Study On Urban Waterfront Public Space Renewal Along the Grand Canal in Beijing's Urban Sub Center from The Perspective of Place Attachment

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Abstract. Urban renewal is a policy hot spot and a focus of work in the field of urban construction, which is realizing a major transformation from rough development to quality enhancement and organic renewal at the current stage. As an important waterfront space in Beijing, the Grand Canal is the memory and soul of Beijing's development. The renewal of the public space along the canal play an important role for the overall renewal and development of the urban sub center. 'Place attachment' is an important theory to discover the emotional connection between people and places in the discipline of recreation geography. It has been used by relevant scholars at home and abroad to study human-land interaction in communities, urban parks and other places. Based on the problems of the public space such as inefficient use of residents and lack of emotional indentity and the growing needs of people for a better life, this study carries out the research on the renewal of urban waterfront public space along the grand canal based on place attachment, with the hope of addressing the lack of a sense of belonging and identity in the use of waterfront public space and supplement the updated method of public space in human-land interaction.

Keywords: Enter key words or phrases in alphabetical order, separated by commas.

1. Introduction

1.1. Research background

1.1.1 Trends in human-centered urban renewal

Urban renewal is a policy hot spot and a focus of work in the field of urban construction at the current stage. The Outline of the 14th Five-Year Plan (2021–2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China explicitly requires that during this period, we should deeply promote the new urbanization strategy centered on human beings, implement urban renewal actions, promote solutions to outstanding problems and shortcomings in urban development, and enhance the people's sense of benefit, happiness and security.

With the development of economy and the improvement of people's living standards, Chinese society has entered a new era of socialism with Chinese characteristics. The main contradiction of the society has been transformed into the contradiction between the people's growing needs for a better life and the unbalanced and inadequate development. Under the demands of the new era, the themes of the times in urban renewal should be people-orientated and increase the quality of the living environment to provide a good life. Researchers and scholars such as Zhao Wanmin have also pointed out that the enhancement of urban space requires a shift from the mere construction of physical space to the creation of humanistic space, and from a single space that meets the needs of simple living to a multifaceted space that meets the needs of spiritual living[1]. Therefore, in order to improve the living environment for urban residents efficiently, we need to emphasis on the human dimension, and enhance residents' sense of belonging and identity in the use of urban public space.

1.1.2 The importance of the waterfront public space along the Grand Canal in the sub center

Public space, as one of the important parts of urban renewal works, is a key component that influences people's identity and attachment to the city. The Beijing Urban Master Plan (2016-2035) emphasizes the enhancement of the quality of urban space and the provision of rich, pleasant and vibrant urban public space for citizens. It also proposes in detail the construction of a blue net system consisting of water bodies, waterfront green corridors and waterfront public space.

As the center of urban life, public space is an important place to provide public communication for urban residents, which carries the historical traces of the city's development and human activities. The rich spatial types such as streets and squares, as well as perceptual elements such as vegetation and water bodies and public art most intuitively show the quality and characteristics of the city. It also carries unrepeatable historical and cultural connotations and demonstrates the city's cultural charm. Tongzhou District has been in a higher research hot spot since it was first designated as Beijing's urban sub-center in 2012. As an important waterfront public space in Beijing, the planning of the Beijing Tongzhou Canal Section of the Beijing-Hangzhou Grand Canal deeply affects the development of the neighboring areas and has important research value. However, due to various reasons, the previous public space along the canal was characterized by "poor accessibility, single function, lack of cultural connotation, lack of popularity" and many other problems. Therefore, under the trend of urban homogenization nowadays, maintaining cultural characteristics and shaping the memory of the place have gradually become the important contents of urban renewal and construction, and it is urgent to study how to improve the quality and vitality of the waterfront public space along the canals.

1.1.3 The relevance of place attachment theory

Place attachment is a research hot spot in foreign disciplines such as recreation and environmental psychology and has now become a multidisciplinary and comprehensive concept[2]. Its concept was proposed by Daniel Williams and Joseph Roggenbuck in 1989, referring to the connection between people and place development. It is a positive affective bond between people and specific places that maintains a sense of survival, security and continuity, as well as enhancing a sense of social connection and belonging.

In recent years, the concept of place attachment, as an important element of place theory, has begun to become an important grip for designers to care for and respond to the emotional needs of users. The value of its application has also received widespread attention in design disciplines such as architecture, urban planning[3], and landscape[4] architecture. The reason for this is that the rapid and frequent transformation of human-land relations in modern cities as well as the efficiency and convenience of cybervirtual spaces have made the emotional connection between human beings and traditional urban spatial environments weaker and weaker. In particular, public space, as the place type with the closest relationship with residents' daily life, carries the behavioral experience and psychological-emotional connection between people and the daily landscape, which is more easily disturbed or interrupted, coupled with the past public space planning mode dominated by supply and neglecting people's emotional needs, making the contradiction between the quantitative supply and the qualitative demand of the public space construction more and more prominent. Many cities are experiencing a decline in the vitality of public space, which poses new challenges for design disciplines that focus on the interaction between people and public space[5].

Place attachment, as the concept of emotional connection between people and spatial places, is an important psychological concept in the study of human-place relationships. To summarize, in the context of human-centered quality regeneration and development, it is urgent for urban renewal and construction to return to the essence of "design for people". Therefore, the theory of place attachment is introduced into the research and design process of waterfront public space to explore the promotion of human-land emotional connection from the perspective of users' experience of the place, with a view to solving the problem of residents' lack of sense of belonging and happiness.

1.2. Purpose and significance of the study

On the basis of previous research, this study combines the interpretation of the theory of place attachment with the summarization of the current problems faced by the waterfront public spaces along the canals in the sub center and the situation of the users' place attachment. By intervening the place attachment theory in the renewal design of public space, this study hopes to refine the content of the study of waterfront public space along the canal from a human perspective.

At the same time, based on the theory of place attachment, this study explores its application potential and proposes a systematic renewal strategy for public space from the perspective of user psychology at the level of function and culture, providing reference value for the research on the renewal of urban waterfront public space.

2. Theoretical Interpretation

2.1. Concept

The definition of place attachment dates back as far as 1974. Tuan[6] proposed the term 'Topophilia' after discovering that 'a special kind of attachment arises in the process of interaction between people and places,' which was also the first inquiry into the relationship between people and places. Relph[7] introduced the concept of 'Sense of place' in 1976 when he argued for 'the psychology of human emotion and identification with place'. In 1978, Proshansky[8] proposed the concept of 'place identity', arguing that 'the social construction of people and places is complex and variable, and its results are influenced by subjective factors', and introduced this concept into the study of environmental psychology. In 1983, the concept of place attachment was introduced by Shumaker[9] to describe the emotional connection between an individual or a group of people and their place of residence. Later, Daniel Williams and Joseph Roggenbuck further summarized and sublimated on the basis of the previous research, and formally put forward the concept of 'place attachment' in 1989, which is regarded as a kind of connection between a person and a place based on emotion, cognition and practice.

Although different scholars have different definitions of place attachment, they all agree that place attachment is a diversified and comprehensive concept for the study of human-place relations, reflecting a positive emotional connection between people and specific places. Precisely, it is a benign emotional connection formed through practical cognition after deep and multidimensional functional exchanges between people and places.

2.2. Dimensional composition

Williams and Roggenbuck proposed 'place dependence' and 'place identity' in 1989, which is also the classic two-dimensional framing theory. They consider 'place dependence' as a functional attachment, which refers to the extent to which individuals need the public facilities, landscape environment and special resources provided by a place, and originates from the physiological level of dependence. 'Place identity' is a kind of spiritual attachment, which refers to an emotional desire generated intentionally or unintentionally by an individual's subjective emotions and behaviors through repeated practice and strengthened cognition of the objective environment and originates from the psychological level of human identity. Besides, in the research history of place attachment, experts and scholars have constructed a variety of dimensions based on the two-dimensional structure according to the different contents of the research, see Table 1. However, the classical two-dimensional structure which was firstly proposed is still the most recognized structure at present.

Table 1. Different Dimensions of Place Attachment Constructs Targeted by Experts

Time	Experts	Dimensional Composition
1992	Lalli	External evaluation, overall attachment, sense of commitment
2000	Bricker, Kerstetter	Place identity, place dependence, lifestyle
2003	Williams, Vaske	Place dependence, place identity
2006	Hammitt, Backlund, Bixler	Sense of identification, dependence, familiarity, Sense of belonging, rootedness
2010	Scannell, Gifford	Physiological processes, social relations
2013	Ramkissoon, Weiler, Smith	Emotions of place and social connection[10]
2017	Gieling, Vermeij, Haartsen	Social orientation, cultural attachment

Source: Author's drawing based on relevant information

3. Analysis of the correlation between place attachment and public space

From the two-dimensional framework theory, it can be seen that place attachment consists of two dimensions. Place dependence refers to a functional attachment that people form to spatial places while place identity refers to an affective attachment that people form to spatial places. A ‘place’ is a space for people to engage in activities and social interactions, and the material characteristics of its environment are the basis for the creation of ‘attachment’. Attachment is an emotional response to the cognition and practice of ‘place’, so its connotation can be understood from two levels: ‘place’ and ‘attachment’.

3.1. Physical dimension: Place is the basis on which human interaction with space occurs

The ‘material dimension’ refers to the characteristics of the physical environment of the place. Its material elements of special significance can induce attachment, and the attraction of its resources and facilities is the first step in the formation of emotional bonds. Due to the high accessibility of public spaces or the abundance of amenities, people will have frequent contact with the physical elements of the place, and the functional characteristics of the place will come to the fore, prompting individuals to revisit the place to strengthen their cognition and experience[11].

The urban waterfront public space has the functions of rest and recreation, fitness and exercise, and social interaction for the citizens. Therefore, the good or bad characteristics of its physical environment directly affects the residents' satisfaction and identification with the living place, which also plays a crucial role in the formation of place attachment. It is found that the more the characteristics of the physical environment in the place satisfy the behavioral needs of the residents, the deeper the degree of attachment to the place generated by the citizens. In other words, places with high attachment should have physical environment features such as ‘comfortable environment’, ‘diverse facilities’ and ‘rich activities.

3.2. Social dimension: Attachment is a result of the occurrence of human-space interactions

The ‘social dimension’ refers to the sense of identification with and belonging to the place, from which the attachment is the emotional response and spiritual sublimation of people's cognition and practice of the place. John Bale[12] takes sports venues as an example to analyze the satisfaction of users and found that in addition to the physical experience after their daily fitness exercise in the venues, they also gained better satisfaction in the emotional aspect. This suggests that the interaction between human bodily and place will eventually be transformed into an emotional connection with place, which triggers emotional cognition and generates dependent emotions.

Besides, a good place is also a carrier for the centralized display of culture and spirit. In addition to serving as a physical space to meet the physical activity needs of residents, urban waterfront public

space also carries the values of residents' spiritual support and the inheritance and promotion of urban culture. A good public space will build a bridge between the place and emotional communication, which can integrate the spirit of urban culture into the daily life of residents and transform it into the affirmation and recognition of the place. Such an environment enables people to share common values and cohesion, prompting them to actively participate in the co-construction of the place. This way their positive emotional experience of the spirit of the place and the cultural lineage will further deepen their attachment to the place and turn into a virtuous cycle.

4. Status of public space along the canal in the sub-center

4.1. General situation

The Beijing section of the Beijing-Hangzhou Grand Canal, which spans thousands of years and six districts, now plays a pivotal role in communicating with Beijing's urban water system, and is rich in waterfront landscapes and humanistic resources, making it a precious urban public space in a high-density living environment[13]. The canal within the scope of the Beijing urban sub center passes through urban expressways, main roads, railroad land from west to east. The north bank of the waterfront space is part of the land for business, commerce, cultural industry and the south side is mainly a large area of residential land. Besides, after many times of planning and construction, the canal in Beijing urban sub center has remarkable effect from the watershed management to the riverfront space enhancement. Now many green landscape nodes have been built such as the Grand Canal Forest Park, forming a display of the intersection of tradition and modernity.

4.2. Problems with the current situation

4.2.1 Weak connection between waterfront public spaces and neighboring spaces

Due to the railway and bridge obstruction, the canal and the surrounding urban land and public space cannot form a good connection and interaction. People working or living on both sides of the canal can only reach the canal through the flyovers, underpasses, and intersections of the urban arterial roads. The open accessibility that the waterfront space should have is not well reflected, which seriously affects the usage rate of the waterfront space of the canal. In addition, the spacing between some passages to the waterfront space is too big, which further reduces the accessibility of the waterfront space, resulting in the lack of connection between the space and the surrounding functions and the people-space interaction (**Fig 1)**.



Fig. 1. Excessive spacing between banks

Source: Author's own photographs

4.2.2 Monofunctional and low-quality of the waterfront public spaces

Waterfront shoreline design form is relatively single and rigid, which is mostly consist of levee or stone wall. Not only the canal itself lack spirit and change, but vertical steep barge also makes people and water near at hand but difficult to approach (**Fig 2**). The north bank has only about 10 metres of space due to the road squeeze, which fails to create a good stopping point and water-friendly space. In addition, the environmental quality such as the green space along the canal is in poor condition, losing the vitality that water bodies and green banks should have (**Fig 3**).

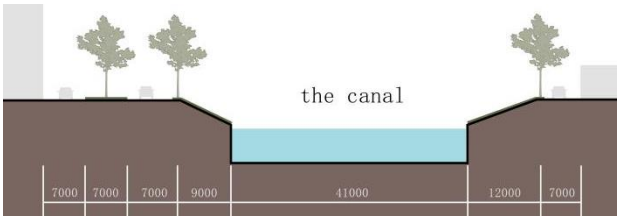


Fig. 2. Waterway cross section

Source: Author's drawing based on relevant information



Fig. 3. Single function and poor quality

Source: Author's own photographs

4.2.3 Poor slow-moving continuity of the waterfront public space

The green space along the waterfront is a better venue for activities and a better carrier for the slow-moving system. However, the waterfront green space on both sides of the river is intermittent, and some sections are even blocked by structures (**Fig 4**), resulting in the waterfront walkway and the slow-moving traffic being forced to interrupt. In addition, the two sides of the water system are only used as a single passage space, without considering the bearing of social activities. The lack of slow walking needs and care for residents leads to a poor tour experience, affecting the overall continuity of the space and the convenience of the slow walking experience[14].



Fig. 4. Waterfront space is blocked.

Source: Author's own photographs

4.2.4 Insufficient exploration of the cultural connotation of waterfront public spaces

The Beijing-Hangzhou Grand Canal, as the longest and largest ancient canal in the world, has been successfully inscribed on the World Heritage List in June22, 2014. As an important waterway in the Beijing-Hangzhou Grand Canal, the canal in Beijing's urban sub center has played an important role in Beijing's urban development, witnessed the metamorphosis of the city and carried valuable cultural memories. However, due to the historical development and changes, some of the ruins no longer exist and currently there is only one historical and cultural card named Beiguan Barrage (**Fig 5**). The current situation ignores the characteristics of the memory of the waterfront space, and due to the lack of maintenance of the site and the integration with the water landscape and cultural atmosphere, its uniqueness and cultural vitality has not been fully demonstrated.



Fig. 5. Beiguan Barrage

Source: Author's own photographs

5. Renewal Strategies of waterfront public space along the canal in Beijing's Urban sub center

5.1. Design Objectives

The Grand Canal is an important urban public space and an important carrier for the daily public life of residents. Under the renewal of the waterfront public space oriented to the current problems, the overall objective of shaping the Canal Cultural Landscape Belt is proposed to promote the vitality of the waterfront public space of the canal, so as to present a high-quality urban image and enhance the residents' sense of belonging to the city.

5.2. Construction strategies

Based on the above analysis of the correlation between place attachment and public space, it can be seen that the renewal of public space mainly consists of both material and social aspects. Therefore, priority should be given to the creation of the material space itself. At the same time, the use of space is inseparable from people's participation, and the process of people's various activities in the space are intertwined together to give the space diversity[15]. Only when the physical space and the social space complement each other can the public space be better activated, which will in turn enhance people's sense of belonging and identity.

On the basis of the current problems and design objectives of the canal, combining with the principle of creating vitality of waterfront space, it puts forward two major levels and four major strategies for the renewal of waterfront public space along the canal. That is: physical level - open and accessible shared waterfront public space, green and pleasant ecological waterfront public space, social level - continuous and unimpeded friendly waterfront public space, and historical and humanistic waterfront public space (**Fig 6-7**).

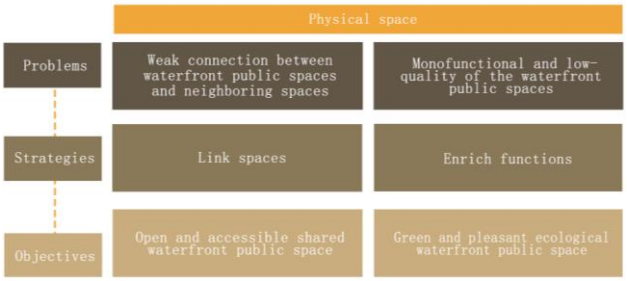


Fig. 6. Objectives and strategies of the waterfront public space (Physical Space)

Source: Author's own drawing

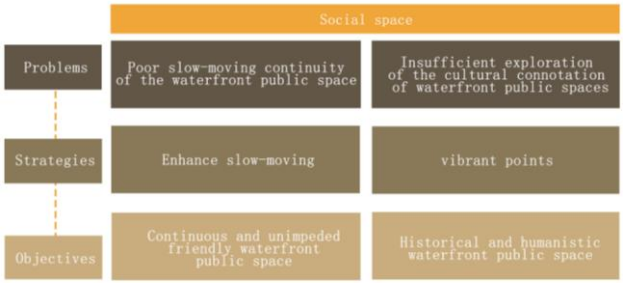


Fig. 7. Objectives and strategies of the waterfront public space (Social Space)

Source: Author's own drawing

5.2.1 Open and accessible shared waterfront public space

First of all, sort out the traffic connecting the two sides of the canal and establish a number of pedestrian and vehicular passages. This will weaken the blocking effect of expressways and railways on the waterfront space and strengthen the integration of the functions and activities on each side of the canal, so as to form a better connection and intercommunication.

In addition, flyovers with the mode of continuously crossing roads and canal with multiple up and down points should be construct at large spacing between bridges to increase the accessibility of waterfront space. And further create a new public space corridor to connect the canal and the urban functional area, which can closely integrate with the surrounding small spaces to form a complete regional public space system and enhance the basic material conditions along the waterfront (**Fig 8**).

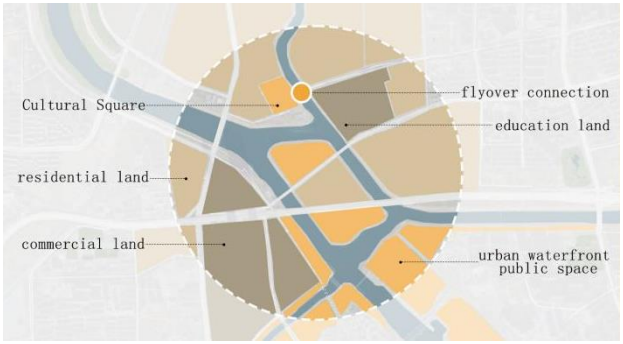


Fig. 8. The construction of the flyovers at the confluence of five rivers makes the regional public space system more complete.

Source: Author's own drawing

5.2.2 Green and pleasant ecological waterfront public space

As the new general plan of Beijing proposes to build a blue net system of water body, green corridor and waterfront space for important rivers, the core section should widen the waterfront space and increase the stationary platform appropriately to build a pleasant waterfront space of ‘point’. The hard waterfront shoreline can be softened into an ecological bank protection and open to the public through ecological renovation to build waterfront space of ‘line’. Restore the river fundamentally and enrich the water-friendly functionality to comprehensively enhance the user's visual and recreational experience, making it a public space ‘surface’ created by residents’ attachment. Points, lines and surfaces interpenetrate each other, enriching the diversity of spatial levels and establishing a perfect spatial network.

5.2.3 Continuous and unimpeded friendly waterfront public space

The creation of vitality of the canal waterfront public space needs to be enhanced not only from the material space such as landscaping and greening and ecological environment, but also from the social space level to consider the care of various human needs. Therefore, human activities should be followed, and the factor of slow travelling should be fully considered. The existing waterfront roads and green belts interrupted by the bridges under construction should be connected through

engineering construction to create a continuous waterfront slow-moving space like bicycle paths (**Fig 9**), which will attract the public to recreation and fitness and activate the waterfront, creating a city-friendly and smooth waterfront space for slow walking experience.



Fig. 9. Schematic of the slow walkway connection
Source: Intention cases from the web

5.2.4 Historical and humanistic waterfront public space

First of all, the unique historical monuments and culture along the canal should be explored and protected appropriately, especially the continuous protection of the site of the Beiguan Barrage and the creation of space around it. So that the historical water system can be used as an important way of linking up the essence of culture, creating a cultural landscape and recognizing the culture of the city.

Canal culture is a flowing culture, and a valuable heritage left to the city. On the basis of promoting the construction of the site and its landscape environment, the construction of cultural connotation on both sides of the canal should be strengthened through creating humanistic landscape nodes such as citizens' activity squares and integrating corresponding activities, which will not only pass on the history and culture lineage, but also embody the humanistic value of the waterfront space, displaying the charm of the canal in the Beijing’s sub centre comprehensively.

6. Conclusions

Cities are born and developed because of water. Urban waterfront public space witnesses the evolution and development of cities and has multiple values such as social and cultural. Public spaces need to be given the opportunity to communicate emotionally with the site more than ever after the needs of the inhabitants in their daily lives. With the background of urban renewal and the theory of place attachment as a means, this paper tries to propose a strategy for renewing the public space from the simultaneous consideration of the functional and emotional aspects of the space required by the residents, so as to meet the residents' behavioral needs and emotional attachment and to make the public activities develop to a deeper level, making the city a place of people's emotional support and belonging.

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