Study on landscape rheology of architectural cultural heritage in Shandong section of Beijing Hangzhou Grand Canal

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Abstract. Architectural heritage is an important part of the cultural heritage of Beijing Hangzhou Grand Canal and an important carrier of historical culture. On the basis of expounding the temporal dynamic pattern of architectural cultural heritage of Beijing Hangzhou Grand Canal, this paper reveals its leading process and main factors. The results show that the time dynamic pattern mainly depends on political, cultural, institutional and economic factors. At the same time, this paper puts forward some innovative strategies for its protection and sustainable development.

1. Introduction
The Beijing Hangzhou Grand Canal is a cultural heritage formed by long-term historical accumulation, which is obviously non replicable, inheritable and superimposed. In June 2014, at the world heritage conference, the Grand Canal of China was successfully selected into the world cultural heritage list. Most of the existing studies focus on a single building or several buildings, or stay at the level of existing heritage survey. Due to the lack of overall research perspective of Landscape Geography, the overall spatial and temporal pattern of architectural cultural heritage of Beijing Hangzhou Grand Canal, the causes of its differences and the law of change are still unclear. Therefore, this paper attempts to take the architectural cultural heritage of Shandong section of Beijing Hangzhou Grand Canal (namely Liaocheng section, Liangji canal section and Nansihu District section) as the research object, and comprehensively constructs the temporal dynamic pattern of the existing architectural cultural heritage in Shandong section of Beijing Hangzhou Grand Canal. The objective is to reveal its internal mechanism, leading process and main causes. To explore the path of its protection and sustainable development, to provide a useful supplement for the theoretical research of the cultural heritage of the Beijing Hangzhou Grand Canal, and to provide a model for reference and reference for the relevant practice. It is very important to promote the excellent traditional culture of our country and to realize the cultural renaissance of the Chinese nation.

2. Materials and Methods
The architectural cultural heritage along the Shandong section of Beijing Hangzhou Grand Canal includes Liaocheng section, Liangji canal section and Nansihu District section, involving Liaocheng, Jining, Zaozhuang and seven counties and districts under their jurisdiction, and a large number of historical and cultural towns along the canal are concentrated.
According to the relationship between architectural cultural heritage and canal, architectural cultural heritage can be roughly divided into three categories: historical, functional and spatial. Historical correlation refers to the heritage derived from the development of canal water transportation, commerce and other functions. Functional correlation refers to the heritage directly related to the operation of the canal. Spatial correlation refers to the space location close to the canal cultural heritage, which is a part of the Canal Heritage. From the perspective of the correlation between the architectural remains and the Grand Canal, the historical related existing architectural cultural heritage is the most, followed by the spatial correlation, and the functional correlation is the least, with only two left. With the development of society, the function of the canal gradually weakened, and its functional buildings disappeared seriously.

3. Results & Discussion

3.1. Rheological characteristics of heritage buildings

The number of architectural remains of different periods is showed in Figure 1. It can be found that along the Shandong section of the Beijing Hangzhou Grand Canal, the number of architectural cultural heritages in various periods from Sui and Tang Dynasties to Ming and Qing Dynasties increased gradually with the passage of time, but decreased sharply in the period of the Republic of China. On the one hand, this phenomenon reflects that the older the age, the less remains of ancient buildings. On the other hand, influenced by the development of the canal in different periods, the Ming and Qing Dynasties were the most prosperous stage of the development of the Grand Canal, and the towns along the canal were more developed. Therefore, the number of ancient architectural remains along the canal increased sharply. However, with the abolition of water transport in the late Qing Dynasty, the status of the Grand Canal fell sharply. The active degree of urban settlements along the canal was reduced due to the prosperity of the canal. The number of remains of ancient buildings in the period of the Republic of China was affected by the continuous wars.

From the dynamic change of architectural types (Table 1), the existing Confucian architecture in the study area has the longest history, which was built in the Sui and Tang Dynasties, and is also the only surviving building in this period; the number of existing Taoist and Buddhist buildings is equal, and they are mainly built from Song Dynasty to Qing Dynasty, among which, Buddhist buildings are mostly built in the song and Jin Dynasties, while Taoist buildings are mostly built in the Ming and Qing Dynasties; the research area The existing Christian and Islamic buildings, as well as other building types such as Guildhall buildings were built after the Ming and Qing Dynasties. Among them, Islamic architecture is the most popular. The prosperity of Islamic communication in the Grand Canal Shandong basin during the Ming and Qing dynasties can be seen imaginably.

![Figure 1 Number of architectural remains of different periods in Shandong section of Beijing Hangzhou Grand Canal](image)
Table 1. Dynamic distribution of architectural types in Shandong section of Beijing Hangzhou Grand Canal.

|                | Confucianism | Taoism | Buddhism | Christianity | Islamism | Total |
|----------------|--------------|--------|----------|--------------|----------|-------|
| Sui and Tang Dynasties | 1            | 0      | 0        | 0            | 0        | 1     |
| Song and Jin Dynasties  | 0            | 1      | 5        | 0            | 0        | 6     |
| Ming and Qing Dynasties | 1            | 4      | 1        | 1            | 9        | 7     |
| Republic of China      | 0            | 0      | 0        | 2            | 0        | 11    |
| Total                   | 2            | 5      | 6        | 3            | 9        | 25    |

3.2. Influence factors of the rheology of architectural cultural heritage

3.2.1. Social thought and religious communication.

Since the establishment of the orthodox position of Confucianism by Emperor Wu of Han Dynasty, Confucianism has gradually become an expression of the inherent value system of China. It has experienced the strong impact of Buddhism and Taoism in the Wei, Jin, southern and Northern Dynasties. In the Sui and Tang Dynasties, Confucianism returned to the mainstream again. In Song Dynasty, with the rulers' esteem of Taoism and the prevalence of Zen Buddhism, Confucianism needed to be revived. Neo Confucianism, which was based on Confucianism and integrated Buddhism and Taoism, gradually formed the Neo Confucianism of Song and Ming Dynasties, which became the dominant Confucian philosophy system since Song and Ming Dynasties. Therefore, the dominant position of Confucianism since the Sui and Tang Dynasties made zhongzi temple the only remains of Tang Dynasty ancient architecture preserved in the eastern section of the Beijing Hangzhou Grand Canal. The heritage of Taoism and Buddhist architecture also reflects the prevalence of Buddhism since Song and Jin Dynasties and the overall secularization of Taoism in Ming Dynasty[1,2].

Christianity spread in China for the first time in Chang'an, the capital of the Tang Dynasty. Its introduction to Shandong can be traced back to the Yuan Dynasty, and then almost disappeared with the demise of the Yuan Dynasty. In the Ming Dynasty, Christianity was introduced into Shandong again and achieved great success. In 1720, Emperor Kangxi banned Christianity, and missionaries of Christian Church secretly preached in Shandong. Therefore, there were no remains of ancient buildings related to Christianity before the Qing Dynasty. After the Opium War in 1840, the Christian missionary activities in Shandong began to resume gradually, allowing the establishment of churches and cemeteries, and officially obtained the freedom of missionary work. Therefore, the existing Christian related ancient buildings in Shandong section of the Beijing Hangzhou Grand Canal mainly include the Christian Church in Liaocheng and Huangjia Street Church and chapel church building in Jining, which were built in the Qing Dynasty and the Republic of China respectively. After the Juye religious case in 1897, the focus of the church power shifted to Jining, the core area of southern Shandong Province. Jining became the center of missionary work of the holy word Church in China.
Jining, the core area of southern Shandong Province. Jining became the center of missionary work of the holy word Church in China Islam was first introduced into China from the Sui and Tang Dynasties, and the Tang and Song dynasties were the initial stage. At that time, the overseas trade was very developed, and Islam was introduced into China along with Muslim merchants. The period of yuan, Ming and Qing Dynasties was an important period for the development of Islam. With the opening of the Beijing Hangzhou Grand Canal, Muslim businessmen in business frequently appeared in the major cities along the canal. In the Yuan Dynasty, Muslim merchants had spread all over the country. In the Ming and Qing Dynasties, their business scope gradually expanded and they were involved in all walks of life. They traveled from north to south through the Beijing Hangzhou Grand Canal, and concentrated in major towns along the canal. They built a large number of Islamic buildings and left many architectural cultural heritage. There are 9 remains of Islamic architecture in the eastern section of Beijing Hangzhou Grand Canal, including 8 built in the Ming Dynasty, which are distributed in Liaocheng, Jining and Zaozhuang ancient towns with canal culture.

3.2.2. Economic and commercial activities.
The first is the tax system. In the Ming Dynasty, there was a system of setting up checkpoints to collect taxes on important transportation lines. After the completion of the northern and southern Grand Canal, the canal evolved into the most important commercial road for transporting grain and goods in the north and south. Therefore, Chao Guan was moved along the canal. During the Yongle period, four banknotes were set up along the Shandong canal, namely Jining, Dongchang, Linqing and Dezhou. Later, due to the lack of water and difficulties in navigation, in order to make it convenient for ships to travel, other banknotes except Linqing were cancelled. The reduction of taxes along the canal in Shandong Province has promoted the development and prosperity of Commerce and transportation. After entering the Qing Dynasty, the customs duty began to decline, until the establishment of the customs in the late Qing Dynasty, coupled with the abandonment of the canal, the banknote customs duty in Linqing decreased year after year. Until the 19th year of the Republic of China, the 500 year old Linqing banknote pass was closed and abandoned [3]. As a result, only Linqing chaoguan and Linqing Weiwang chaoguan, both built in the Ming Dynasty, exist in the Shandong section of the Beijing Hangzhou Grand Canal. Secondly, commercial activities. During the Ming and Qing Dynasties, the opening of the Grand Canal greatly promoted the development of commodity economy. The frequent long-distance commodity trafficking activities led to the construction of commercial guilds along the Grand Canal, which became a historical witness of the commercial development of the Grand Canal. In the canal basin of Shandong Province, the Ming Dynasty was the peak stage of the rapid growth of Huizhou merchants, but after the Qing Dynasty, the influence gradually weakened, so the number of guild hall remains is small. In the Qing Dynasty, Shanxi merchants played an important role in the regional commerce of the Grand Canal in Shandong Province. Their influence basically occupied the northern market of China. There were a large number of commercial guilds in Jining, Taierzhuang and other important canal towns. There are three existing guilds: Shanshan guild hall in Dongchangfu District of Liaocheng City, Zhangqiu Shanshan guild hall in Yanggu County and Shanxi guild hall in Taierzhuang. However, after the Republic of China, the Beijing Hangzhou Grand Canal gradually declined, new commercial organizations appeared in the city, and the canal commercial Guildhall disappeared from then on.

3.3. Inheritance and innovation strategy
There are 8 national and provincial cultural relic protection units in Shandong section of Beijing Hangzhou Grand Canal, 12 cultural relics protection units at municipal and county level, and one third of them are not listed as cultural relics protection units. From the current situation of architectural heritage protection, only 17% of the original objects are well preserved, and 62% are well preserved. 79% of the architectural cultural heritage still has high scientific research value. Among them, only 25% of the well preserved and well preserved ancient architectural relics are listed as national cultural relics protection units, and 65% of the ancient architectural relics with serious damage, no original objects
and complete reconstruction are non cultural relics protection units. Therefore, the protection consciousness and measures of architectural cultural heritage in Shandong section of Beijing Hangzhou Grand Canal need to be strengthened. On the other hand, there is a lack of overall planning. The architectural heritage of Beijing Hangzhou Grand Canal carries rich historical and cultural connotation, which is continuous, changing and integrated. Its inheritance and development should not be based on administrative divisions, but should be taken into account to promote collaborative innovation in many regions along the line. Its strategy depends on the inherent cultural heritage of each region, and inevitably presents the development trend of diversification and differentiation.

3.3.1. Building historical and cultural blocks.
Linqing has a profound historical and cultural heritage, has a strong traditional culture, all ethnic groups live in harmony, live and work in peace and contentment. Among them, the Islamic Mosque complex has a high historical and cultural value. The North mosque and East mosque are located on the East and west sides of Taoyuan Street respectively, surrounded by influential Hui communities. They are also one of the areas with large Islamic architectural communities along the Shandong section of the Beijing Hangzhou Grand Canal, which have the advantages and preconditions for the construction of historical blocks with Islamic ethnic customs. Through the construction of Islamic ethnic customs district, we should focus on protecting the traditional pattern of its remains, improve the comprehensive service facilities and municipal infrastructure, and use the architectural style and environmental color to reflect the historical and cultural accumulation of the region for hundreds of years. It has become an important way to spread and display the achievements of ethnic culture in order to produce greater economic, social and cultural benefits. In addition, the ancient streets of Qiji town in the Ming and Qing Dynasties were affected by canal transportation, and became an important water transportation hub and cargo distribution center in the east of Yanggu. At present, only some remains are found along the canal. The streets are 2.2 meters wide and more than 200 meters long. Old plank houses can still be seen on the streets. There are ancestral halls, streets, teahouses, shops and other ancient architectural remains, surrounded by traditional villages and towns, with good environmental coordination. It is conducive to comprehensively sorting out the existing resources of streets and alleys, constructing historical and cultural blocks through landscape reconstruction, inheriting local culture under the premise of protection, exploring effective ways of renewal and formulating corresponding strategies for the new needs of urban development, so as to realize the development of historical blocks Sustainable development.

3.3.2. Restoration of the ancient city.
The restoration project of Taierzhuang ancient city has become an important part of the cultural renaissance of the Shandong section of the Beijing Hangzhou Grand Canal, and one of the typical cases of the continuation and development of the cultural heritage of the Grand Canal. Although there are not many remains of ancient buildings in Taierzhuang, only the halal ancient temple, the southern Muslim temple, the Shanxi guild hall and some trade names, the traditional water system and street spatial mechanism are well preserved. At the same time, there are more ancient relics in the canal revetment and canal wharf. Through the restoration of the ancient city, the historical relics of the ancient city are protected, and the endogenous power is stimulated, and the economic development of the tertiary industry is promoted, along with the culture The birth of new industrial formats. The first mock exam of the ancient city of Liaocheng is to build a core cultural heritage of Dongchangfu, which is the core of the ancient city of Liaocheng. It can display the core of the ancient city's spatial pattern, display the traditional customs and features of the old city, and build a new cultural innovation in the Shandong section of Beijing Hangzhou the Grande Canale based on the natural resources and the characteristics of the cultural industry that meet the needs of the times.
3.3.3. Building a heritage park.

Historical sites or relics are the premise of building a site park, and its primary purpose is to protect and reproduce the historical and cultural values of the sites. According to the differences of site types and status quo, the appropriate design ideas should be selected by comprehensively considering various factors. It should not only have the function of popular science education, so as to inherit the historical and cultural value it carries [4], but also consider its leisure and recreation function, so as to improve residents' life and increase urban vitality. The most important thing is to inherit and innovate the excellent Chinese traditional culture and enhance the city cultural brand and cultural competitiveness.

4. Conclusions

The dominant influencing factors of the rheology of religious architectural remains are social thoughts and religious communication, namely political and cultural factors. The distribution of religious relics depends on the history of the rise, spread and prosperity of the religion in the canal basin, the policies of the rulers towards various religions and the acceptance of religion by the people. Institutional factors play a decisive role in the evolution of functional buildings. For example, the emergence and oblivion of banknotes are directly related to the rise and abandonment of tax system. The distribution of commercial Guildhall buildings in different periods depends on the economic factors such as the prosperity and decline of commercial activities along the canal. However, in the implementation process of the specific strategy, regional differentiation development and cultural diversity also make the work face greater challenges [5]. There are many uncertain factors, especially in fully mining the innovation driving mechanism of the Grand Canal cultural heritage to the development of regional cultural industry, we also need to use effective quantitative tools and dynamic simulation model. Therefore, the exploration of practice based on the methodology system and research paradigm will be the focus of the future research on the protection and sustainable development of the cultural heritage of the Grand Canal.

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