

Research on landscape regeneration design of old industrial sites under the concept of sustainable development

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Abstract. By the end of the 20th century, the transformation of industrial economic structure led to the decline of a large number of old industries. The large area of abandoned industrial land left by the city not only hindered the development of the city, but also brought damage to the ecological environment. According to the background of sustainable development theory, around the problems of industrial site wasteland reuse analysis, from many aspects to the industrial site of water, vegetation, soil and further combing ecological restoration, environmental protection, improve the utilization rate of land and the humanistic spirit refining fusion, the industrial wasteland design with natural ecology and context heritage of human natural landscape.

Keywords: industrial heritage, site, reuse, sustainability, landscape design, green development.

Introduction: under the changing of The Times, the rapid development of society, urban expansion, building upgrading the rapid development of urbanization, each industry in the industrial pattern proportion gradually decline, industrial structure adjustment and energy resources depletion cause more and more industrial land was abandoned, industrial site reuse design gradually become a design trend. This paper is based on the perspective of the concept of sustainable development, and not satisfied with the law of natural development mode, in-depth transformation and upgrading to ecological restoration, improve the use of land resources, cultural heritage cultural memory mainly from the above three aspects to solve the problems of industrial sites, give the value of abandoned land reuse, make it get new life, solve the problem of urban development.

1. Related notion

1.1 Concept of sustainable development

1972 The concept of "sustainable development" was put forward for the first time in the world, and was put forward with the change of The Times and the requirements of social and economic development. The concept of sustainable development is to develop the economy, protect resources and maintain the ecological environment. It is a kind of economic growth mode focusing on long-term development, that is, while meeting the needs of contemporary times, it does not affect the interests and needs of future generations, so that future generations can enjoy sufficient resources and good resource environment. Sustainable development refers to the design activities where both current interests and interests should be taken into account the relationship between design activities and interests.

1.2 Industrial site

Industrial sites refer to the industrial land left in the process of industrial production in human society, and have a certain industrial heritage. Their main body is usually the buildings, structures, equipment and factories in the industrial period. Industrial site is not limited to the past industrial sites, and abandoned wharf, steel mills, textile mills, factories, transportation railway the formation of industrial sites is the predecessor of the shadow of the industrial heritage, all in history, culture, technology, memory has a special and outstanding value, for cities, the emergence of industrial sites will not only affect the beauty of the city, and cause the waste of land resources, also bring great obstacles to the local traffic.

1.3 Regeneration design

The landscape reconstruction of industrial sites is not a simple reconstruction. It should take the premise of retaining the original environment, and improve the land use efficiency and surrounding resources and environment through design innovation. At present, the theme of sustainable development is to combine ecological and historical protection. The updated design of industrial sites can not only preserve the precious historical heritage, but also improve the cultural inheritance of the city, awaken the memory of urban residents, and realize the concept of sustainable development, which is very important for urban development.

2. Development process of landscape regeneration design of industrial sites

2.1 Domestic research status

The research on the protection and reuse of industrial sites in China started relatively late than that abroad. Since the beginning of this century in China, the relevant successful cases of landscape renewal design of industrial sites have continued to increase, and the problem of industrial sites has also appeared to the public and academia.

In domestic policies: "Wuxi Proposal" was issued in 2006 as the first programmatic policy document on industrial sites in China. In 2010, China established the Academic Committee of China Industrial Construction Heritage, and then in the first academic seminar, it issued an initiative to the community to pay common attention to the major topic of industrial sites. In 2017, the national level for domestic industrial heritage statistics. By 2019, three batches of heritage lists have been announced. With the continuous introduction of policies, industrial sites have gained real recognition and protection, and the protection of industrial sites has been supported by all sectors of society and even the national level.

In terms of domestic works: Urban Industrial Land Renewal and Industrial Heritage Protection (2009) deeply expounds the current situation and coping strategies of industrial sites in western countries, and also talks about the status quo and problems of industrial land and industrial heritage protection in China. "Research on the Status and Development of Industrial Heritage reuse in China" (2015) discusses in detail the development process of domestic industrial sites in China and makes an analysis and summary. In her book Research on The Protection Based on Regional Cultural Landscape (2016), CAI Qing analyzed and explored the theory and practice of international heritage protection since the 20th century. Research on Industrial Land Heritage from the Perspective of Dual Attribute (Fan Xiaojun, 2017) further explores the protection and reuse methods of industrial sites, introduces and analyzes various application methods of industrial sites in detail, and summarizes a more comprehensive theoretical framework. Overall, due to the historical stage in our country is different from abroad, the present domestic industrial site research started although later than abroad, theoretical research still weak links, but development has been more successful practical experience, at the same time in management and legal protection, the study of industrial sites landscape regeneration has reference value. Figure 1 below lists the cases of some landscape regeneration in China

Case name	The predecessor of the case	Case position	Case time
Zhongshan Qijiang Park	Yuezhong Shipyard	middle mountains	2001
Beijing 798 Art District	State-run 798 factory	Beijing	2001
Tsingtao Beer Museum	Old factory building of Tsingtao Beer Company	Qingdao	2003
Nanjing Chenguang 1865 Creative Park	The Jinling Machine Manufacturing Bureau	Nankin	2007
The Red Brick Factory Art Park	Guangzhou can factory	Guangzhou	2009
Made in Wuhan Hanyang	Hanyang Bing Iron Factory	Wuhan	2009

China Ship Hall	Jiangnan Shipyard	Shanghai	2010
The Shanghai Museum of Contemporary Art	Shanghai Nanshi Power Plant	Shanghai	2012
Harbin Labor Park	Songjiang electric shock factory	Harbin	2017
The Shougang Industrial Heritage Site Park	Shougang old factory	Beijing	2019

Figure 1 is derived from the author's homemade version

2.2 Foreign research status quo

From the perspective of the protection and reuse of industrial sites: the western countries were exposed to the related problems brought by the industrial sites early, which is the collateral impact of the industrial Revolution. Therefore, from both theory and practice, foreign countries have obtained more rich and more profound research experience. Research in the field of industrial sites began in the 1950s. The concept of "industrial archaeology" was first proposed by the British scholar Mitchell Rix, who proposed to protect the industrial sites in his country as much as possible. It was from this appeal that the actual role of industrial sites began to change and gradually appeared to the public. In 1978, on the basis of the Convention, the first list of the World Heritage List was published, with some industrial sites among them. In the same year, the International Commission for the Protection of Industrial Heritage (TICCIH) was established and issued the Lower Target Charter in 2003, which clarified the value and social significance of industrial sites and brought the issue of industrial sites into a global perspective. Since the promulgation of the Taipei Declaration on Asian Industrial Heritage in 2012, social issues concerning industrial sites have attracted continuous attention not only from the academic community, but also from the public. Years of theory development and policy support, for foreign industrial sites landscape update provides an important basic guarantee, these case results show the industrial sites for time memory and the significance of industrial culture, promote the city and regional economic, social, environmental and other development progress, as well as the protection of industrial sites and landscape transformation regeneration research constantly provide new ideas and strong power.

At the same time, many foreign scholars carry out more theoretical exploration of industrial sites. In 1955, in his article, Industrial Archaeology, published in History lovers, M. Ricks called for greater protection of the industrial production legacy. In 2001, in his "Artificial Site: A Rethinking of the Post-Industrial Landscape", Neil Corkwood sorted out and classified several successful industrial site landscape renewal cases at that time, and then summarized and summarized to provide key materials. In his "Protection and Development of Industrial Heritage" (2013), Michael Law combined the theory of case analysis, and repropose the adaptive reuse of industrial sites in the context of urban renewal, which is of reference value. The following table shows some of the successful cases of foreign transformation. The adaptive reuse of the site is of reference value. Figure 2 below shows some successful cases of foreign transformation.

Case name	The predecessor of the case	Case position	Re-use time
The SOHO District of New York	Warehouse areas for hoarding textiles	New York	1973
LA Brewery Art Village	brewery	Los Angeles	1980
The Museum of Art of Orsay	Paris railway station	Paris	1986
The North Duisburg Landscape Park	The Medrich Steel Works	Duisburg, Germany	1991
Citroen park	Citroen automobile factory	Paris	1992
The Tate Modern Art Museum	Thames River station	London	1995
The Turin Industrial	Waste industrial land	Turin, Italy	1998

Site Park			
Mill Textile City Museum	Flour processing workshop	Minn	2003
New York High Line Park	aerial railway	New York	2009
DE HALLEN AMSTERDAM	Tram maintenance base	In Amsterdam, the Netherlands	2014
The Kindl The Center for Contemporary Art	Berlin Brewery	Berlin	2016

Figure 2 is derived from the author

3. Study on design strategies for landscape regeneration in industrial sites

3.1 Landscape design type of industrial sites

Industrial sites of landscape design type from the area overall different cities have different industrial heritage, determines the basic derivative design, subsequent in the function of space can be divided into museum pavilion design, industrial park design, park design, the design of waterfront park is a design, children's park design, space is according to the function and the original building retention can be divided into closed, semi-closed, fully open space, space dimension is also according to the present situation of the site in the design.

3.2 Landscape development value of industrial sites

In terms of economic value: it can selectively change the status quo of the abandoned industrial land, so as to carry out more ecological and economic construction, and even a way to revitalize the urban economy to realize urban rejuvenation. In recent years, many industrial sites have been transformed into more popular forms of cultural industrial parks, which can promote the rise of some emerging industries, appropriately realize industrial transformation, absorb a large number of technical talents, and promote regional vitality.

In terms of historical and cultural value: the old industrial sites in the city are also witnesses of the development of local culture, retaining profound historical traces. These abandoned land are not only the old appearance of the city, the abandoned buildings emphasize the structure, but also the memory of the previous generation of the city, with a certain humanistic spirit.

On the ecological value: the transformation of industrial heritage follows the concept of sustainable development, in the process of design of all old material, old material, old culture again recycling and utilization, save resources, reduce the consumption of various resources and damage to the natural ecological environment, combined with the surrounding resources configuration, considering the soil, water, vegetation balance site ecological environment.

3.3 Landscape and ecological restoration of industrial sites

As an industrial abandoned land, there are pollutants produced by industrial transportation, which will cause pollution to the soil, plants and water bodies. Therefore, compared with the ordinary municipal construction land, the abandoned railway is more likely to appear the phenomenon of ecological environment loss, such as water loss and plant decay. According to the ecological restoration theory of "sustainable concept", the restoration of natural ecology in terms of sustainable management, restoration and renewal of vegetation community, collection and utilization of water body is proposed.

Due to the operation process in the past, the city abandoned industrial land accumulated a lot of garbage infiltration and other pollutants, these pollutants is difficult to be degraded in the short term, into the ground, the site of the soil, the land texture and structure changed, and reduce fertility, cannot provide enough energy for plant growth, thus causing the deterioration of the abandoned land and its surrounding ecological environment.

At present, the common method of soil remediation measures is physical transfer of shallow soil contaminated with soil and toxic substances, covering the new soil for surface vegetation growth, but the cost is high. It can also change the chemical properties of soil through acid and alkaline metal materials, although the effect is quick, but the risk is great. Using plant-resistant vegetation is the best choice under common pollution, including the analysis of plant number and species.

Starting from the concept of protecting the original ecological plants, while pollution control, make full use of the rich variety of wild plants, and integrate industrial sites to carry out landscape transformation, to create natural wild plant communities. The construction of plant greening should start from the following aspects: (1. Select the plants with strong adaptability, high survival rate and fast growth, considering their cold resistance, drought resistance, windbreak and sand fixation and the ecology brought to the base. Economic benefit; (2) The protection and utilization of original vegetation should be fully emphasized in the reconstruction process. On this basis, select local plants for collocation and construction. After the initial planting of local seedlings and stable survival, the foreign plants will be cultivated and planted; (3) from the perspective of ecological aesthetics, the plants are treated artistically.

Sponge measures low cost, and high landscape, the sponge measures used in abandoned factory renewal, in part of the node set rainwater garden, sinking green space, planting ditch, permeable pavement, two water utilization and collection measures, on the premise of low impact development, construction with low maintenance cost extensive art style of ecological landscape. On the basis of ensuring the effective flood control of the drainage system of the city, the precipitation is distributed to increase the urban flood regulation and storage capacity.

4. conclusion

To sum up, industrial sites are the witnesses of the historical development of cities and the social change of human beings. Although they have lost their original production function, they have unique value. Therefore, industrial sites are not a stumbling block to urban development, and they need to use landscape regeneration to arouse new life. The transformation of industrial sites and landscape design is a systematic project, which needs not only to improve the environment of industrial sites and improve the utilization rate of land, but also to protect the history and culture. Renewal, reconstruction and activation are the themes of the design, so as to give full play to its value and even create more future value. For industrial sites of landscape regeneration design and the continuation of regional culture and industrial spirit, meet the public aesthetic, and make the modern and past landscape "symbiosis" make the pedestrian experience in the history of the sustainable development of contemporary landscape, so that the Wang Ye site to return to People's Daily life look to continue to create its due value, and retain the human industrial civilization, this is expected by human society, and the pursuit of landscape designers.

Industrial sites are the relics of industrial civilization, and also an important basis for human reading cities. They have great significance for the landscape regeneration of industrial sites that will benefit future generations. Today's industrial factory area may be the industrial sites of the future, which will be an endless topic. Respecting history, cherishing the present and looking to the future is the constant law of landscape regeneration design of industrial sites.

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