

FORMATION AND CHARACTERISTIC ANALYSIS OF INDUSTRIAL HERITAGE SITES ALONG THE GRAND CANAL IN JIANGSU PROVINCE

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ABSTRACT

As a cultural treasure of China, the Beijing-Hangzhou Grand Canal has a rich history and cultural heritage. Jiangsu Province has a superior geographical location and convenient transportation, which not only promotes the prosperity of trade, but also provides convenient conditions for industrial development. The purpose of this paper is to make an in-depth study of the industrial heritage along the Jiangsu Grand Canal. Firstly, by reviewing the historical development of industry and the modern socio-economic situation in this area, we conduct a field survey, paying special attention to those industrial heritages that are representative and have high cultural and historical value, deeply analysing their current situation, discussing effective protection strategies and sustainable reuse methods; Second, delve deeply into the characteristics of industrial development along the canal, study the current situation and spatial distribution characteristics of industrial heritage in detail, and at the same time integrate canal culture and industrial culture organic integration, sum up the mode of industrial heritage protection and reuse along the Grand Canal in Jiangsu; Finally, pay attention to the historical memory and cultural spirit inheritance contained in industrial heritage, and explore how to integrate industrial heritage with modern urban development, for Jiangsu Province to contribute new ideas and practical experience to urban renewal and sustainable development. This will also help to better inherit the historical value of the Grand Canal, so that it can continue to bring cultural prosperity and inspiration to people.

Keywords: Jiangsu Canal, Industrial Heritage, Formation and Characteristic, Conservation and Reuse

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INTRODUCTION

The Grand Canal is one of the longest man-made rivers in the world, and its history can be traced back to the General Purpose Ditch of the State of Wu during the Spring and Autumn and Warring States Periods in the 5th century BC. During the Sui dynasty, the Beijing-Hangzhou Grand Canal connected the north and south for the first time. It passes through six provinces and cities, namely Beijing, Hebei, Tianjin, Shandong, Jiangsu, and Zhejiang, connecting the five major water systems, namely the Haihe, Yellow, Huaihe, Yangtze, and Qiantang rivers, and making great contributions to the exchange and communication between the north and the south. China's Jiangsu Province, located on the southeast coast, has a profound industrial heritage and a long history of industrial development. It has made significant contributions to China's economic growth (Jingjing, Lei & Wen, 2019). It is an important city in the history of the development of the Beijing-Hangzhou Grand Canal. There are many cities passing through the canal, such as Xuzhou, Suqian, Huai'an, Yangzhou, Zhenjiang, Changzhou, Wuxi, and Suzhou, which are areas with more industrial heritage (remains) in modern China (Figure 1).



Figure 1 Distribution map of Jiangsu canal flowing through cities

Source: collected by the author

Through the review of related studies, the main historical period of concern for industrial heritage along the Jiangsu Canal is since the Industrial Revolution in the second half of the 18th century to the present day, and the whole process of modern industrialization can be divided into the following stages (Table 1). According to the industrial heritage research and census carried out by the Department of Industry and Information Technology of Jiangsu Province in 2020, a total of 99 industrial heritages were recorded, of which 61 were recorded along the Jiangsu Canal area (between 1840 and 1990), accounting for 62% of the total number of heritages in Jiangsu Province. Cities along the canal relied on the convenient transportation advantages of the canal, which enabled the priority development of modern industry, and industrial heritage was gathered along the Beijing-Hangzhou Canal, expanding in a belt-like manner. Through the formation and characterization of the industrial heritage along the canal in Jiangsu, the value of the industrial heritage along the canal is assessed, and combined with the regional culture, new connotations and functions are given to the industrial heritage of the canal

through the study of a reasonable mode of protection and reuse, so as to achieve the purpose of combining the protection and utilization, and the integration of culture and tourism.

This research aims 1) to through the exploration and research of the development of modern Chinese industry, promote the in-depth research of industrial history in the direction of industrial heritage history and build a bridge of physical evidence between history and protection; and 2) to explore the reuse mode of industrial heritage protection to ensure the integrity and sustainable use of heritage.

Table 1 Stages of modern industrial development in China

Historical stages	Time span	Development process	Features
Modern industry	1840-1894	The embryonic stage of modern industry	After the Opium War, the Qing government was forced to sign unequal treaties, such as the "Nanjing Treaty", and was forced to form a semi-open trade market. Many industries achieved breakthroughs from scratch.
	1895-1911	Initial stage of modern industrial development	The signing of the "Treaty of Shimonoseki" and the "Sino-Germany Jiao-Australia Lease Treaty" allowed foreign capital to set up factories in various places, and China lost its exclusive right to industrial manufacturing.
	1912-1936	The rapid development of modern industry	During the period of the Republic of China, the industrial and commercial management institutions were reformed, the development of government-run industries accelerated, and modern industries gradually moved towards independent development.
	1937-1948	The modern phase of industrial decay	During the Anti-Japanese War, the development was difficult; the heavy industry in the northeast expanded rapidly; the industry in the southeast declined; the liberation war broke out; and the industrial development basically stagnated.
Contemporary industry	1949-1965	Initial stages of modern industrial development	After the founding of the People's Republic of China, different degrees of socialist transformation were carried out on the original foreign-funded enterprises, national government-run enterprises, private enterprises, and handicraft industries, and a group of large-scale heavy industry enterprises were met with the assistance of Soviet experts.
	1966-1976	Modern industrial stagnation phase	After ten years of the "Cultural Revolution", modern industry was advancing in a zigzag period, and industrial production stagnated or even regressed.
	1977 - present	Modern industrial development phase	During the period of great development of socialist modern industry, the industrial structure was adjusted from the second to the third, prompting the repositioning of certain industrial areas.

Source: Collected by the author

LITERATURE REVIEWS

The origins of industrial heritage

In the middle and late 20th century, western countries successively entered the post-industrial era with the origin of the "Industrial Revolution". Under the dual influence of economic globalization and de-industrialization, traditional manufacturing industrial cities have

experienced different degrees of decline. The choice of leaving the abandoned industrial heritage in the city is not only a technical and economic problem but also involves complex problems such as social problems, the ecological environment, urban rejuvenation, and life reconstruction. In the face of urban renewal and urban protection, the Great London Industrial Archaeology Society was established in the United Kingdom in 1968. It aims to investigate, count, and record historically valuable industrial relics and recommend local governments to protect these historically valuable industrial buildings and facilities (Boying & Zhongping, 2009). In the 1970s, people began to deeply realize the importance of industrial heritage in the history of social development, and people gradually formed a relatively complete concept of protecting industrial heritage.

In 1978, the International Committee for the Conservation of Industrial Heritage (TICCIH) was established, and it became the first international organization dedicated to promoting the protection of industrial heritage in the world. In July 2003, at the General Assembly held in Nizhny Tagh, Russia, an international standard dedicated to the protection of industrial heritage was adopted, namely "the Nizhny Tagh Charter on Industrial Heritage". It systematically and profoundly explains the significance and basic methods of industrial heritage protection, and it has become an important symbol of the formation of the international consensus on industrial heritage protection. From then on, the dilapidated and abandoned industrial plants and rusted idle production equipment are no longer dirty, ugly, shabby, or negative; instead, they witness the irreplaceable urban characteristics formed by the industrial heritage and reflect the history of human industrial civilization (Boying & Zhongping, 2009; Ji, 2019).

The connotation of the industrial heritage

Industrial heritage is an important milestone in the history of mankind and is related to the economic, technological, and architectural development of our cities (Douet, 2014). The area covered by industrial heritage is clearly defined in the Nizhny Tagh Charter. It includes industrial cultural monuments of historical, technological, social, architectural, or scientific value, but also buildings and machinery, factories, production workshops and mills, mines, as well as sites of processing and refining, warehouses and stacks, places of production, transformation, and use, transport, and its infrastructure, as well as places of industry-related social activities, such as those used for housing, religion, or education (Xiaohan Li & Zhenyu Yang, 2018). It establishes a link between the modern world and history, serving as an authentic chronicler of the advancement of human civilization (Clark, J., 2013). The old industrial buildings, industrial equipment, and site structures along the Grand Canal in Jiangsu Province, China, which are relatively well preserved and have a high residual value, and the enumeration of cases are based on the following criteria:

1. Early construction of a seminal industrial landscape that marks the beginning of a particular industrial discipline in China;
2. Associated with major historical or political events;
3. Once dominant in scale and technology among its peers, representing the advanced level of productivity at the time;
4. Marking a technological change in industrial production or innovation in the form of management;
5. Exert a profound influence on driving regional economic expansion and urban development;
6. Reflecting the specific aesthetic orientation derived from industrial production in a certain period.

RESEARCH METHODOLOGY

Literature research

The literature review method mainly involves collecting, identifying, and organising literature to form a scientific understanding of the facts. This article mainly includes three aspects: 1)

research on relevant concepts of industrial heritage; 2) research on the development of modern industrialisation in cities along the Jiangsu Canal in recent times; and 3) research on literature related to the protection and reuse of industrial heritage along the Jiangsu Canal.

Interview method

The interview method uses two approaches to conducting interviews: in-depth interviews and group interviews. The interviewees include four types of people: members of the public (visitors), local residents, experts from relevant industries, and experts from industrial heritage management departments.

Fieldwork method

By integrating the results of the literature and the field survey, we have determined the distribution, primary construction periods, types, core components, protection, and use status, as well as the types of reuse for the industrial heritage studied. Finally, protection and reuse measures are proposed, providing a theoretical reference for future studies and practical developments of a similar nature.

Scope of the study

The scope of this study covers the Jiangsu section of the Grand Canal, including eight cities along the canal: Xuzhou, Suqian, Huai'an, Yangzhou, Zhenjiang, Changzhou, Wuxi, and Suzhou. Field surveys were carried out in these regions to determine the distribution of some industrial heritage sites. A total of 23 sites with documented records and historical value were identified, six of which were designated as national industrial heritage sites (Table 2). The industrial heritage sites surveyed in this study vary in size and have distinctive styles, making them valuable research subjects and providing guidance for the renovation of other industrial heritage sites.

Table 2 Distribution of some industrial heritage along the Jiangsu Canal

NO.	City	Completed years	Name	Address	New name	Use the mode
1	Suzhou	1950s to 1970s	Suzhou Second Pharmaceutical Factory	No. 859 Panxu Road, Gusu District	Suzhou 69 Pavilion Cultural and Creative Industry Park	Creative Industry Park
2	Suzhou	1950s	Suzhou Power Capacitor Factory	No. 26 Baita East Road, Gusu District	Rong Creative Industry Park	Creative Industry Park
3	Suzhou	1950s to 1970s	Jiangnan Radio Factory	No. 426, Xujiang Road, Gusu District	Jiangnan Cultural and Creative Industry Park	Creative Industry Park
4	Suzhou	1890s	SuLun spinning factory	No. 239, Renmin Road, Gusu District	Su Lun Factory Fashion District	Business district
5	Suzhou	Late Qing Dynasty	Suzhou Lumu Royal Kiln Gold Brick Factory	No. 95, Yangcheng Lake West Road, Xiangcheng District	Royal Kiln Gold Bricks Museum	Museum
6	Wuxi	Ming Dynasty to Republic of China	Dayao Road Kiln Group Site	No. 27 Dayao Road, Liangxi District	Wuxi Kiln Group Site Museum	Museum

NO.	City	Completed years	Name	Address	New name	Use the mode
NO.	City	Completed years	Name	Address	New name	Use the mode
7	Wuxi	1930s	Yongtai Silk Factory	No. 364, Nanchang Street, Liangxi District	China Silk Industry Museum	Museum
8	Wuxi	1940s	Wuxi Kaiyuan Machine Factory	No. 11 Hubin Road, Hubin District	Canal bund	Business district
9	Wuxi	1940s	Maoxin flour factory★	No. 415 Zhenxin Road, Liangxi District	China National Museum of Industry and Commerce	Museum
10	Changzhou	1930s to 1970s	Changzhou Hengyuan Chang Factory★	No. 141, Sanbao Street, Bell Tower District	Canal No.5 Creative Park	Creative Industry Park
11	Changzhou	1920s to 1970s	Changzhou Daming Yarn Factory	No. 388 Yanling East Road, Economic Development Zone	Tianhong Daming 1921 Creative Park	Creative Industry Park
12	Changzhou	1960s to 1980s	Changzhou No. 2 Radio Factory Site	No. 93, Qingtan Road, Zhonglou District	Guoguang 1937 Science and Technology Cultural and Creative Park	Creative Industry Park
13	Changzhou	1930s	Qi shu yan machine factory	No.358, Yanling East Road, Economic Development Zone	CRRC Qishuyan Locomotive Co., Ltd. (still in use)	Factory
14	Zhenjiang	1950s	Heng shun Zhenjiang balsamic vinegar traditional brewing area★	No. 60, Guangyuan Road, Xincheng, Dantu District	China Vinegar Culture Museum	Museum
15	Zhenjiang	1950s	Texaco, Mobil, Asia Minor Fire Oil Co	West Jindu Street, Runzhou District	Pien Tze Huang Museum, Xijindu Cultural and Art District	Museums, commercial districts
16	Yangzhou	1930s	Yangzhou wheat powder factory	Hanjiang District Gaoqiao South Road 20 Yi imen Square south building	Yangzhou Industry Museum	Museum
17	Yangzhou	1860s	Xie Fuchun Site	No. 243, Dongguan Street, Guangling District	Xie Fuchun Fragrance Powder Craft Hall	Museum
18	Huai'an	1960s	Huaiyin Xinhua Printing Factory	No.44, Huaihai North Road, Qingjiangpu District	Huaiyin Time Cultural and Creative Park	Creative Industry Park
19	Suqian	1940s	Yanghe old cellar pool group	No. 118, Middle Street, Yanghe	Yanghe Winery (still in use)	Factory

NO.	City	Completed years	Name	Address	New name	Use the mode
			and brewing workshop★	Town, Sucheng District		
NO.	City	Completed years	Name	Address	New name	Use the mode
20	Suqian	1930s	Shuanggou old cellar group and winemaking workshop	No. 173, Middle Street, Shuanggou Town, Sihong County	Shuanggou Winery (still in use)	Factory
21	Suqian	1950s to 1960s	Jiangsu glass factory	Suyu District Santai Mountain Forest Park is 800 meters to the south	Crystal World Glass art gallery	Museum
22	Xu zhou	1950s	Quan Tai coal mine	Jiawang District Street, Panan Lake	Quantai Coal Mine Site Creative Park	Creative Industry Park
23	Xu zhou	1970s	Peigong wine cellar group and brewing site	No. 128 Dongfeng West Road, Peixian County	Peigong Winery (still in use)	Factory

Remarks: “★” indicates industrial heritage listed in China's National Industrial Heritage List

Source: Collected by the author

RESEARCH RESULTS

Basic characteristics of the industrial heritage along the canals in Jiangsu

In terms of the distribution of the industrial heritage sites surveyed, of the 23 industrial heritage sites surveyed for the first time, there are 5 in Suzhou, 4 in Wuxi, 4 in Changzhou, 2 in Zhenjiang, 2 in Yangzhou, 1 in Huai'an, 3 in Suqian, and 2 in Xuzhou. In terms of geographical distribution, the industrial heritage along the canal in Jiangsu is mainly concentrated in the southern part of Jiangsu, with 15 sites, accounting for 65.22% of the total number of sites surveyed. Geographically, the industrial heritage is mainly concentrated along the Grand Canal Cultural Belt, where urban industries along the canal were given priority due to the convenient waterway transportation.

The main body of industrial heritage along the canals of Jiangsu built in the years

From the perspective of the main construction periods of the surveyed industrial heritage, they can be roughly divided into the following categories: pre-late Qing Dynasty (before 1910) with a total of 4 sites, Republic of China and the Transition Period (1910-1949) with a total of 7 sites, early years of the People's Republic of China (1950-1969) with a total of 7 sites, and post-reform and opening up era (after 1970) with a total of 5 sites. Among these, the highest proportion is found in the heritage from the Republic of China to the early years of the People's Republic of China, accounting for 60.86% of the total surveyed (Table 3).

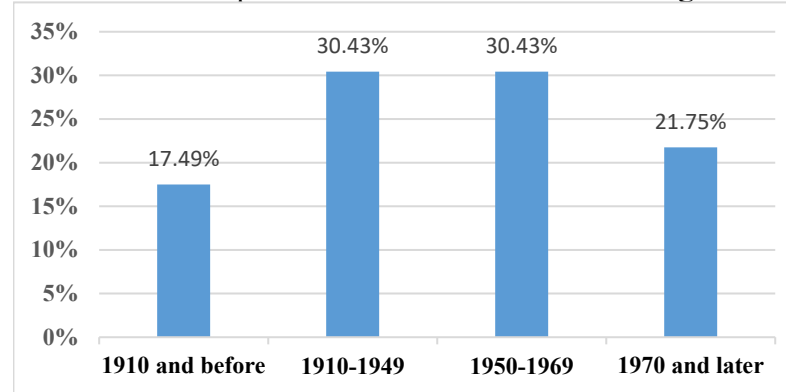
Main types of industrial heritage along the canals in Jiangsu

From the types of heritage sites surveyed, it can be seen that Jiangsu Province has a wide variety of industrial heritage sites, covering 14 categories (Figure 3). Among them, the Wuxi Yongtai Spinning Mill is one of the most important early machine silk factories in China and has now been transformed into the China Silk Museum. In addition, Wuxi is also one of the four major modern spinning centers in China, with more than 140 spinning mills, including Yongtai Spinning Mill and Hua Xin Spinning Mill, Wuxi Maoxin Flour Mill, the birthplace of China's national industry and trade, is one of the earliest national capital enterprises and one of the

earliest joint-stock companies in China, founded by the Rong family. It has now been converted into the National Museum of Industry and Commerce.

Conservation and use models for the industrial heritage under study

Table 3 The completion date of the industrial heritage



Of the 23 industrial heritage sites surveyed, 9 are museums, 8 are creative parks, 1 is an office site, 2 are commercial blocks, and 3 are factory sites (normal use) (Table 4). This shows that as practice develops, there is a trend towards integration between these different models. In particular, the museum and creative park models are widely adopted, accounting for 73.91% of the total, indicating that these two models are more practical and can better meet social needs.

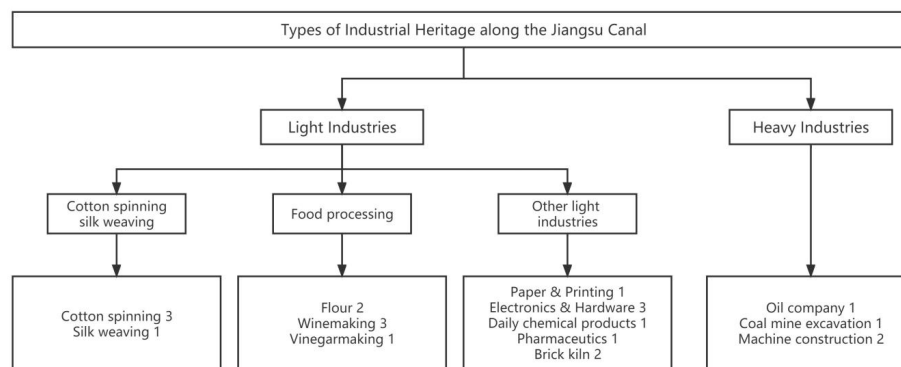
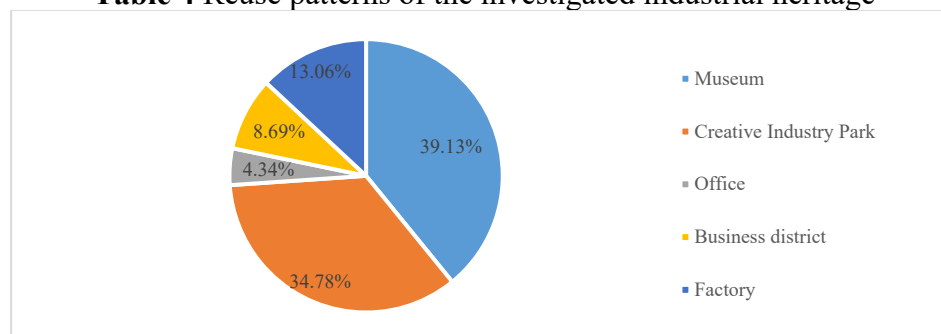


Figure 3 Type of industrial heritage along the Jiangsu Canal

Source: Collected by the author

Table 4 Reuse patterns of the investigated industrial heritage



Source: Collected by the author

1. The “Museum” model with a focus on conservation and display

The "museum" model mainly targets industrial heritage with high historical, scientific and artistic values. In the process of renovation, the protection of building facades and internal structures is generally considered, and even the original industrial equipment and tools are preserved for on-site display and transformed into museums or art galleries in line with the original historical theme, or a large cluster of industrial heritage buildings is planned and constructed in a unified manner, with the aim of preserving the historical culture and architectural features, continuing the city's historical veins, and constructing it into a historical landscape area along the canal.

2. The “Art Park” model with a focus on cultural and creative industries

The “art park” model refers to the transformation of industrial buildings with declining functions, diminished use and abandonment in the process of urban renewal and development. Often located in areas with convenient transportation, relatively low rents and large spatial scales, these industrial estates provide flexible spaces for creative professionals to meet their needs for exhibitions, exchanges, creations and even residences. Inspired by the "Soho" model, conservation and renovation can be implemented to create an "art park" model focusing on cultural and creative industries. In the process of renovating and revitalizing these old industrial buildings, the original architectural style and internal structure are preserved.

3. The “Ecological Park” model with a focus on environmental improvement

The “Ecological Park” model aims to preserve the factories, equipment, and industrial landscape in industrial heritage areas as much as possible. It integrates the environmental, historical, and cultural characteristics of the site through rational planning of the industrial heritage and the surrounding natural environment. The creation of canal parks preserves the cultural and historical characteristics of the industrial heritage, integrates various urban functions, promotes the overall revitalization of the cities along the canal, and enhances urban vitality. On the other hand, it addresses the pollution and brownfield issues caused by industrial civilization and achieves a significant level of restoration.

DISCUSSION & CONCLUSION

It is clear from the study that 1) Relying on the convenient transportation advantage of the canal, the cities along the canal in Jiangsu Province, the modern industry has been prioritized and distributed in a belt shape, and the industry in the southern part of Jiangsu Province is more developed, with a large number of industrial heritages and high value; 2) Republic of China to the early years of industrial development is more rapid, and better preserved, fully reflecting the course of industrial development in Jiangsu; 3) There are as many as 14 categories of industrial heritage, with flour manufacturing and silk reeling being particularly well developed; 4) Production, storage and transportation facilities, related ancillary living services and other structures are retained in high numbers and are characterized by their intergenerational nature; 5) Reuse models are richer, and creative parks are widely used because of their greater utility. The protection and reuse of industrial heritage along the Jiangsu Canal is a comprehensive and multi-level subject, and in view of the insufficiency of its protective reuse at the architectural, plot and urban levels, we put forward a holistic protection concept: to provide a holistic framework for the utilization of resources for the industrial heritage buildings that embody the characteristics of the city's industrial culture, and no longer rely solely on large-scale construction to drive the city's investment and vitality, but to achieve material and spiritual renewal by renewing the spatial environment and cultural atmosphere of the old districts. Instead of relying solely on large-scale construction to drive investment and vitality in the city, it will realize the joint enhancement of the material and spiritual environment by renewing the spatial environment and cultural atmosphere of the old areas.

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