Journal of Landscape Research 2024, 16(1): 27-30

Evaluation of the Spatial Quality of the Greenway on the Tonghui River in Beijing

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Abstract This study organized the current status of tangible cultural heritage along the Tonghui River. The spaces along the Tonghui River were classified according to the farmland, suburban areas, urban residential areas, and urban center areas. Spatial analysis of the current situation was conducted through Baidu Street View images, with a focus on evaluating the spatial environment around the tangible cultural heritage. Negative factors affecting the reuse of cultural heritage were analyzed, such as poor appearance of buildings and low accessibility of transportation along the Tonghui River.

Keywords Urban water system, Beijing-Hangzhou Grand Canal, Cultural heritage protection
DOI 10.16785/j.issn 1943-989x.2024.1.006

The Beijing–Hangzhou Canal is divided into 7 sections: Tonghui River, North Canal, South Canal, Lu Canal, Middle Canal, Li Canal and Jiangnan Canal. The part involved in this study is mainly the section of Hebei Canal. Tonghui River belongs to the North Canal water system, the Yuan Jinshui River, also known as the Datong River, after the Ming Dynasty renamed the royal river (Jade River), east-west. Tonghui River is the most developed waterway in Beijing, and an economic lifeline of Beijing. The river was maintained during the Ming and Qing Dynasties and was used until the early 20th century. After the water transport stopped, it became the main river for sewage discharge in Beijing urban area, and also undertook the task of water transport for agricultural water. After decades of treatment, it became the landscape river of Beijing. The North Canal is one of the tributaries of the Haihe River. The main flow from Tongzhou District to Tianjin is also the northern section of the Beijing–Hangzhou Grand Canal. Its upper reaches is the Wenyu River that originates from the southern foot of Jundu Mountain, and from Changping District and Haidian District of Beijing. It flows south into Tongzhou District and is called Wenyu River in the upper reaches of Beiguan in Tongzhou District.

1 Overview of Beijing Grand Canal tangible cultural heritage protection

1.1 Overall composition of the Grand Canal heritage in Beijing

The cultural heritage of Beijing Grand Canal presents the combination of virtuality and reality, that is, the combination of tangible cultural heritage and intangible cultural heritage. According to the relevant explanation of Article 11 of Chapter 3 of *The Grand Canal Heritage Protection Plan* (Beijing Section), There are a total of 40 tangible cultural heritages related to the Grand Canal (Table 1), including 31 water conservancy projects and 5 river courses, 4 water sources, 7 hydraulic engineering facilities (gates),10 shipping engineering facilities (8 bridges, 2 wharves); 5 relics of ancient canal facilities and management institutions (warehouses). There are 9 other canal-related tangible cultural heritages, including 6 ancient sites, 2 ancient buildings, and 1 stone carving. According to statistics, there are a total of 18 tangible cultural heritage items in Tongzhou, mainly involving 2 canals, no water source, and water conservancy facilities. Shipping engineering facilities account for a large propor-tion, accounting for 80% of the total number of such heritage, including 6 bridges and 2 docks. There are 2 remains of ancient canal facilities and management institutions, and among the other canal tangible cultural heritage, there are 6 ancient building and 2 ancient sites. It can be seen that the shipping engineering in Tongzhou District was relatively developed at that time, with a large distribution of bridge sites, favorable traffic locations, high accessibility and relatively large number of ancient sites, indicating that there were rich cultural heritages left in the region, and it played a certain driving role in the management of water transport and river channels in the surrounding areas. A total of 11 intangible cultural heritage items, including 3 place names, 6 legends, 1 custom and others (such as folk art songs, folk poetry, etc.) (Fig.2). Among them, there are the output of cultural heritage legends, customs and folk songs from Tongzhou, which further confirms the authenticity of the cultural heritage of Tongzhou Ancient Canal and the related customs of water culture spreading along the canal for a long time. At the same time, it realized a good tourism function on the basis of water transport in the early stage.

1.2 Overall assessment of Beijing Grand Canal heritage

Heritage protection planning is mainly evaluated from the following 4 perspectives: value assessment, current preservation assessment, use assessment, and current preservation assessment. There are still a considerable number of canal tangible cultural heritage in Beijing, mainly the Beijing–Hangzhou Grand Canal heritage in Yuan, Ming and Qing dynasties. There are some canal remains in Sui, Tang, Liao and Jin dynasties, but most of these remains need further archaeological excavation and research.

The Beijing section of the Grand Canal heritage occupies a vital position in the entire canal system of China, ensuring the transport of goods from the South to Beijing, and promoting economic, cultural and religious exchanges between Beijing and the areas along the canal. Part of the Beijing section of the Grand Canal heritage has enjoyed a high reputation at home and abroad, but most of the other heritage sites are less well-known. For example, the Tonghui River (now the Yuhe River), as a kind of river site, preserves the river docking bank in the Yuan and Ming dynasties, showing the development and changes of the Grand Canal, reflecting the real historical information in the construction and use of the Grand Canal to a certain extent, as well as the material production, lifestyle,

Received: December 15, 2023 Accepted: January 18, 2024
Sponsored by Innovation and Entrepreneurship Training Program for College Students.
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ideological concepts, customs and social customs on both sides of the Grand Canal.

2 Analysis of the protection status of the tangible cultural heritage of the Grand Canal in Tongzhou District

2.1 Cultural heritage resources, spatial location and canal segmentation

On February 1, 2021, *World Heritage: Tonghui River Tongzhou (East) Section Examination* on Beijing Deputy City Center Newspaper P4 recorded that the Grand Canal application was successful on June 22, 2014, and "two sections and two points" in Beijing was listed in this application, of which the longest section is the Tonghui River Tongzhou section. The river starts from Yongtong Bridge in the west (the common name of the Bali Bridge) and ends at the junction of the Tonghui River and North Canal in the east (Wahu Bridge), which is the first world-class heritage in Tongzhou District, of which the new North China Road Bridge in the east of the Tonghui River is the northern boundary of the old city of Tongzhou, and has been used not only as a canal but also as a moat in the north of the city. This study takes the Tonghui River as the main research object,

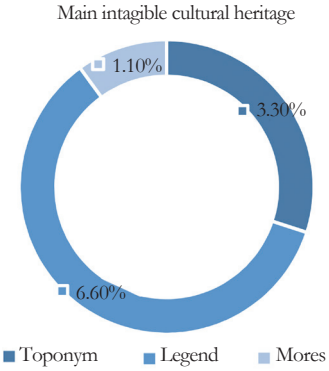

Fig.1 Proportion of intangible cultural heritage in Tongzhou

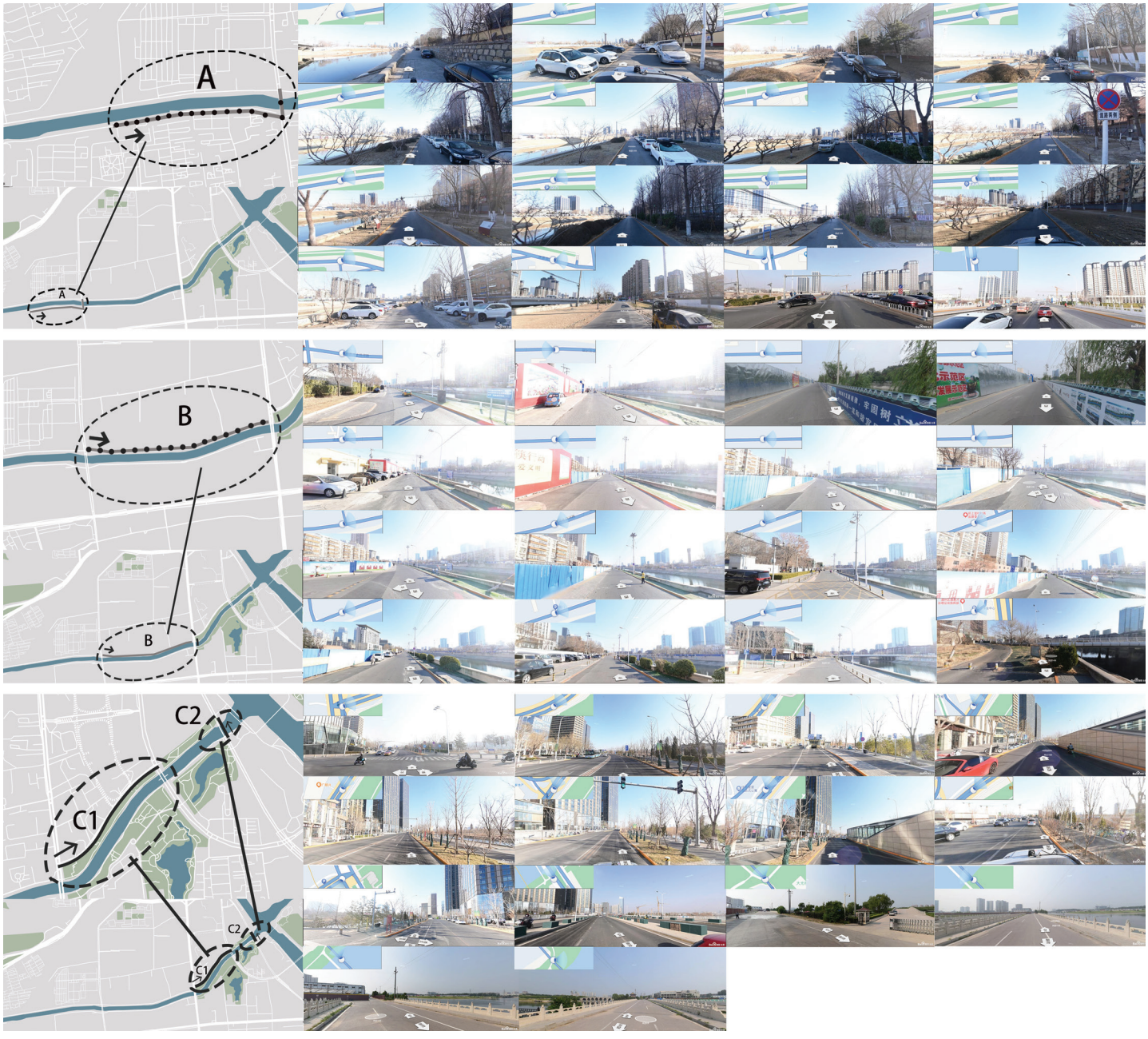

Fig. 2 Baidu map street view of the Tonghui River section of Tongzhou

and the research scope starts from the west end of Binhui Third Street at the junction of Baliqiao and Tonghui River, and ends at the junction of Tonghui River and North Canal (Wuhu Bridge) in the east.

Part of the Tongzhou section of the Tonghui River, which belongs to the North Canal water system, is classified. According to the features on both sides of the river, there are mainly 3 categories: farmland and countryside section, urban residential section, and urban center section. Through comparison research on Baidu Map, Tongzhou area borders on the Binhui North Fourth Street. The river-side road is the closest road to the junction of Tonghui River channel and regional boundary, and the boundary position extends about 100 meters southeast from the exit of Tongyan Expressway, and is about 800 meters away from the junction of Baliqiao River channel mentioned in the references. In order to ensure the rigor and authenticity of the study, the overall research section is divided into three sections ABC. The westernmost point is taken as the starting point, and the easternmost point is taken as the Binhe North Road, which crosses the junction of Tonghui River and North Canal. Section A: Binhui South 3rd Street to Tonghui South Road; Section B: Tonghui Hebei Yanhe Road to New North China Road Beiguan Bridge connected with Section A; Section C: Xinhua North Road Binhui North Street to Sagong Branch Street; Tonghui−Hebin Hebei Road cross-river part. Due to reasons such as crossing the scenic area, the road along the river is not continuous, and it is disconnected several times, and each bridge across the river is intercepted for analysis.

Based on relevant documents, the cultural relics protection units announced by the State Administration of Cultural Heritage at all levels and the intangible cultural heritage lists and intangible cultural heritage announced by the people's governments at all levels were sorted out, and cultural heritage related to the Grand Canal was selected and classified as a whole, which mainly included water conservancy project heritage, other tangible cultural heritage of the canal and intangible cultural heritage. Through the analysis of Baidu Street View, the following classification results can be obtained. According to Street View (Fig.2), Section A is distributed with relatively dense residential areas, and the east side is connected with the urban main road, so Section A is summarized as the transition section from the urban residential section to the urban central area. According to the street view, the surrounding area of section B is mainly residential buildings, which can be summarized as urban residential section, while section C1 is summarized as urban central section due to the distribution of business districts. The transition area between C1 and C2 is the transition area between urban central section and farmland rural section. Section C2 is located at the intersection of rivers, the scenic area is connected to the external road, the residential areas and office buildings are sparse, and the surrounding area is mainly for sightseeing, so it is summarized as the farmland and countryside section. The area around C1C2 has the highest density of ancient site resources, indicating that the sites are mainly distributed in the intersection of the main river channel of Tonghui River, namely the transportation hub, and scattered in the intersection of residential areas and rural areas and the area with a certain distance from the river bank. It is inferred that superior geographical location and high traffic accessibility may be one of the important factors affecting the site distribution at the intersection of tributaries and main rivers.

Baidu map was used to collect street photos along the canal every 100 m to evaluate the environmental quality according to the previously divided sections. As can be seen from the figure, the section from Xinhua North Road at the west end of Binhui North First Street to the east section of Monkey Branch Street is a scenic belt along the river, with an entrance and exit connecting the linear recreational green space on the river bank. There is a series of commercial buildings on the left side of the road, without tall trees blocking it, the lighting is better. There are 2 underground tunnels in the direction of the road extension for fast passage of motor vehicles, but the river scenery cannot be seen in the tunnels. This section of the route does not have a special scenic cycling lane, but from the southwest to the northeast, the distant tower-like buildings can be seen. This section leads to the Grand Canal scenic area, so it is speculated that the tower-like buildings are preserved ancient architectural sites in the Grand Canal scenic area.

Table 1 Quantity and type of tangible cultural heritage in Tongzhou

Major tangible cultural heritage of the Grand Canal	Specific type of heritage	Quantity
Water conservancy heritage	Watercourse	5
	Source of water	4
	Hydraulic engineering facilities (gates)	7
Shipping engineering facilities	Bridge	8
	Quay	2
Remains of ancient canal facilities and management institutions	Stash	2
Other canal tangible cultural heritage		3
	Ancient building	6
	Ancient heritage site	2
	Stone carving	1
Total	9	40

2.2 Preservation of ancient sites and overall environmental assessment

Based on the study on the preservation of ancient ruins along Dacheng Street, combined with the captured Baidu map street view photos, the main analysis elements include three-dimensional greening, blue sky proportion, building style, road width and narrowness, and then weight score. As can be seen from the figure, due to the low visibility and relatively scattered visitors, the progress and current situation of the renovation of the surrounding road environment are relatively chaotic, and the gap is larger than that of the external three temples and one tower south square.

It can be seen from the table that the proportion of blue sky and lighting in the sampling points are generally higher, but the building style is poor (Table 2).

From the street view, it can be seen that most of the buildings are old residential buildings, or under construction land covered by construction fences, and the facade greening is poor. The surrounding landscape is relatively simple and lacks in the cover of trees and plants. From the perspective of transformation, it does not form a good series relationship with the external canal landscape, resulting in isolation from the scenic area, and there is no relevant sign to guide the flow of people around it. The road is mainly one-way, which can not adapt to a large number of traffic through, and there is no motor vehicle or shared bicycle parking space around, and most visitors are mainly on foot, which affects the flow of visitors to a certain extent.

3 Problem analysis and modification suggestions based on the current situation

This paper explored the viewing effect and accessibility of several roads along and around

Table 2 Take Baidu map street view of Dacheng Road for environmental assessment

Sampling point	Vertical greening	Blue sky ratio	Building style	Road width	Daylighting
SKSS1-F	0	1	0	1	1
DCSE2-F	0	1	0	1	1
DCSE3-F	0	1	0	0	0
DCSE4-F	0	1	0	1	1
DCSE5-F	0	1	0	0	0
DCSE6-F	1	1	0	0	1
DCSE7-F	1	1	0	0	1
DCSE8-F	1	1	1	0	1
DCSE9-F	1	1	1	0	1
DCSE10-F	0	0	0	0	1
DCSE11-F	0	1	0	1	1
SKSS2-F	0	1	1	1	1
Average	0.33	0.92	0.25	0.42	0.83

the canal, and found that (1) there are relatively few linear canal viewing spaces along the canal; (2) there are mainly gaps in the landscape series and transition of the Grand Canal cultural scenic spots; and the marginal and little-known ancient architectural culture needs to be activated and improved; (4) the surrounding architectural features need to be improved. To a certain extent, the surrounding construction land encircles and squeezes the space of the ancient architectural sites on the edge, blocking the light; (5) the way of slow walking observation route still needs further improvement. Research has found that there are multiple sections of under-crossing tunnels for motor vehicles in the surrounding area. It is speculated that the purpose of setting up under-crossing tunnels is to avoid traffic congestion near the commercial area. However, this has to some extent affected the continuity of the viewing route for the river scenery, and the viewing space for slow traffic along the river series needs further improvement. (1) In addition to focusing on the cultural display in the Grand Canal cultural scenic spot, the culture will be further extended to the outside, on the basis of the overall connection of large-scale canal culture, to further improve the neglected and relatively unknown site culture retention. (2) Improve the three-dimensional greening in the middle of the tour route, and promote the spatial planning and construction of the slow space.

References

[1] Zhang, F. (2018). A historical survey on the protection and utilization of the grand canal cultural heritage (2006−2017). *Agricultural Archaeology*, (4), 237-244.

[2] Jiang, S. L., Zhang, Y. (2014). The protection and utilization of the Grand Canal cultural heritage based on the outstanding universal value. *Famous Cities in China*, (4), 50-57.

[3] Liu, D. L., Jia, J., Ma, H. T. et al. (2023). A study on the protection and utilization of the living cultural heritage of the Grand Canal: A case study of the Shandong Section. *Art Science and Technology*, (12), 141-143.

[4] Wang, X. W., Li, X. J. (2023). The spatio-temporal differentiation and inheritance protection of intangible cultural heritage of traditional arts in the Grand Canal Cultural Belt. *National Art Research*, (4), 144-151.

[5] Wang, Y. (2012). Management of the grand canal and it's bid as a world cultural heritage site. *Frontiers of Architectural Research*, (1), 34-39.

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provide reference and guidance for the future construction of children's walking school commuting, and ensure that children have a healthy and safe experience of walking school commuting, promoting the construction of child friendly cities.

References

[1] Yuan, X. D. (2023). Optimization strategy of primary school commuting space under the background of child-friendly city construction. *Intelligent Building & Smart City*, (2), 40-42.

[2] Xu, S. H., Zhuang, W. M. (2023). Research on the quality criteria of street space affecting children's hierarchy of school travel needs. *Journal of Human Settlements in West China*, *38*(2), 45-51.

[3] Zhang, Y., Cheng, X. T. & Gao, Y. (2023). Influence factor model and design strategy of urban school travel aiming at active school transportation. *Shanghai Urban Planning Review*, (2), 133-140.

[4] Bi, B., Yang, T. T. & Ma, C. Y. et al. (2022). Exploring interactions between after-school space and behaviors of primary and secondary school students for creating child-friendly spaces in blocks: A case study of Wanliu and Dashilar Blocks of Beijing. *Landscape Architecture*, *29*(2), 119-126.

[5] Xu, Z., Liu, A. J. & Zhou, Z. Q. et al. (2021). Analyzing and scenarioizing walking routes and urban context of middle school students with Baidu Map: A case study of Jianye District of Nanjing. *Modern Urban Research*, (2), 33-40, 91.

[6] Wu, F. W., Chen, M. Y. (2020). Evaluation and optimization strategies for pedestrian school commuting pathways from the perspective of children's health and safety. *Urban Development Studies*, *27*(7), 20-27.

[7] Xing, H. N., Huang, X. Y. & Xia, Y. F. (2023). Associations of neighborhood and school built environment with active commuting to school in children: An empirical study of Xi'an City based on cross-classified multilevel model. *Journal of Northwest University* (*Natural Science Edition*), *53*(5), 749-760.

[8] Shang, W., Lv, S. & He, C. et al. (2023). Primary school access path space research: A case study of Wuhan Nanhu school district. *Chinese & Overseas Architecture*, (4), 85-89.