Study on the Town Pattern Characteristics of Tongzhou in Beijing Based on the Change of Water Environment

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Abstract
As the starting point of the northern end of the Beijing-Hangzhou Grand Canal, a world cultural heritage, Tongzhou is closely linked to the changes in the water environment. After hundreds of years of development, Tongzhou has evolved from a canal town to a Sub-center of Beijing. This study uses the continuous change of the water environment on the time axis as a clue. According to the era background of the beginning, prosperity, and decline of urban water transport culture, the Tongzhou pattern can be divided into three significant historical periods: Jin Dynasty, Yuan-Ming-Qing Dynasties, and modern times. Moreover, this research discussed the spatial characteristics of the Tongzhou during each period in detail. On this basis, the profound impact of the water environment on the transportation, storage, and culture of Tongzhou is further explored. Finally, the research analyzes contemporary issues such as eco-city and city identification during the construction of the Beijing sub-center. The purpose of this study is to summarize the historical context of Tongzhou and emphasize the critical role of the water environment in the urban pattern change and cultural heritage.

Keywords
Tongzhou; Beijing-Hangzhou Grand Canal; Urban Pattern; Water Environment; Beijing Sub-center

1 Introduction
Tongzhou is located in the southeast of Beijing and is the eastern gateway of the capital. As the northern end of the Beijing-Hangzhou Grand Canal, a world cultural heritage, Tongzhou is the most concentrated and abundant area of Beijing's canal cultural heritage.

From the perspective of geographical conditions, the terrestrial environment of Beijing plain determines the hydrological characteristics of Tongzhou and also determines the development direction of Tongzhou: it is located between two alluvial fans with an average elevation below 20 meters. There are many rivers and lakes (the Chaobai River, Wenyu River, etc.), which provides the possibility for the development of water transportation in Tongzhou (Figure 1).

Tongzhou's urban development began in the Western Han Dynasty, where Luxian was set up. In the Jin Dynasty, Beijing became the capital of the feudal dynasty, and at the same time, the Beijing-Hangzhou Grand Canal was open to navigation. Tongzhou, as a transportation hub at the northern end of the canal, continuously supplies material resources from various places to the seat of the capital, providing conditions for the development and growth of Beijing. The long-term transport function has enabled Tongzhou to accumulate deep canal cultural heritage, making it an essential part of Beijing's historical and cultural city.

Though thousands of years of development, Tongzhou became a district of Beijing after 1949. In 2012, 155 square kilometers at the core of Tongzhou became the Beijing Sub-center, and all government agencies in Beijing moved in.

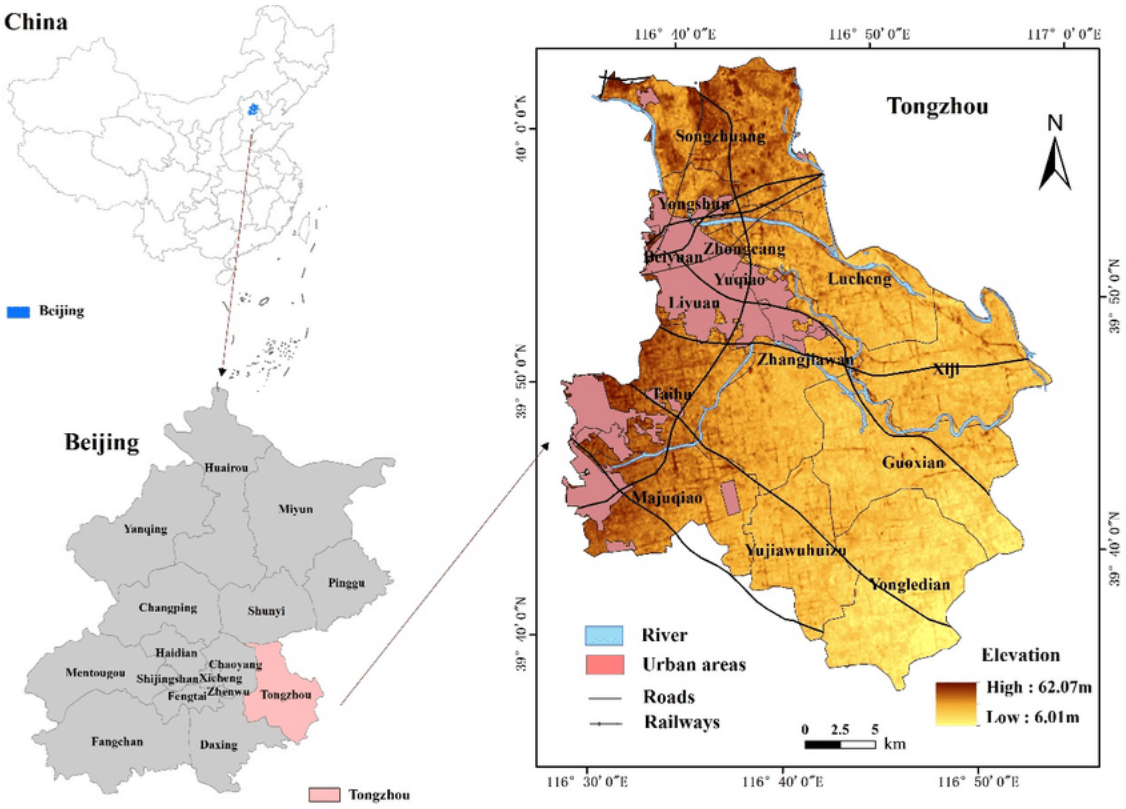

Figure 1. Geographical Location of Tongzhou District, Beijing. Expansion of Rural Settlements on High-Quality Arable Land in Tongzhou District in Beijing.

2 The Main Historical Stages of Changes in Tongzhou Water Environment and Town Pattern

2.1 Town Pattern Characteristics of the Initial Period of Water Transport in the Jin Dynasty

In 1151, the Emperor Hailing moved his capital to Yanjing and promoted the Luxian county to Tongzhou State. In 1171, the Yellow Emperor ordered the excavation of the Jinkou River. The river was diverted from the north of capital from Jinkou estuary, and then from the east to the north of today's Tongzhou and merged into the Lushui River. In 1204, to transport corn from Shandong and Hebei and linked the water systems with Gaoliang River, Bailian Lake, ect., the Jin emperor ordered a further excavation of the Zha River on the parallel south side of Jinkou River.

2.2 Town Pattern Characteristics on the prosperity period of the Beijing-Hangzhou Grand Canal during the Yuan-Ming-Qing Dynasties

In 1215, when Mongolia occupied Zhongdu, the imperial city and palace city were destroyed into ruins, and the area was renamed Yanjing. In 1264, Kublai Khan renamed Yanjing as Zhongdu. In 1272, he changed the Zhongdu to the Dadu as the capital of the Yuan Dynasty. At this time, the tribute rice was mainly taken from the Jiangsu and Zhejiang regions. The amount of grain levy from Jiangsu and Zhejiang provinces accounted for nearly one-third of the total grain levy in the whole country. With the completion of the Beijing-Hangzhou Grand Canal, Tongzhou's status has become increasingly prominent. During the centuries of the Yuan Dynasty, the Ba River, Tonghui River, Jinkou new River, and Xiaotaihou River were successively built, which further strengthened the connection between east and west waterways between Dadu and Tongzhou. The water environment of Tongzhou Town itself did not change significantly from the Jin Dynasty. According to the town and water system distribution map at that time, it can be seen that Tongzhou in the Yuan Dynasty presented a water environment pattern of the town surrounding by the canal (Figure 2).

In the Yuan Dynasty (1368), the strategic status of Tongzhou was gradually improved, and the city was expanded. The town doubled southern

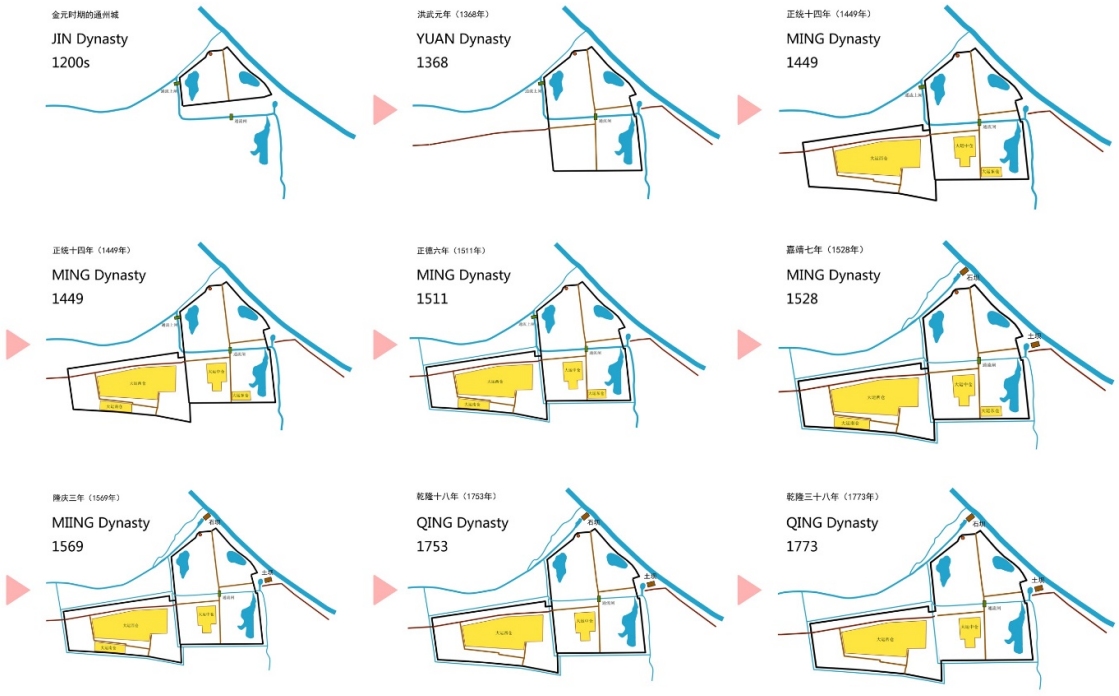

Figure 2. Changes of Tongzhou Town Pattern and Water Environment in Jin, Yuan, Ming and Qing Dynasties. Research Group of Tongzhou History - Water Transportation - Canal Culture of Peking University.

from South Moat, so the original moat became a through-town river. The town region at this time is commonly known as the old town of Tongzhou. At the same time, the Beijing-Hangzhou Grand Canal has gradually become a crucial north-south water transportation line. Tonghui River was dredged in the Ming Dynasty (1528) because of the block at the end of the Yuan Dynasty. The estuary of the Tonghui River was also moved from Zhangjiawan to Tongzhou. In 1449, to prevent Mongolia from looting Tongzhou across the Great Wall, which could lead to the severing of Beijing garrison food, a city was added to the west of the Tongzhou southern region to protect the West Warehouse, commonly known as New Town (Figure 2).

Qing Dynasty (1758), the west gate, and the south wall of Tongzhou's old town were demolished, and the old town and the new town merged into one, thus forming the Tongzhou historic town area. In the middle and late Qing Dynasty, the scale of maritime transportation gradually expanded, and the vital role of the Beijing-Hangzhou Grand Canal gradually weakened. Tongzhou town areas and water systems have, therefore, changed little (Figure 2).

2.3 Town Pattern Characteristics of the Water Transportation Decline Period During Modern Time

In the last years of the Qing Dynasty, the transportation of tribute rice was difficult due to the disrepair of the Grand Canal and the disadvantages of the water transport system. With the completion of the Beijing-Tianjin Railway, the tribute rice transportation was switched using the train to transfer to Beijing after 1900 without passing Tongzhou. As a result, Tongzhou has lost its status as a transit hub for tribute rice. At the time of the Republic of China, with the cessation of tribute rice, the government's emphasis on Tongzhou gradually weakened. Tongzhou town was desolate, households were sharply reduced, and the economy was withering.

After the founding of the People's Republic of China, the area of water bodies in Tongzhou further reduced notably the water bodies in the south of the town gradually disappeared. One part of the channel connecting the warehouses was filled, and the other part was covered by

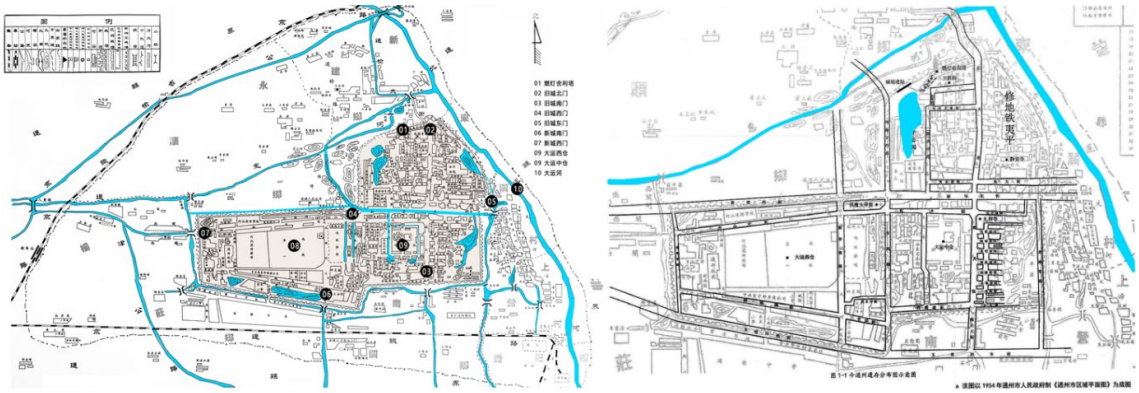

Figure 3. Changes of Tongzhou Town Pattern and Water Environment in 1954 and 2010 (P.R.C period). Beijing Advanced Innovation Center for Future Urban Design.

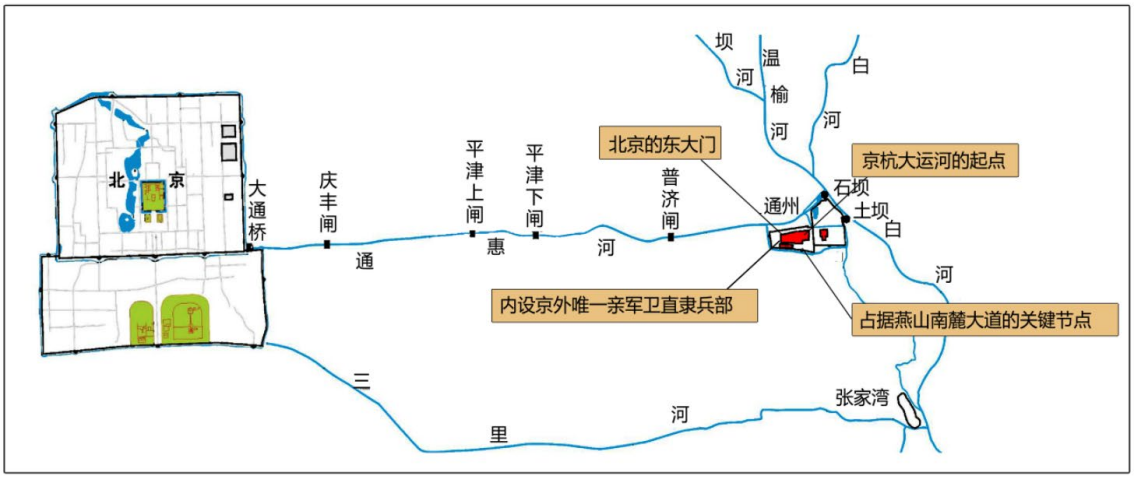

Figure 4. The Water Transportation System between Tongzhou and Beijing. Beijing Advanced Innovation Center for Future Urban Design.

roads to form underground water channels. The warehouse is no longer the most important building in the town. Since its development and evolution, only West Warehouse and Middle Warehouse could find a little trace. The historic streets on the north were almost completely demolished during the recent construction of the town, and only the Randeng Tower, Three Religions Temple, and the Xihaizi Park were kept in isolation. The Hutongs around South Street are intact for the Hui people's inhabitants, so they have kept intact and have a clear and variable historical pattern (Figure 3).

3 3 Influence of water Environment on Tongzhou

3.1 Water Environment and Transportation

As the saying goes, the establish of Beijing was based on Zhangjiawan. The construction and operation of Beijing heavily depended on water transportation. The Grand Canal and Tongzhou played an essential role in Beijing's urban development. The primary purpose of the Tongzhou water system, especially the canal system, is the transportation of grain. It can be divided into two parts: to south China and the Beijing city. The function of the Rockfill Dam is the transfer terminal of grain to Beijing, while the Earth Dam is the transfer terminal grain to Tongzhou. Commercial transportation has even affected the naming of Tongzhou neighborhoods. The most representative one is the Ciqi (porcelain) Hutong located on the east side of North Street, which name related to Jingdezhen Kiln, Jun Kiln, Cizhou Kiln, and other well-known porcelain production areas connected by Grand Canal (Figure 4).

3.2 Water Environment and Warehousing

The development of water transportation not only strongly supported the construction of Beijing. In the town development of Tongzhou itself, changes in the water environment also

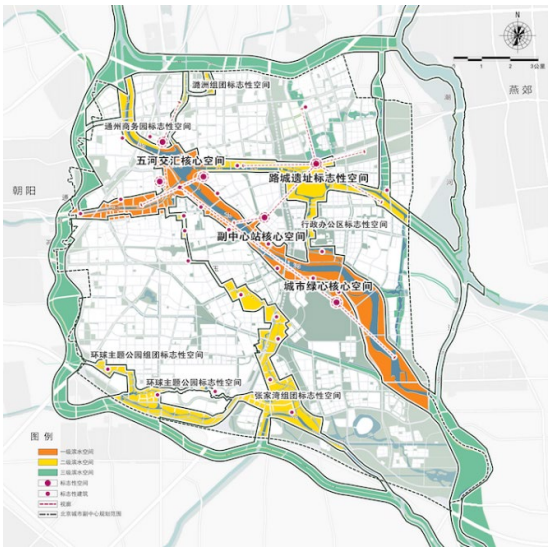

Figure 5. Planning Diagram of the Three-level Waterfront Space and Important Nodes of Beijing Sub-center. Beijing Municipal Commission of Planning and Natural Resources.

affected the shaping of the town pattern skeleton. Tongzhou initially formed a basic pattern of coexistence of East Warehouse, Middle Warehouse, and West Warehouse in the Ming Dynasty. In 1449, the South Warehouse was newly built on the south side of West Warehouse. In 1511, to facilitate the transportation of materials to various warehouses, Tongzhou introduced the canal water system along the outside of the old and new town walls. In 1528, Tongzhou built Rockfill Dam and Earth Dam dedicated to the water transportation terminal. Since then, the town structure of Tongzhou has reached a complete period. Later from 1569 to 1773, East Warehouse, South Warehouse, and the walls and gate of the southwestern town of the old town were demolished one after another.

3.3 Water environment and culture

As one of the critical world cultural heritages, the influence of the canal on its surrounding natural and human environment has created Tongzhou's unique cultural landscape. Along the North Canal, there are a large number of cultural heritages such as ancient river channels, docks, dams, dikes, warehouses, temples, bridges, and so on. Today in Tongzhou, the old Zha River and Tonghui River channel of Jin Dynasty near the historic town still exists. The site of Middle Warehouse, West Warehouse, and South Warehouse can even be identified. The Beijing-Hangzhou Grand Canal is not only a national fundamental cultural relics protection unit but also a world cultural heritage. Among them, Zhangjiawan and Rockfill Dam still have the function of use while having features of the landscape. Historic buildings such as the Sky Queen Palace dedicated to the transportation protection god Mazu is a primary cultural carrier generated under the historical background of water transportation, and it is also a reflection of the simple dialogue between human and water spirit.

4 Reflections on the Water Environment in the Period of Beijing Sub-center

4.1 From Canal Town to Sub-center of Capital

In 2012, the Beijing Municipal Government explicitly proposed “focusing on the Tongzhou strategy and building a fully functional city sub-center.” In early 2019, the Beijing city-level administrative center officially moved into Tongzhou, which represents it formally entered the era of Sub-center.

The canal is the source of the unceasing development of Tongzhou. In the new period, cities can give full play to the advantages of ancient canal resources to drive the growth of various affairs. On the one hand, the government pay attention to ecological flood control, optimize waterfront space, open riparian space, reduce the fragmentation of urban area by dikes, and bring people and nature back to harmony. On the other hand, the government focus on strict water pollution controlling, pleasant spatial environment creating and trying to attract people to return to the waterfront area to activate and bring vitality back (Figure 5).

4.2 Construction of Waterfront Ecological City

Historical progress shows that the focus of cities on water systems in different periods has continuously changed. The use of water resources in Tongzhou also evolved from the basic needs for survival and development in the early stages, and gradually to higher requirements for comfort and sustainability.

During the Sub-Center period, Tongzhou is no longer just an existing built-up area oriented to history, but also including a large-scale new-built area. Therefore, different strategies are needed for various areas on the city scale. Tongzhou begins to use urban design guidelines as a planning controlling tool. These guidelines

request the city should rely on the green background of abundant rivers and aims to build an ecological city that integrates water and city based on ensuring the safety of urban flood and waterlogging prevention. There have three main guidance aspects: good scenery view, a close relation to the water, and vitality. Elements such as water bodies, riparian areas, green belts, roads, and bridges in waterfront spaces require to follow high standard requests from these aspects. Besides, Tongzhou further adopted a refined sponge city construction strategy, which should be based on the core concepts seepage, stagnation, storage, net, use, and exhaustion.

4.3 Water Environment and City Identification

The Grand Canal is the most critical city name card for Tongzhou. The resulting cultural relics such as canals, city walls, temples, streets, official residences, docks, warehouses, and transportation facilities are scattered all over the city, and their richness is rare in China, which becomes the most valuable city identification . The conservation of these identifications can be divided into two parts: material and non-material. At the material level, the government has strengthened the protection of the pattern and remains of historical areas around the Grand Canal. The action at the non-material level mainly includes the protection of the connotation of place names and culture, so that the historical context of Tongzhou can continue.

5 Conclusion

The Grand Canal will always be the soul of Tongzhou from hundreds of years ago to the future. The town pattern relies on the growth, prosperity, decline, and prosperity of the canal. Canal and related remains are an essential carrier of Tongzhou's cultural heritage, and it has a unique city identification. In the vital period when Tongzhou becomes Beijing Sub-center, attention should be paid to the protection of urban ecology and waterfront space, as well as the inheritance of canal culture, which should be strengthened. Finally, an outstanding water environment will lead this ancient city to a better future.

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