adding entertainment and tourism facilities around the Li Canal, the benefits of urban spatial agglomeration can be maximized.

Specific measures for the protection of the inheritance of the historical and cultural heritage of the Li Canal are required in planning. In urban renewal, the focus is put on capital accumulation rather than on quality. For cultural satisfaction, spiritual culture needs to be considered for the protection and inheritance of culture. To protect the culture of the Grand Canal, the diverse folk customs along the canal must be preserved. It is necessary to integrate cultural symbols into infrastructure construction so that residents can cultivate a cultural way of life. It is also necessary to integrate the culture of the Li Canal into daily activities, communication, consumption, entertainment, and etiquette and promote cultural memory as a part of their lives. For public construction, it is necessary to add distinctive culture such as streetlights, benches, and garbage bins to allow residents and tourists to understand the Huai'an Canal culture (Fig. 7–9).



Fig. 7. Benches.



Fig. 8. Garbage bin and street lamp.



Fig. 9. Cultural sketches.

The Li Canal is far away from other scenic spots and is not a tourist attraction for walking along the Li Canal. Therefore, green transportation facilities must be provided as there are few pedestrian walkways across the river between the two banks and transportation is not available. There is a significant height difference between the embankment and the road, and there are few horizontal connecting walkways between the two. By sharing bridges with a river crossing transportation, residents and tourists can have a sense of separation. During the inspection, it was found that the wooden fences on the hydrophilic corridors on both sides of the river bank posed a risk of cracking and shaking. The ecological riverbank, pedestrian corridor, and cycling corridor can damage the ground which needs repairs and reduces the tourism experience.

6. Successful Waterfront Space Design

Various smart industries are developed in the Qingjiangpu section of the Li Canal. According to the development of the area, it is appropriate to integrate diverse industries related to culture, finance, technology, and commercial services. A waterfront industry cluster with cultural and creative industries needs to be constructed as a high-end modern industry cluster of Huai'an City. The Qingjiangpu District of Huai'an is located in the center of Huai'an City with the most potential for development in Huai'an. In 2021, as the only county in the city, Qingjiangpu District was selected as the zone of provincial-level cultural and tourism industry integration and development. Dancheng County belongs to Zhoukou City, Henan Province. Due to the poor current environment on both sides of the river, the lack of unified planning and layout, and the frequent occurrence of illegal and unauthorized construction, the discharge of domestic and industrial wastewater, the pollution and eutrophication of the river water are serious which has a serious impact on the living environment. A project of urban renewal and improvement of waterfront leisure spaces on both sides system (Minghe River and Diversion Canal) was initiated to develop Dancheng. The project put the ecological red line, created a hydrophilic space, integrated cultural and historical elements, enhanced the landscape space along the line, built core landscape nodes, and created a popular open space based on accessibility and integrity [10]. The Liaocheng Urban Section of the Beijing-Hangzhou Grand Canal had poor hydrophilicity and was separated from the city and rivers. There were hidden drainage hazards, single vertical spatial changes, a monotonous landscape, poor road continuity, and no accessible passages. The project combined the current cross-section of the canal and designed a distinctive waterfront landscape with a three-dimensional road traffic system and ecological function restoration [11].

The above successful urban waterfront space design showed the following aspects.

(1) Sustainable ornamental ecological zone

The mountains and rivers, and green plants and water veins need to be integrated. It is demanded to create a diverse ecological environment, green plants on embankments, and habitats for the green riverside landscape and protect the ecosystem. A green ecological zone with clear water and green shores must be restored with fish beds, water plants, and flocks of egrets in the waterfront space for a sustainable, vibrant, and self-renewing waterfront space.

(2) Quality of waterfront space

According to the different types and conditions of riverbanks, waterfront spaces must be designed to overcome height differences with plantations. With ecological restoration, a three-dimensional transportation system can be established to improve the user experience.

(3) Leisure zone with humanistic care

Spaces along the river are required to connect to the surrounding green spaces. Supporting service facilities for cultural and entertainment, leisure and sports, and riverside commerce are necessary for leisure, fitness, and cultural influence. The core landscape with the functions of the city and waterfront area must be created to ensure accessibility and integrity. The functionality, scientificity, and artistry of the city must be sustained to revitalize the waterfront space and regenerate the spaces.

(4) Cultural and historical elements

Rivers are closely related to the development of cities. Thus, waterfront spaces have rich cultural and historical elements. In the revitalization and renovation of urban waterfront spaces, these elements must be integrated to enhance the vitality of the waterfront space and develop its deep-seated spiritual tourism functions for historical, cultural, and social comprehensive benefits.

7. Optimization Strategy

Regarding the problems in the planning of the Grand Canal in Huai'an City and the successful cases, the construction of waterfront space must be planned. Riverbanks, pedestrian leisure corridors, and hydrophilic spaces are required as residents are the major visitors of waterfront spaces. To meet their needs, waterfront spaces must be shared, and it is strictly prohibited to privatize high-quality residential and high-consumption commercial areas [12]. The opinions of residents must be considered to constructing surrounding facilities for the economy and tourism industry. Traditional culture needs to be inherited by preserving historical and cultural heritages. These efforts allow for the cultural experience and vitality of waterfront spaces. The transportation accessibility of waterfront spaces also must be increased to enhance the tourist experience.

Smart industries in the Qingjiangpu section of the Li Canal are required to optimize the industrial and functional structure of the Li Canal area. It is appropriate to integrate diverse cultural and creative industries including finance, technology services, and commercial services. A waterfront industry cluster can be planned for the future high-end modern industry cluster of Huai'an City. As the Qingjiangpu District of Huai'an is located in the center of Huai'an City, it has potential for development. In 2021, Qingjiangpu District was selected as the construction unit of the provincial-level cultural and tourism industry integration development.

The government plays an important role in the transformation of waterfront space by providing policies or infrastructure construction to attract investment. Meanwhile, multi-party cooperation is important to establish public-private partnerships. In this process, local governments and institutions must act as agents and developers. Although numerous studies have repeatedly proven that public participation is important in ensuring the success of waterfront space transformation, the possibility of public participation is limited due to the confidentiality of development agreements between local institutions and developers [13]. To balance the interests of actors in the transformation process of waterfront space, further research and exploration are needed.

Planning and design are important for the orderly and healthy development of urban waterfront spaces. By planning strategies and designs, technical means for the regeneration of urban vitality and the improvement of people's quality of life can be chosen [14]. A corridor must surround the entire waterfront space of the Li Canal to create a bicycle road system and fragmented pedestrian walkways. The pedestrian walkway radiates in a dotted pattern along the river connecting scenic spots along the Li Canal and promoting the cultural value of the waterfront space. They meet the needs of residents and make the waterfront area proper for them to rest, walk, jog, ride bicycles, and enjoy the scenery of the Canal. The establishment of a characteristic canal adds to and optimizes the green landscape, and solves the problem of insufficient vitality in external places. At the same time, it can also solve the problems of lack of leisure and rest places, cultural experience, vitality in internal functional facilities, and low resident participation. Benches and observation platforms allow tourists to enjoy the scenery. With murals and the greenery of the corridor, the Li Canal can convey a healthy, green, and cultural atmosphere. By using a bridge to connect the two sides of the Li Canal, the barrier effect of water is removed, and the charm of its waterfront space is unleashed.

The Li Canal forms a waterfront space. The green corridor, composed of pedestrian paths and bicycle systems, effectively connects the culture and space of the Li Canal. The originally planned four theme areas were scattered in the long waterfront space of the Inner Canal with isolated and insufficient connections. The green corridor connects the spaces and provides each section with cultural connections and the experience of canal culture. It is important to integrate original facilities and carry out inspection, repair, and resolution. The personal safety of tourists and residents must be ensured in the waterfront space.

8. Conclusions

Urban waterfront spaces are crucial components of urban green infrastructure, serving various functions such as flood control, ecological regulation, and recreational and cultural landscapes. In the urban renewal, urban waterfront spaces have become increasingly important. Li Canal is an integral part of the waterfront space in Huai'an. By transforming the Li Canal, its potential can be maximized in cultural preservation, tourism, livelihoods, the economy, and ecology. We investigated and analyzed the current status of the canal to identify the issues that need to be addressed in the development of Li Canal. At the same time, guided by the principle of urban renewal, the renovation of the Li River was explored for green, ecological, recreational, and cultural functions to provide a reference for the renovation of waterfront spaces in urban renewal. Based on the previous research results, it is necessary to construct a research framework in line with Huai'an's economic background and values. We concluded that it is required to emphasize regional case studies. Multi-dimensional and multi-type empirical studies are required to understand the spatial characteristics of the Huai'an Canal waterfront and summarize the research results. The optimization effect of Huai'an Lane Canal waterfront space needs to be evaluated for the development with the concept of "ecology, production, and life" in the waterfront space of Huai'an Lane Canal. Data were collected from a questionnaire survey and site visits to evaluate the optimization effects, the landscape of the waterfront space, the experience of tourists and residents, and the effect of urban development.

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