

Sustainable Urban Regeneration Based on Industrial Heritage Conservation in Dalian, China

Xiuli Ge^{1,2}, Lijuan Jiao², Jihui Qu^{2,*}, Fangbin Guo¹

¹Liverpool John Moores University, Liverpool, UK

²Dalian Polytechnic University, Dalian, China

*Corresponding author: Jihui Qu

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Abstract

As an essential part of cultural heritage, industrial heritage witnesses the development of the city, embodies the spirit of the industrial era, and forms the spiritual and cultural foundation for the future development of the city. Currently, many countries are facing the problems of redeveloping industrial heritage, including excessive emphasis on economic benefits and the neglect of environmental and social impacts. In addition, many cities are unaware of the value of industrial heritage and lack proper identification and protection of industrial heritage, which results in the demolition of many valuable industrial sites. There are many successful urban regeneration projects in western countries, which set great examples for many Chinese cities. Dalian has a large number of industrial heritage sites and the proper redevelopment based on heritage conservation will surely increase the environmental, social and economic sustainability of urban regeneration practices. Taking industrial heritage conservation and regeneration in Dalian as the example, this paper starts with the significance of urban regeneration and industrial heritage protection, summarizes the situation of urban regeneration in Dalian, evaluates the industrial heritage redevelopment projects in Dalian, and explores the causes of the problems existing in urban regeneration of former industrial sites and proposes new strategies for urban regeneration projects based on industrial heritage conservation in China.

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I. INTRODUCTION

Many social and urban problems emerged with the rapid urbanization process. Urban regeneration has been widely employed by many countries as an effective way to address urban decay in cities, increase land value and solve some environmental problems. Western countries experienced the post-industrial era earlier than China and have accumulated more experience in urban regeneration. Examples of successful urban regeneration include the Ruhr area of Germany, the Ironbridge Gorge Museum and Albert Dock of Liverpool in the United Kingdom. Urban regeneration is a complex process, which involves a series of issues with urban planning, environmental

protection, economic development, cultural heritage, etc. Industrial heritage sites are the remains of industrial culture. Many of these industrial buildings are still within their service life, but the original functions and orientations of the building can't meet the requirements of social development in the new period because of the adjustment of industrial structure and changes of land use. Although some industrial buildings have completely lost their original functions and will not produce more economic benefits, they have unique environmental, social and economic values. However, many urban regeneration projects just pursue economic benefits and neglect the environmental and social impacts of the projects,

thereby reducing the overall sustainability of these projects. Therefore, sustainable urban regeneration based on industrial heritage conservation is crucial in improving the city's image and competitiveness.

II. SUSTAINABLE URBAN REGENERATION CONCERNING HERITAGE CONSERVATION

The term sustainable development was first popularized by the International Union for the Conservation of Nature (IUCN). In 1987, the World Commission on Environment and Development (WCED), which had been set up in 1983, published a report entitled *Our Common Future*. Sustainable development is defined as follows: "sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs [1]. Literature shows that sustainable urban regeneration approach is well supported by researchers, professionals and government officials worldwide [2-4]. In the past, sustainable development was mainly used to discuss environmental sustainability rather than social and economic sustainability. In recent years, more researchers are calling for the establishment of a holistic framework to assess the overall sustainability of urban regeneration projects. It is deemed necessary that urban regeneration practices take the environmental protection, cultural transmission, social inclusion, economic benefits, heritage conservation and other elements into consideration.

Many countries have realized the significance of cultural heritage and made relevant rules and regulations to protect the industrial heritage. However, the listed industrial heritage sites are just preserved to satisfy the requirements of national or local governments. Actually, industrial heritage is an effective tool to enhance the image of the city and to give the local community a strong sense of identity. It can promote the smooth development of sustainable urban regeneration projects, improve the surrounding ecological environment, increase

the city's overall competitiveness, meet the local residents' increasing requirements for better public facilities and living conditions, contribute to the diversity of the local economy, and comprehensively achieve sustainable urban regeneration.

III. CURRENT SITUATIONS OF INDUSTRIAL HERITAGE IN DALIAN

Dalian has rich industrial heritage and therefore it has a strong potential to develop its city image on this. Starting from 1980s, modern industry began to develop in Dalian with the Self-Strengthening Movement, which started in 1861. The dock built in Lvshun in 1888 marked the beginning of modern industrial development in Dalian. After that, the industry in Dalian enjoyed a fast-paced development during the period of Russian and Japanese invasion. The scale and cargo handling capacity of Dalian Port increased quickly and the construction of new railways made Dalian an important port connecting Asia with Europe. In 1913 there were more than 200 factories in Dalian, which included most of the heavy and light industries of that time. In 1957 the total number of factories increased to 557 and it laid a great foundation for the further development of industries in Dalian [5]. Nowadays, Dalian is the largest port city in northeast China and plays an important role in industrial fields such as crane manufacturing, shipbuilding, petroleum, chemical engineering, and cement production.

There are three major regeneration patterns of the industrial heritage sites in Dalian: reconstruction, redevelopment and conservation. Firstly, the former industrial sites are completely demolished. Secondly, the old buildings and equipment are reconstructed for residential quarters, commercial complex, public green space and other public amenities. Thirdly, some representative industrial buildings are completely protected on purpose.

From 2017 to 2019, China Association for Science and Technology issued three batches of national industrial heritage sites. Altogether 102 sites have been included in the list of national industrial heritage. Among them, 2 industrial sites in Dalian have been listed, including Dalian Lvshun Dock and Dalian Refrigerator Plant [6]. In addition to

these national industrial heritage sites, the Industrial Heritage Protection List in China (second batch) released in 2019 also listed some major industrial heritage sites, including 8 industrial sites in Dalian [7]. Now many industrial sites in Dalian are in the list of national industrial heritage (Table 1).

Table 1. Major Industrial Heritage Sites in Dalian

No.	Name	Founded in (Year)	Location
1	Dalian Shipyard Group	1898	Shugang Road, Xigang District, Dalian
2	Dalian Port	1899	Gangwan Street, Zhongshan District, Dalian
3	Dalian Ganjingzi Dock	1926	Gongxing Road, Ganjingzi District, Dalian
4	Laotieshan Lighthouse	1892	Laotieshan National Nature Reserve, Lvshun, Dalian
5	Dalian City Transportation Company Ltd.	1907	Dalian
6	Dalian State-owned No. 523 Factory	1947	Haimao Street, Ganjingzi District, Dalian
7	Longyin Spring	1879	Sanbali Village, Shuishiyang Street, Lvshun, Dalian
8	Dalian Chemical Industry Company	1933	Gongxing Road, Ganjingzi District, Dalian
9	Lvshun Dock	1883	Lvshun, Dalian
10	Eastern Railway Locomotive Company	1889	Xinggong Street, Shahekou District, Dalian
11	Dalian Refrigerator Plant	1930	Shahekou District, Dalian

In addition to the industrial heritage sites built before the founding of People’s Republic of China in 1949, there are also many factories and industrial buildings with a relatively short history. Generally, they have the following characteristics. Firstly, they were built in the first half of 20th century and had particular historical values for conservation. Secondly, they include a variety of industries, including mechanics, chemical engineering, textile, silk reeling textile, steel smelting, cement industry, papermaking etc. Thirdly, the establishment and development of these factories are the real records of certain

historical periods in Dalian. It shows Chinese people’s awareness of modern industries in late Qing Dynasty, the exploitation of natural resources during colonial occupation and the resolution to strengthen national industrial power after the liberation of China. All in all, industrial heritage in Dalian witnesses the historical and social development of a city.

The following table shows the major urban regeneration projects based on former industrial sites in Dalian (Table 2). They mainly adopt the three modes of regeneration: reconstruction, redevelopment and conservation.

Table 2. Major Urban Regeneration Projects Based on Former Industrial Sites in Dalian

No.	Project	Regeneration Mode	Major businesses
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1	Dalian No. 15 Warehouse	Redevelopment	Museum, exhibition hall and catering
2	Dalian Heshe Art Zone	Redevelopment	Cultural creative park
3	Dalian Wisdom Park	Redevelopment	Commercial complex
4	Dalian KM Infinite	Redevelopment	Catering
5	Dalian Houku Creative Park	Redevelopment	Cultural creative park
6	Dalian Z28 Fashion Silicon Valley	Redevelopment	Commercial complex
7	Dalian Cement Factory	Reconstruction	Residential quarter

From the above table, it can be seen that there are several issues with the redevelopment of former industrial sites in Dalian. Firstly, the regeneration of former industrial sites should not be limited to certain forms. Most of the old industrial buildings are developed into archives, museums, exhibition centers, shopping malls, restaurants, theaters, offices or residential quarters. More regeneration strategies need to be employed in accordance with the social development and people's demand for better living environment and entertainment facilities. Secondly, "ecological regeneration" needs to be incorporated with the whole process of planning, construction, management and maintenance. The maximum recycling and reuse of building materials can help to create new landscapes and preserve the industrial features and spirits. The key of urban regeneration based on industrial heritage lies in preserving the historical footprints of the sites and endowing them with modern functions and new aesthetic values. Thirdly, the regeneration of former industrial sites should be based on its original physical structure and spiritual meanings. Urban regeneration is a comprehensive and systematic project, which involves environmental protection, economic benefits and social impact. The redevelopment needs to focus on the representation of the living and working environment in the past and reveal the workers' excellent spirits such as perseverance, bravery and diligence.

Currently, the regeneration of former industrial sites concerning industrial heritage in China mainly refers to the Interim Measures for the Administration of National Industrial Heritage issued by the Ministry of Industry and Information Technology in 2018. The standardization of industrial heritage protection is conducive to exploring the rich cultural connotations of the city's industrial heritage and shaping the new image of national industry. The protection and utilization of industrial heritage should follow the principles of scientific planning, land management, effective protection and reasonable utilization. Surveys of industrial heritage should be carried out regularly. The promotion of industrial heritage to the public can be conducted under the premise of proper protection. All in all, urban regeneration can be closely integrated with industrial heritage conservation by preserving the industrial heritage, promoting the local area's unique cultural and historical heritage and creating a sustainable community with strong sense of belongings and distinctive regional characteristics. This paper takes three representative regeneration projects as the examples, which show the different regeneration strategies adopted in redeveloping the former industrial sites in Dalian.



Fig 1: Dalian Wisdom Park before Regeneration



Fig 2: Dalian Wisdom Park after Regeneration

As a key urban regeneration project in Dalian, Dalian Wisdom Park aims to develop the former Dalian Refrigerator Plant (built in 1930) into a commercial complex, which mainly deals with finance, education, culture, entertainment,

exhibition and technology innovation base (Fig 1). It gives new vitality to the local community, creates a great business atmosphere, builds new landscapes and provides better public facilities (Fig 2).



Fig 3: Dalian Heshe Art Zone

The former factory of Dalian Heshe Art Zone was Shanghai Jiahua Group Dalian Branch. After the regeneration, Dalian Heshe Art Zone has become the first cultural and creative park based on former industrial sites in Dalian. It integrates industrial park management, cultural film and television



investment, art fund investment, industrial park management, Internet business incubation, and cultural enterprise investment. The successful transformation of this place sets a good example for the development of other similar projects (Fig 3).



Fig 4: Z28 Fashion Silicon Valley

Dalian Z28 Fashion Silicon Valley was transformed from Dalian Knitting Factory. The businesses of Z28 are mainly related to fashion design and relevant services. It leads the trends in fashion by providing the exhibition hall for new products release, car model exhibition, professional conference services, wedding etiquette services, photo studio and other services (Fig 4).

IV. VALUES OF INDUSTRIAL HERITAGE REDEVELOPMENT IN DALIAN

Industrial heritage in Dalian witnesses the development of the city, embodies the spirit of the industrial era, and forms the spiritual power and cultural foundation for the future development of Dalian. It has economic value, environmental value and social values.

Economic Value

Most of the old industrial buildings are in the central area or waterfront area of the city. The property-led reconstruction of these places will bring forth huge economic profits. Furthermore, most factories have strong structures and vast inner space, which allows for renovation of different scales with fewer costs.

Environmental Value

The redevelopment of industrial buildings needs to adopt strategies that are beneficial to the urban environment. It can turn the derelict factories and waste land into attractive places to meet the increasing demand of the social development. The effective use of natural light, ventilation and renewable energy can greatly increase the environmental sustainability of renovated sites. What's more, the reduction of energy consumption in transporting the construction waste is of great benefits.

Social Value

Urban regeneration is used to solve many social problems caused by urbanization such as gentrification, social exclusion and lack of sense of identity. The communication among government officials, project developers, designers and architects, local residents and other key stakeholders of urban regeneration projects can deepen their mutual understanding and cooperation and create a harmonious atmosphere to improve the overall sustainability of the regeneration practices.

All in all, Dalian is a city with a magnificent industrial tradition. The factories, facilities,

buildings left during the industrial period have become part of the modern urban landscape. They have experienced the influence of different periods and become the shared memory of the city. The protection and regeneration of former industrial sites will help to preserve the local identity and the city's historical footprint, which has lasting and far-reaching significance of historical and social level.

V. CONCLUSION

To sum up, the redevelopment and conservation of industrial heritage needs to be integrated with the whole process of urban regeneration to improve the environmental, economic and social sustainability of urban regeneration practices. National and local laws and regulations on industrial heritage protection will be developed to solve problems arising with regeneration practices. More creative regeneration strategies will also be adopted according to the local history, geography, culture and other regional characteristics in addition to culture-led and property-led regeneration.

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