

Evaluation of the Heritage Value Demonstration Degree at the Beijing Tongzhou Grand Canal Heritage Site

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Abstract This study took the Beijing Tongzhou Grand Canal as a case to investigate and evaluate the core section of the Tongzhou Grand Canal. It assessed the historical, artistic, and scientific values embedded in the spatial entity of this cultural heritage and its surrounding environment, as well as the level of its presentation and interpretation. The study culminated in an evaluation of how effectively the heritage values of the Beijing Tongzhou Grand Canal's spatial heritage are demonstrated. Ultimately, it aimed to provide recommendations and references for the protection and refinement of related cultural heritage spaces, ensuring that the cultural legacy of the Grand Canal's grain transport system remains enduring and vibrant through time and space.

Keywords Tongzhou Grand Canal, Heritage space, Heritage value(s), Grand Canal Cultural Belt

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The concept of “Demonstration Degree of Heritage Value” evaluates the historical, artistic, scientific, and socio-cultural values inherent in a heritage site and its surroundings, focusing on their conservation, display, and interpretation. This study emphasized how effectively these values were communicated to visitors, unlike most previous evaluations that prioritized conservation techniques and economic impact^[1]. Innovatively, it built on existing frameworks to assess how well heritage spaces conveyed their historical and cultural essence, offering targeted insights for activating heritage.

The study examined 38 cultural heritage sites along Beijing's Grand Canal Cultural Belt, divided into 2 groups: a main sample from the Tongzhou core section (including Tongzhou and Zhangjiawan ancient towns), and a control group comprising the remaining Beijing sections of the Grand Canal (Fig.1).

Protective development of heritage spaces is not only a crucial initiative to serve the public's spiritual and cultural needs but also a key foundation for building national cultural confidence and identity^[2]. The Grand Canal grain transport system spurred commercial development and cultural integration along its banks, leaving behind numerous heritage sites such as locks, dams, and granaries. It stands as a testament to the vicissitudes of ancient state governance and economic and cultural exchange between the north and south China, representing an exemplary linear cultural heritage. The Tongzhou Grand Canal, as the northern starting point of the Beijing–Hangzhou Grand Canal, was once a thriving hub of water transport, where grain was

transferred into the capital. By comparing and studying the heritage spaces along the Tongzhou Grand Canal and the broader Beijing Grand Canal Cultural Belt, deficiencies and shortcomings in the demonstration of heritage values could be better identified^[3]. This research aimed to provide recommendations for enhancing the activation of heritage sites and the communication of their intrinsic values, breathing new vitality into the Tongzhou Grand Canal amid modern development^[4].

1 Research methodology

1.1 Comprehensive sampling

To ensure the rigor of the evaluation, this study employed multiple tools for comprehensive sampling. In addition to field investigations, photos of heritage spaces in the past 12 months were extracted from online platforms such as Dianping, Xiaohongshu, and various official scenic service account mini-programs. This approach ensured a more holistic and representative set of evaluation samples.

1.2 Evaluation framework

The evaluation framework of this study consists of 1 first-level indicator and 3 second-level indicators. The first-level indicator is “Demonstration Degree of Heritage Value,” which is the core research objective of the entire evaluation. The second-level indicators are: “Authenticity and Integrity”, “Readability of Spatial Information”, and “Effectiveness of Cultural Interpretation”^[5].

“Authenticity and Integrity” aims to assess the preservation authenticity and overall coherence of the spatial layout, historic buildings, traditional

materials, craftsmanship, and historic environmental elements of the heritage space. It evaluates whether these aspects remain intact and comply with relevant conservation principles and requirements.

“Readability of Spatial Information” is used to evaluate whether the historical layers, significant historical events, traces of historical figures, and imprints of traditional functions within the space are clearly discernible, and effectively convey historical context.

“Effectiveness of Cultural Interpretation” aims to determine whether the space can successfully interpret, convey, and disseminate the cultural values embedded in the heritage through methods such as interpretive systems, cultural activities, and spatial atmosphere creation.

For each of the 3 second-level indicators, evaluation criteria on a 1–5 point scale were established. Public ratings for the current state of each heritage space—based on images—were collected via Questionnaire Star. A comprehensive score reflecting the overall demonstration degree of heritage value for heritage spaces along the Tongzhou Grand Canal Cultural Belt was calculated by summing the weighted average scores of the second-level indicators for each site.

1.3 Data processing

Using SPSS weighting analysis, data from 21 survey questionnaires on the importance of each indicator were processed. The weights of the 3 second-level indicators under the first-level indicator—“Demonstration Degree of Heritage Value”—were determined through an

Analytic Hierarchy Process (AHP) judgment matrix. Specifically, the weights were as follows: Authenticity and Integrity: 33.59%; Readability of Spatial Information: 31.25%; Effectiveness of Cultural Interpretation: 35.16%.

Linear regression analysis showed that the p -value for the Effectiveness of Cultural Interpretation was 0.016. Since the corresponding p -value in the t -test was less than 0.05, this indicator had a significant impact on the evaluation of the demonstration degree of heritage value. The standardized coefficients in the regression analysis for Authenticity and Integrity, Readability of Spatial Information, and Effectiveness of Cultural Interpretation were 0.043, 0.085, and 0.552, respectively. This indicated that, in descending order of influence on the first-level indicator, the most impactful was Effectiveness of Cultural Interpretation, followed by Readability of Spatial Information, and then Authenticity and Integrity.

The correlation coefficient between Readability of Spatial Information and Effectiveness of Cultural Interpretation was 0.849** ($p < 0.01$), indicating a significantly strong positive correlation. Higher Readability of Spatial Information generally corresponded to higher Effectiveness of Cultural Interpretation, and these 2 indicators were strongly interrelated. However, both showed low correlation with Authenticity and Integrity, with no significant relationship observed.

2 Evaluation of heritage value demonstration in the Tongzhou Core Section (Segment A)

The comprehensive score for the demonstration of heritage value in the core Tongzhou section of the Grand Canal was 2.51. The Tongzhou Ancient City sub-section (a) scored 2.54, and the Zhangjiawan Ancient City sub-section (b) scored 2.47. Scores for heritage spaces within this section varied significantly, with a low mode and high extremes. This section was designated as the core tourism area for the Tongzhou Grand Canal within the Beijing Grand Canal Cultural Belt tourism development plan and contained numerous high-quality, well-conserved heritage spaces (Fig.2).

2.1 Authenticity and integrity

From this perspective (avg. score: 2.29), protective development levels varied markedly. The core tourism circuit comprising Xihaizi Park, the Three Temples & One Pagoda scenic area, the Tongzhou Grand Canal Museum, and Daguang Tower boasted excellent heritage

conservation, with scores above 4, serving as models for canal heritage protection. Except for the Grand Canal Museum, these spaces largely adhered to conservation principles, with well-preserved ancient buildings and spatial layouts closely integrated with the original canal history^[6]. The clever integration of new technologies and traditional craftsmanship had largely restored the historical appearance from the grain transport era. The Tongzhou Grand Canal Museum, a modern cultural education venue, housed extensive collections of grain transport artifacts and ancient documents; its architectural style was also closely linked to canal culture, injecting contemporary vitality into the ancient heritage through modern interpretation. Tongyun Bridge, Zhangjiawan Ancient City Wall, Granary Transport Wharf, and the Salt Field retain their original appearance with minimal restoration, standing quietly within the urban fabric filled with a strong sense of their era, scoring around 3. Central Granary, West Granary, East Granary, Revenue Board Branch Office, Tongzhou Guard Station, Water Gate Ruins, Merchant Guild Halls, the Stone Dam, and the Earth Dam gradually faded from view during Beijing's early development. Their traces were no longer findable in the city; their history could only be gleaned from old photos, documents, or oral accounts from elders. These sites all scored 1, which is the main reason for the section's overall low score.

2.2 Readability of spatial information

Regarding readability of spatial information (avg. score 3.06), most areas with existing remains had varying levels of historical interpretation. The Tongzhou Grand Canal Museum scored highest (nearly 5), offering authoritative, detailed historical interpretation incorporating the latest research, showcasing the canal's history from various eras and functional perspectives (political, economic, cultural), and providing immersive experiences through high-tech interactive displays. The Three Temples and One Pagoda area also scored well in readability, though slightly lower than the museum due to a less comprehensive guided interpretation system. Other well-preserved sites scored above 3, allowing for a preliminary understanding, though depth was limited by site scale and management strategies, making it hard to envision complete historical contexts. Among the sites with no visible remains, only Zhongcang and the Stone Dam had information plaques (score 3). The others had no readable information on-site (score 1).

2.3 Effectiveness of cultural interpretation

Effectiveness of cultural interpretation is key to heritage space activation. In the core Tongzhou section, only the Tongzhou Grand Canal Museum scored above 4. It featured a well-designed "Exhibition Viewing" section on its WeChat mini-program, presenting exhibition highlights through aesthetically pleasing digital media, and housed multiple immersive exhibition halls with a strong Grand Canal atmosphere, making visitors feel like they are on the canal banks, offering an engaging experience that effectively showcases the canal's cultural connotations. Additionally, Xihaizi Park, Three Temples and One Pagoda, Daguang Tower, Tongyun Bridge, Zhangjiawan Ancient City Wall, the Cao Yun Matou, and the Salt Field scored between 3–4. These spaces could interpret basic cultural connotations, covering main cultural features and values, allowing visitors to form a preliminary understanding of Grand Canal history. Zhongcang and the Stone Dam score between 2–3. They had basic displays or explanations but only offered superficial information without fully exploring the historical contexts. Furthermore, the absence of physical remains at these sites prevented visitors from effectively connecting the cultural explanations to tangible heritage, resulting in insufficient cultural interpretation. Other heritage spaces scored 1, with no relevant explanations or displays, failing to reflect the cultural significance of the sites.

The core Tongzhou section possessed several heritage spaces with good heritage value demonstration. The primary factor pulling down the average score was the loss of authenticity and integrity for a significant portion of spaces due to urban development. Subsequent development should adhere to cultural heritage conservation principles—"avoid unnecessary intervention, maintain authenticity, avoid reconstruction." Historical information could be installed near irretrievably lost sites to better showcase the Grand Canal's cultural connotations.

3 Evaluation of heritage value demonstration in the Beijing Section (excluding Tongzhou Core) (Segment B)

The heritage value demonstration score for the Beijing Section (excluding the Tongzhou core) is 3.52, nearly a full point higher than the Tongzhou core section. This section's average score is significantly higher, containing many

world-renowned cultural heritage sites that exhibit unique and profound historical significance, making it a key focus for Beijing's cultural and tourism development.

3.1 Authenticity and integrity

The authenticity and integrity score for Beijing Section spaces was 3.38, compared to

2.29 for the Tongzhou core, indicating better overall preservation status. Except for Qingfeng Lock, Huoxian Ancient City, and Niumutun Village (scoring 2), scores for authenticity and integrity in this section were 3 or above. As the Grand Canal lost its transport function within urban Beijing, Qingfeng Lock was transformed

into a public park, leaving little trace of its ancient form. Huoxian Ancient City and Niumutun Village, towns at the southern end of the Tongzhou canal, had canal heritage fully integrated into residential areas without restoration, losing some historical environmental elements. Other heritage spaces generally followed relevant conservation principles with relatively complete historic elements. Wanning Bridge, the Palace Museum, Dongbuya Bridge, and Bali Bridge scored 4 or above, with intact spatial layouts and well-preserved historical structures.

3.2 Readability of spatial information

The readability of spatial information score for the Beijing Section was 3.52, compared to Tongzhou's 2.51. Kunming Lake (Summer Palace), Yuyuantan Park, Shichahai, Nanluoguxiang, and the Palace Museum scored above 4. These spaces offered rich, in-depth historical information covering details and background, satisfying further exploration. Most offered online guides or diversified information platforms (e.g., mini-program official guides, on-site brochures, thematic exhibitions, basic info boards). Except for the Jingmi Diversion Canal, Huoxian Ancient City, and Niumutun Village, other spaces scored between 3–4, providing basic historical information but with relatively limited guided interpretation services. Huoxian Ancient City and Niumutun Village lacked in extensive planning and systematic on-site historical interpretation, though their history could be inferred from related ancient paintings. The Jingmi Diversion Canal, while environmentally scenic, served primarily for water diversion and was not presented as a cultural heritage site open to the public; it lacked in historical interpretation and prohibits riverside visits.

3.3 Effectiveness of cultural interpretation

Regarding effectiveness of cultural interpretation (Beijing avg.: 3.1 vs. Tongzhou avg.: 2.56), the Palace Museum stood out with a near-perfect score. It extensively disseminated the Forbidden City's history through documentaries and promotional films, and designed exquisite cultural-creative products and offered experiences like imperial afternoon tea, using innovative methods to vividly present imperial cultural connotations, evoking strong cultural identity and emotional resonance, and providing unique cultural experiences. The Jingmi Diversion Canal, Yanqing Temple, Prince Qing's Mansion, Emolument Granary, Northern New Granary, Huoxian

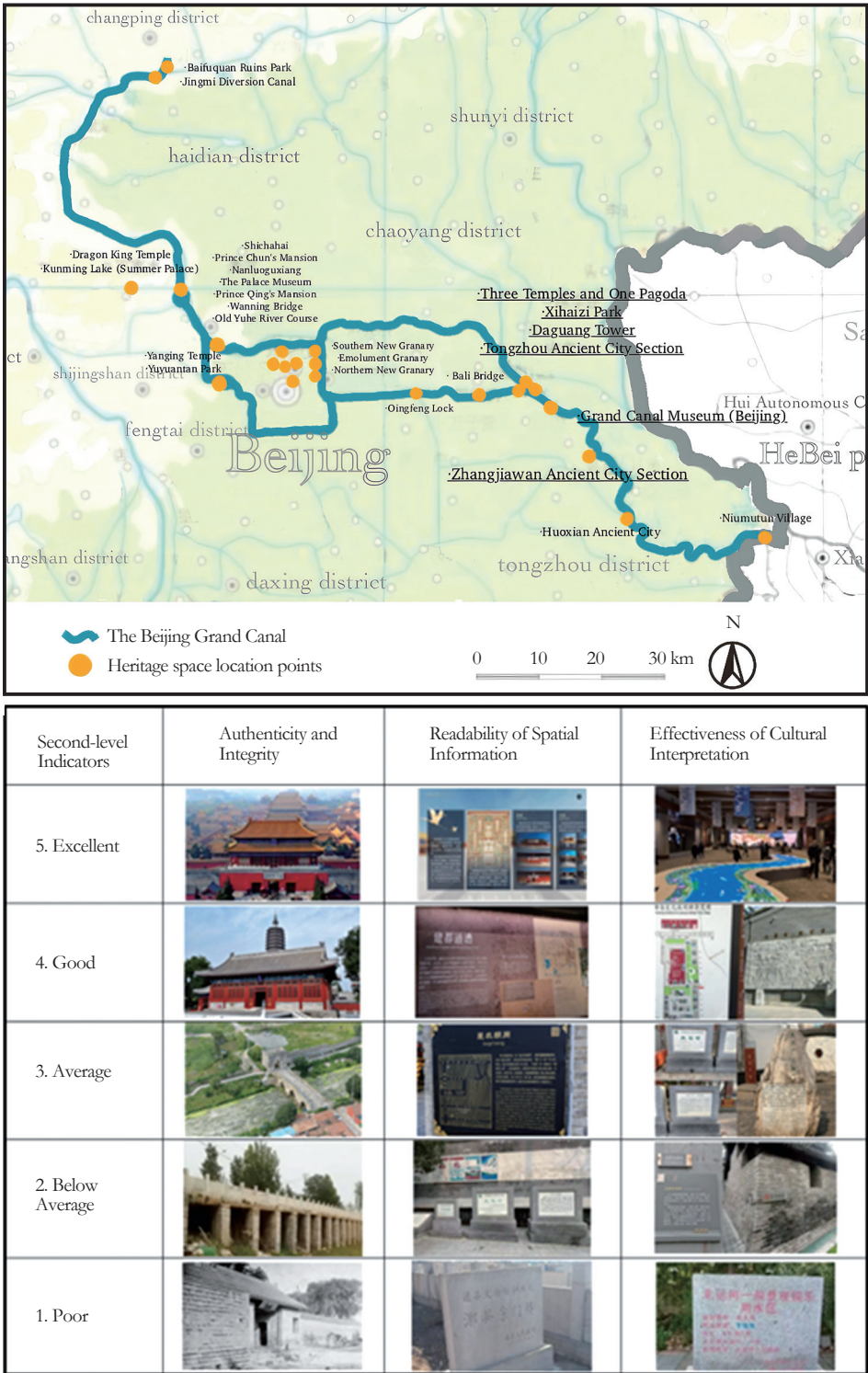


Fig.1 Location map of heritage spaces and effectiveness of cultural interpretation

Ancient City, and Niumutun Village scored below 3, lowering the section's average. Yanqing Temple has become a crowded residential compound amid the urban development, making it difficult to find traces of the ancient temple with no cultural interpretation. Prince Qing's Mansion has been used by military authorities and not open to the public, offering extremely brief cultural interpretation. Emolument Granary and Northern New Granary, important historical nodes in the Grand Canal grain transport culture, only provided superficial information. However, new conservation and utilization measures were being planned for these granaries, potentially allowing a renewed glimpse into the prosperity of canal civilization in the future.

Overall, the heritage value demonstration level of the Beijing Section (excluding the

Tongzhou core) is higher than that of the Tongzhou core section, with prominent overall advantages, aligning with its status as a key focus for Beijing's cultural and tourism development. Future efforts should focus on addressing weaknesses to enhance the comprehensive level of cultural heritage within the Beijing Canal Cultural Belt.

4 Research summary

4.1 Sample comparison summary

The overall heritage value demonstration score for the Tongzhou core section was 2.51, for the control group (Beijing section excluding Tongzhou core) it was 3.52, and for the entire Beijing section (average) it was 3.06. Descriptive analysis in SPSS of the 3 second-level factors showed average values for the Tongzhou section

were 2.29 (Authenticity/Integrity), 2.51 (Readability), 2.50 (Interpretation). For the Beijing section, they were 3.38, 3.52, 3.13 respectively. For the full sample, they were 2.89, 3.07, 2.85 (Fig.3).

This clearly indicated that the Tongzhou core section's scores were significantly lower than the Beijing section's and below the overall Beijing average. Comparing the sample groups led to the following conclusions for the Tongzhou core section: while it contained several heritage spaces with good individual value demonstration, its main shortcomings were the complete disappearance of many spaces, preventing value interpretation at the foundational level, severe lack of on-site information and incomplete interpretation systems for most spaces (except the Grand

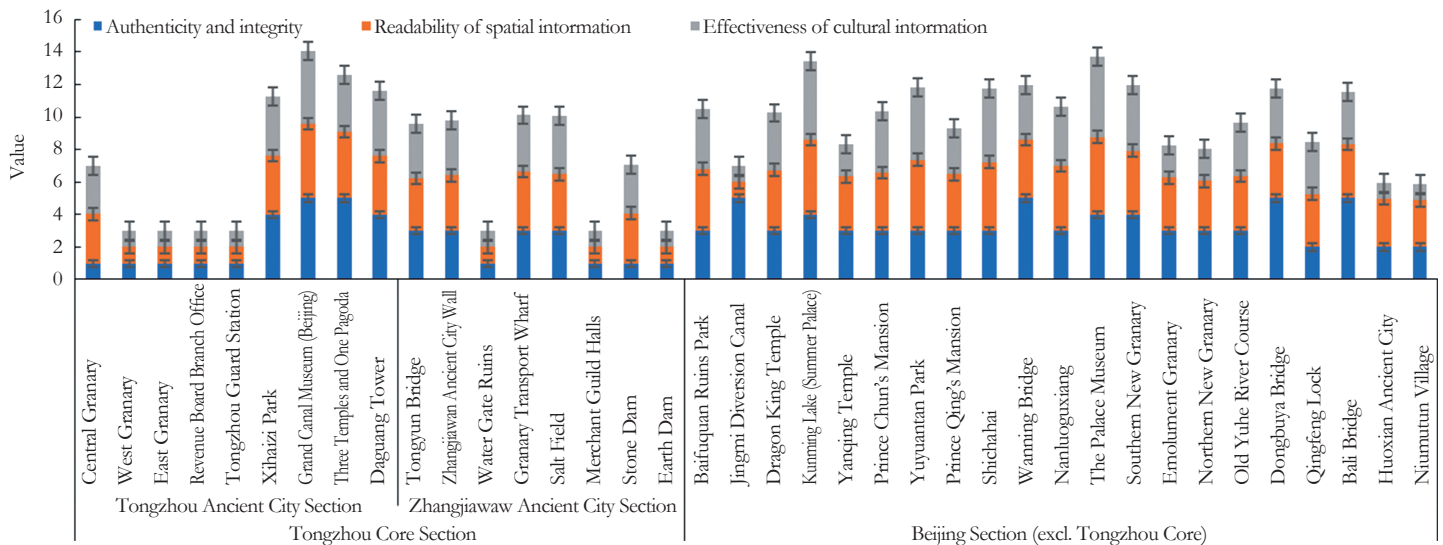


Fig.2 Scores of second-level indicators for heritage value demonstration

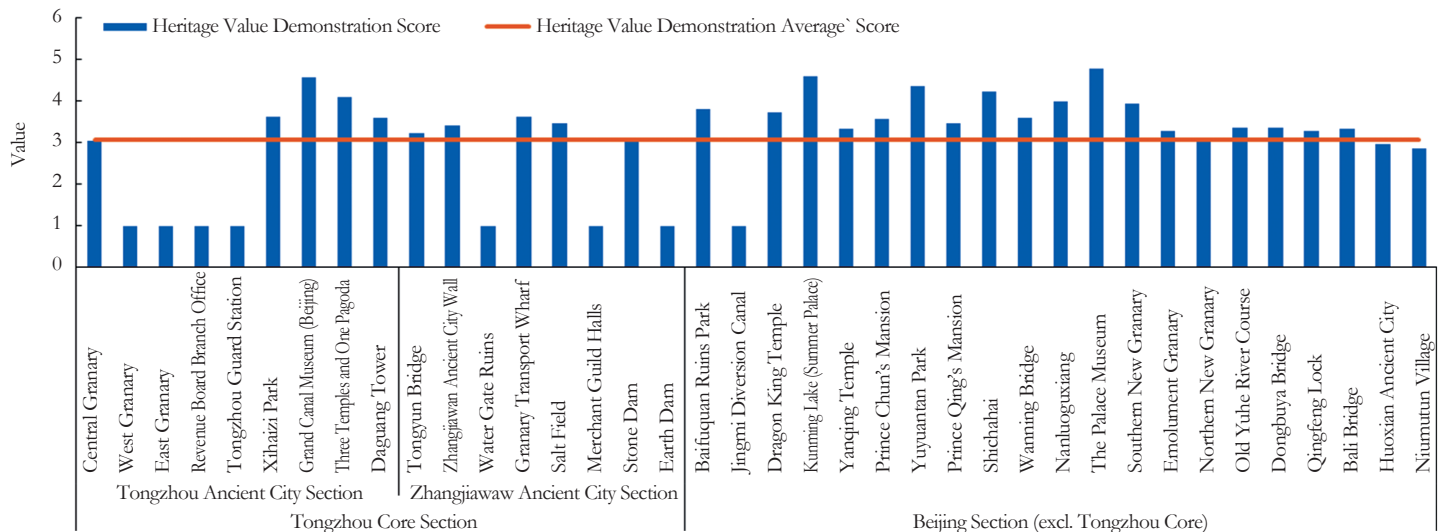


Fig.3 Demonstration degree of heritage value

Canal Museum, Three Temples and One Pagoda), and cultural interpretation that, while showing the smallest gap compared to the Beijing section, remains insufficient for most spaces beyond the museum, lacking digital interpretation systems and interactive experiences found in spaces like Kunming Lake, the Palace Museum, or Yuyuantan. Although the Tongzhou core section has high-value individual sites, the loss of clusters of heritage and fragmented interpretation systems result in an overall heritage value demonstration level lower than the Beijing section, indicating significant room for improvement in future development.

4.2 Improvement suggestions for heritage spaces in the Tongzhou Core Section

For lost heritage sites, existing technology and historical records could be used to create models of the relevant ruins, install basic explanation boards, or erect stelae with historical background information. This would allow visitors to understand the canal's legacy beyond mere imagination, enhancing overall heritage integrity and spatial information readability. For spaces with poor cultural interpretation, key nodes could establish public leisure spaces like

"Grain Transport Relay Stations" offering rest, stamping activities, and digital interactive devices, creating a gamified check-in experience. Relevant authorities could launch a "Canal Tour" mini-program containing interpretive information and cultural guide maps for all heritage spaces in Tongzhou District, allowing users to access specific explanations for each site directly within the program. QR codes could be placed at various heritage spaces providing access to AR digital reconstruction models and interpretive information upon scanning, establishing a highly interconnected guide system.

5 Conclusion

The Grand Canal is a treasure of Chinese civilization. The heritage spaces along its banks connect history and reality, serving as core carriers for showcasing canal culture and continuing the city's cultural lineage. Through systematic planning and precise measures, enhancing performance across all dimensions can allow the Tongzhou section's heritage spaces to shine with unique brilliance within Grand Canal cultural transmission. May the canal culture endure and thrive through the long river of time.

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villagers-enterprises", to promote the creative transformation of cultural heritage, and boost rural revitalization and cultural self-confidence.

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