

Research on Brownfield Restoration Abroad and Its Enlightenment to China

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Abstract

With the proposal of sustainable development strategy, brownfield restoration has been paid more and more attention. This paper defines the concept and characteristics of brownfield, analyzes the reasons for the formation of brownfield, and sorts out the modes of brownfield restoration and redevelopment in foreign countries by collecting relevant literature on brownfield restoration and development. Combined with the current problems in China, countermeasures and suggestions are put forward to promote brownfield governance and development in China from the aspects of improving brownfield laws and regulations system, developing brownfield standards at the national level, establishing cooperative mechanism among government, enterprises and people, and improving basic information construction of brownfield.

Keywords

Brownfield; Restoration; Development; Enlightenment; Abroad.

1. Introduction

In the late 18th century, western countries began to enter the industrial Revolution, and mankind began the process of industrialization and urbanization. By the middle of the 20th century, traditional industries were declining and the urban industrial structure was adjusted. The old industrial areas were gradually surrounded by new urban blocks, and a large number of factories were forced to move out, resulting in the formation of a large number of idle and abandoned industrial sites in urban areas. In the 1970s, many developed countries in the process of industrialization, while economic development, ignored the different degrees of land pollution caused by industrial production, serious harm events occurred to human health and ecological environment caused by industrial abandoned land. After the Love Canal incident in 1977, many countries began to study brownfield governance and adopted a series of measures to deal with the pollution of brownfield. Since then, with the continuous attention of countries around the world to environmental protection, brownfield issues such as idle land and environmental pollution have attracted more and more attention from all walks of life.

2. Concept and Characteristics of Brownfield

2.1. Concept of Brownfield

The word "brownfield" first appeared in British planning literature as a planning term corresponding to green space. In a broad sense, it refers to the land that has been developed or used, which a concept is corresponding to the undeveloped and unused "green space". For the narrow sense of brownfield, countries, organizations and scholars have different descriptions. The first formal definition of brownfield is the United States in 1980 issued the Environmental Response, Compensation and Liability Act (referred to as the "Superfund Act"). According to the act, brownfield refers to derelict, under-utilized industrial land and land identified or suspected to be contaminated. In 2005, THE US Environmental Protection Agency defined brownfield as land complicated by redevelopment and reuse due to actual or potential environmental pollution. The British government began to pay attention to brownfield issues as early as the 1970s. The UK National Land Use Database defines land with the following properties as brownfield land: developed and idle land, idle buildings, derelict land and buildings; other land still in use that may be developed with appropriate planning and permits; other land that is still in use but has the potential for further development. In Canada, the widely accepted definition of a brownfield was developed by the National Conference on Environment and Economics held in 2003. Brownfield is defined as commercial and industrial land that has been abandoned due to known or suspected pollution and has not been fully used but has potential for development. In addition, the European Economic and Brownfield Renewal Network Implementation Group has also defined the concept of brownfield, The panel defines brownfield as land that has been or will be contaminated by improper use by previous users, including abandoned and still in use [1].

2.2. Characteristics of Brownfield

Although countries have not yet formed a unified definition of brownfield, consensus has been reached on the basic concept of brownfield: Firstly, brownfield is the land that has been developed and used. Secondly, part or all of the brownfield has been abandoned, idle, not fully utilized. Thirdly, brownfield sites have been or will be contaminated. Fourthly, there are many obstacles in the governance and development of brownfield [2].

3. Causes of Brownfield

The cause of brownfield lies in the change of urban land value caused by the decline of industrial zone and the adjustment of urban industrial structure. In the West, due to the influence of the industrial revolution and the development of urban economy, the early urban industrial areas began to decline and lose their use value, and gradually became abandoned, idle or low-utilization land, namely brownfield. Under the influence of the idea of environmental protection and sustainable development, some heavy polluting enterprises have adjusted location or changed production, and their original sites have become brownfield. In addition to former decaying and contaminated industrial areas, abandoned gas stations, commercial facilities such as dry cleaners, waste disposal stations, oil storage tanks, cargo stacks and warehouses, railway yards, etc., can all be sources of brownfield sites. Many of these places are located in the city, and their dilapidation will lead to idle land, community recession, environmental pollution, quality of life decline, unemployment, urban space fragmentation and other adverse consequences, which will have a negative impact on the city's economy, society, environment and so on [3]. Therefore, brownfield remediation is necessary for urban sustainable development and urban renaissance.

After being treated, brownfield can be developed for a variety of uses, this comprehensive process of governance and development is called brownfield redevelopment. Successful

redevelopment can transform brownfield into retail business district, residential district, light pollution-free industrial zone, office area, transportation hub station, park, square, exhibition hall, school and other uses. From the overall and long-term perspective of the country and the region, brownfield redevelopment has many benefits, such as relieving environmental pressure, stimulating economic growth, improving the environment, transportation and service facilities of the existing urban areas, revitalizing the old urban areas and integrating urban space. Therefore, all countries regard the improvement of brownfield governance and redevelopment and utilization as the priority of the government, especially the United States and The United Kingdom as the backbone of the brownfield redevelopment strategy.

4. Brownfield Restoration and Redevelopment Mode Abroad

Brownfield can be developed and constructed into various types of land after governance. In general, brownfield redevelopment planning and design abroad can be summarized into three typical modes.

(1) Continuous restoration guided by open space development. The preferred mode of development for most projects is either to provide leisure places for the public as public space or to use ecologically rehabilitated polluted land as urban reserve land, such as parks, squares and rest places.

(2) Ecological restoration based on industrial heritage. Combined with industrial heritage development for public land, in addition to ecological restoration land, can also be used as urban reserve land, such as heritage culture theme park, land art base.

(3) Replacement repair dominated by new industries. New high-tech and creative industries will be used to replace traditional industries, and new functions will be given to polluted land, such as emerging industrial parks and art workshops.

Different brownfield sites have different restoration methods and redevelopment positioning, and their planning processes are different: The public open space model pays more attention to the later environmental monitoring, that is, according to the frequency and duration of people's activities in different sites, as well as the unified monitoring standards, the subsequent state of soil restoration can be judged. The theme park model of industrial heritage takes industrial sites and cultural elements as the premise, and takes into account the recycling of old structures while evaluating their health risks to human beings. The new creative industry park mode needs to consider both soil remediation conditions and industrial development in the park, and determine the sequence of land restoration and utilization according to the time when industries enter the park [4]. Under the condition of considering soil safety, the planning process of the above three modes of brownfield redevelopment will vary according to the actual situation.

5. Enlightenment to Brownfield Governance and Development in China

Brownfield governance and development in China started late, lack of systematic theory and application research, and lack of effective legal support. However, in recent years, serious hazards caused by brownfield pollution have occurred frequently. In 2004, Beijing Songjiazhuang subway station poisoning incident, in 2006, wuhan Sanjiang real estate project site workers poisoning incident, in 2015, Changzhou Foreign Language School "poisoning" incident. Therefore, it is urgent to carry out brownfield governance comprehensively. According to relevant media reports, there are still 300,000 brownfield land in China to be treated, and the brownfield management and development market potential is huge. It is a consensus of academic and engineering circles that brownfield governance is difficult. Therefore, drawing lessons from foreign brownfield governance experience and combining

China's objective reality, A large number of brownfield sites (such as old industrial factories, warehouses, stacks, etc.) in Chinese cities can be treated, re-developed and reused to effectively solve the land contradiction mentioned above.

5.1. Improve Brownfield Laws and Regulations System

In the process of brownfield governance and development, perfect laws and regulations play an important role. Only with legal constraints an effective accountability mechanism can be established to ensure the funding source of brownfield governance and development [5]. In recent years, as the Chinese government attaches importance to the issue of brownfield, some policies and regulations have been issued successively. For example, soil Pollution Prevention and Control Action Plan, Soil Environmental Management Measures for Contaminated Land (Trial), Soil Environmental Management Measures for Industrial and Mining Land (Trial) (Order of the Ministry of Ecology and Environment, No.3), Soil environmental management of construction land is required to be included in urban planning and land supply management, and land development and utilization must meet soil environmental quality requirements. However, most of these laws, regulations and action plans are macro programming documents, and the arrangement of legal procedures needs to be further refined and improved.

5.2. Develop Brownfield Standards at the National Level

In China, the Soil Environmental Quality Construction Land Soil Pollution Risk Control Standard (Trial) has made some provisions on brownfield governance and restoration. Some provinces and cities have also issued some soil evaluation standards suitable for their own urban construction by referring to European and American standards, but there is still no unified standard at the national level. Standards run through every link of brownfield governance and development. Without unified standards, it is impossible to investigate and evaluate the plot, determine the requirements for pollution control, and formulate preferential policies based on pollution standards, so as to force the implementation of pre-treatment of brownfield at the legal level. At present, brownfield investigation and evaluation standards and pollution control standards should be formulated according to the actual situation of China. On the basis of the national standards, brownfield pollution restraint rules should be established for plots of different regions and development types, so as to lay a foundation for the formulation of laws and regulations on brownfield governance and development [6].

5.3. Establish Cooperative Mechanism Among Government, Enterprises and People

In article 8 of the Opinions on Strengthening the Prevention and control of Soil pollution, The principle of "who pollutes, who governs" was put forward in China. However, ownership disputes and other problems still exist in the concrete implementation process, and it is difficult to correct the responsibility. The government still plays the most important role in brownfield governance. Meanwhile, the capital of brownfield governance and development in China mainly comes from government finance and specific taxes. Therefore, China should guide the active participation of social capital in brownfield governance, and the government should formulate relevant encouraging policies to guide enterprises and private capital to actively participate in brownfield governance. Government agencies are only responsible for land ownership and policy formulation, guiding enterprises to conduct brownfield governance and development, and giving appropriate tax incentives or government subsidies to brownfield development enterprises to improve their enthusiasm for development. At the same time, besides the government and enterprises, brownfield governance and development fund should be set up, various sources of funds from the society and the civil society should be seek to solve the funding problem. The coordination mechanism of the three is also reflected in the collaborative supervision. The supervision of brownfield can establish multiple regulatory approaches

including government supervision, enterprise self-examination, non-profit organization and public supervision to ensure the implementation of laws and policies on brownfield governance.

5.4. Improve Brownfield Basic Information Construction

The construction of brownfield basic information is conducive to providing relevant departments with land background information and management process information, Promote the establishment of brownfield governance and development management system and evaluation and monitoring system suitable for China's economic and social characteristics, and provide technical support for the early planning, pollution control and later management of brownfield. Brownfield database should be established on the basis of soil pollution survey in our country. According to the pollution degree of brownfield, the management and development of brownfield are classified through land use planning and urban planning. From the planning survey, risk assessment, pollution control, landscape design, project management and other links, according to its background and use of different means and direction of transformation, speed up brownfield governance and development, reduce costs, improve the utilization rate of land.

References

- [1] Xiao L, Hou JX, Liu XX, et al. The research progress of brownfield in foreign. Areal research and development, Vol. 34(2015) No.2, p. 142-147.
- [2] Bai Y, Wei W. Research on flooded brownfield ecological restoration. Planners, Vol. 33(2017) No.3, p. 37-42.
- [3] Cao k, Jin T. A Discussion on Brownfield Redevelopment Strategies in Western Countries and Its Inspiration to China. China population, resources and environment, Vol. 17(2007) No. 6, p. 124-129.
- [4] Wang H, Jiang HY, Xiao RB,et al. Overseas Experience Of Brownfield Renovation And Redevelopment. Planners, Vol. 33(2017) No. 3, p. 19-24.
- [5] Ferguson.C. Assessing risks from contaminated sites: Policy and practice in 16 European countries. Land Contamination & Reclamation, Vol. 7(1999) No.2, p. 33-54.
- [6] Song Y, Lin HY, Wang SJ. International Experience of Brownfield Reuse and its Enlightenment. World regional studies, Vol. 24(2015) No.3, p. 65-74.