

EXPLORATION ON CONTAMINATED URBAN MANUFACTURED SITES REMEDICATION MANAGEMENT STRATEGIES IN BEIJING

*GUO Yong**

* School of Architecture, Tsinghua University, 100084, Beijing, China, Email:jacklion.cn@gmail.com

ABSTRACT: The process of industrialization and urbanization brings industrial structure and city layout changes. Consequently, manufacture factories retreat from urban area and leave sites as legacy, which are threatened by the presence or potential presence of contamination. These sites could be recognized as Brownfield, a concept that is being widely accepted internationally. Landscape design as well as other remediation practice is directly impacted by management strategies. The environment protection agency of Beijing takes the lead on the remediation management strategy development on the background of underdeveloped system of legislation, management and standards in China. This article tends to explore the latest development of management strategies rose by Beijing environment protection agency.

KEYWORDS: management strategies, brownfield, urban manufactured sites, contaminated site

FOREWORD

After industrial enterprises closed down or relocated, the properties they left in the cities could be recognized as Brownfield, according to a broadly understanding of the definition to Brownfield. Among these properties are contaminated sites. Recently, the remediation of contaminated sites has been increasingly becoming a theme of concern in the field of Landscape Architecture in China. The practices of remediation are directly influenced by the legal system, including laws, regulations and policies. Accordingly, the development of this system, as a particular point of view, indicates the development of remediating practices in China. Referring to the actions to clear contaminated manufactured sites, Beijing Municipal Environmental Protection Bureau (BMEPB), who has experimented series of policies for these actions, makes Beijing a leading city in China on tackling Brownfield remediation. However, in the early stage of these actions, there are still many upcoming problems to be dealt with.

1 BACKGROUND AND DYNAMICS

1.1 Industrialization and Urbanization

The process of industrialization is one of the background conditions of manufactured sites redevelopment. The process is proceeding in 5 divided stages. China has reached its later phase of middle stage. And with current developing rate, the process of industrialization is supposed to be completed in 2021^[1]. However, this process is not one with average balance. Beijing and Shanghai are much closer to the goal of accomplishing industrialization (see Table 1). They are at early phase of the post-industrial stage, and about to enter the era of post-industrial society. The revolution of the industrial structure within the process of industrialization leads to land-use changes. Meanwhile, when the former industrial properties and industrial facilities lost their production function in the industrial structure adjustment and are turn into city's industrial legacies, how to redevelop and utilize these legacies will be the following problem.

Table 1 Comparison of the stage of industrialization in various regions of China

Stage \ Regions		The entire county	The 4 economic areas	The 7 economic regions	The 31 princes, cities and districts
Post-industrial					Beijing(100), Shanghai(100)
Late stage	Later phase			Yangtze River Delta(85) The Pearl River Delta(80)	Tianjin(96),Guangdong(83)
	Earlier phase		East China(78)	Circum-Bohai-Sea Region(75)	Zhejiang(79),Jiangsu(78),Shandong(66)
Middle stage	Later phase	China(50)			Liaoning(63), Fujian(56)
	Earlier phase		Northeast China(45)	Northeast China(45)	Shanxi(45),Jilin(39), Inner Mongolia(39),Hubei(38),Hebei(38), Heilongjiang(37),Ningxia(34), Chongqing(34)
Early stage	Later phase		Central China(30) West China(25)	Central China(30) Northwest China(25) Southwest China(20)	Shaanxi(30), Qinghai(30), Hunnan(28), Henan(28),Xinjiang(26),Anhui(26), Jiangxi(26),Sichuan(25),Gansu(21), Yunnan(21),Guangxi(19),Hainan(17)
	Earlier phase				Guizhou(13)
Pre-industrial					Tibet(0)

remark: the numbers inside the brackets are corresponding industrialization index

source: Blue book of industrialization

Urbanization is the other prominent background of contaminated sites remediation and manufactured sites redevelopment. At the end of 2008 China's urbanization rate has reached 45.7%, total of 607 million urban populations, which means the county has entered a rapid developing period of urbanization. [2] The developmental tendency of urbanization could be read in Figure 1 as followed. The process of urbanization brings city sprawl and expansion as well as land value changes. Spatial expansion raises more demands for land and the need of adjust the layout of the city's industries. So, manufactured sites redevelopment for new residential, commercial and other land-use is proposed as sustainable solution to meet these demands and needs. On the other hand, some original mining areas, landfills, etc. located in the outskirts are becoming much more valuable plots as the land value changing with the process of urbanization. To clear and redevelop these Brownfield becomes reasonable strategies of city's further development.

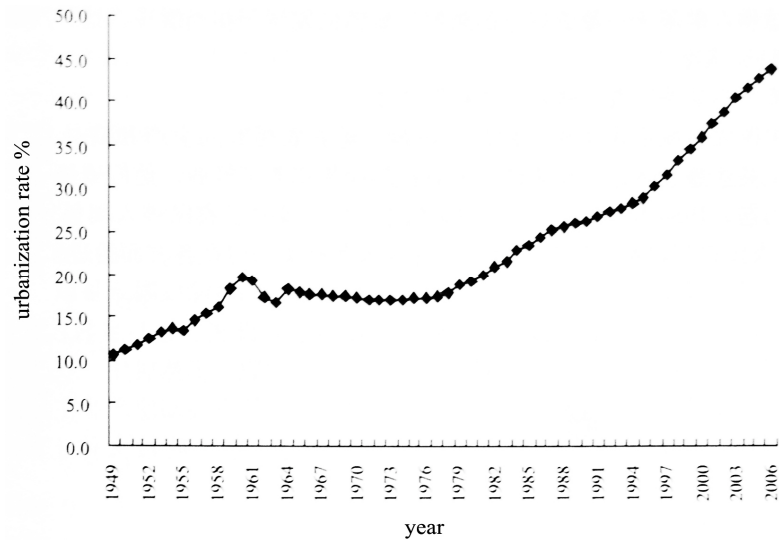


Figure 1 Urbanization rate of China (1949-2006)

Source: Annual Report on Urban Development of China (NO.1)

1.2 Land Value Changes under Market Discipline

Land value change is the dynamic of manufactured sites redevelopment. The current land resource allocation mechanism is a government-led open competing mechanism of market. Except for sites such as educational or public facilities, most urban plots are subject to the market discipline, which means the rights of land developing are allocated by the bidding mechanism in the market. The development of urban land is impacted by the demands and recognized value. Land uses of inconsistent with the rules of the market value are likely to be changed.

Based on the arrangement in the early days of the found of P. R. China in 1950s, industries were concentrated in the city areas. Nowadays, with industrial structure changes and process of urbanization, urban spatial layout changed. The value of former industrial properties increased substantially. Meanwhile the market demand of residential and commercial development is greatly rising as well. Under such situation, original profit from manufacture production would not be able to match the profit from residential or commercial development on the same plot, even take the high cost of site remediation into account. So, nowadays, when the city renewal happens on the base of 1950's plan, manufactured sites become first priority to be redeveloped.

1.3 Presence or Potential Presence Environmental Pollution Threats

The other dynamic for contaminated sites remediation is the threats of pollution, no matter presence or potential presence. The threats came from activities of previous manufacture production. Even though these threats are not perceivable, they could damage people's health and impact the surrounding ecological environment. With the awareness of environmental and ecological values, the entire society began to pay attention to environment improvement, especially to the clear of hazardous contamination. Comparing with the effort by United States and other Western countries, the dynamic in China is some different. In western country, Brownfield remediation plays roles of combating urban decay, creating employment opportunities and encouraging market development. However, in China, with rapid economic development, there no issue of abandoned and decline problem after domestic enterprises closed down and before the beginning of the redevelopment. So, the government supervises and manages the remediation of manufactured sites mainly for public health and safety as well as welfare considerations.

2 REGULATIONS AND POLICIES

Contaminated urban manufactured sites, broadly speaking, are a kind of Brownfield. At present, China has not specified the definition of Brownfield, neither any law nor regulations even policies were released

directly on remediation of Brownfield sites. However, in laws and regulations of environmental protection, there have been some relevant contents about soil pollution which could be recognized as legal base of remediating actions. these contents could be categorized as table 2.

Table 2 Legislation and administrative regulations about site remediation

Laws		<ul style="list-style-type: none"> ◆ Environmental Protection Act of The People's Republic of China ◆ Solid Waste Pollution Prevention and Control Act of The People's Republic of China
Administrative regulation	State Council	<ul style="list-style-type: none"> ◆ the State Council's approval on the 10th Five-Year Plan of National Environmental Protection ◆ Hazardous Chemical Safety Regulations ◆ Economic and Social Development 11th Five-Year Plan
	Ministry of Environmental Protection	<ul style="list-style-type: none"> ◆ Administrative Note of State Environmental Protection Administration issued in June 2004 ◆ Abandoned Hazardous Chemicals Environmental Pollution Prevention and Control Approach ◆ Guidance on Establishment of Mining Environmental Management and Ecological Restoration Accountability Mechanisms
	Beijing Environmental Protection Bureau	<ul style="list-style-type: none"> ◆ Site Environmental Assessment Guidelines

2.1 National Regulations and Policies

On November 26, 2001, the State Council published "the State Council's approval on the 10th Five-Year Plan of National Environmental Protection " and clearly pointed out the need to actively promote pollution remediation by enterprise, industry and market-oriented combination, expanding domestic demand through multiple channels to raise funds, encourage and support a variety of social funds to invest in environmental protection, and increase the collection efforts of urban sewage treatment fee, waste disposal fee, so that pollution remediation facilities can run with financial self supporting and some profits. The government, enterprise, social plural investment and public participation together form the environmental protection mechanism. ^[3]

On January 9, 2002, the 52th State Council executive meeting adopted and announced on January 26, 2002, The People's Republic of China State Council Order No. 344 promulgated, and on March 15, 2002 shall come into force " Hazardous Chemical Safety Regulations." ^[4]In this regulation it provides legal liability for waste disposal of dangerous chemicals and provides a legal basis on handling with hazardous chemicals abandoned on the contaminated sites.

Amended on December 29, 2004, April 1st 2005 " Solid Waste Pollution Prevention and Control Act of The People's Republic of China " was enforced. ^[5]The law with regard to supervision and management of industrial solid waste, life rubbish, hazardous waste and pollution, providing for prevention and control methods, clarifies the legal responsibility. It furnishes legal basis for the contamination caused by solid pollutants disposal.

On March 16, 2006, "Economic and Social Development 11th Five-Year Plan" clearly put forward to "carry out the National Survey on soil pollution, and integrated management of soil pollution." ^[6] Although this request was made mainly targeted at the rural environmental protection, but this plan is made to concern of pollution of land from the national policy level, which has important significance on the urban industrial pollution as well.

2.2 State Environmental Protection Administration (SEPA)'s Policies

In June 2004, SEPA issued a notice requiring the relocating enterprises should pay attention to

prevention and control work on soil pollution in the process. Clearly due to legacy that issues of pollutants in the soil caused by environmental pollution should be responsibility of the original business units, and the enterprises should restore the function of soil under the governance.^[7]

In 2005, SEPA issued Decree No. 27, "Abandoned Hazardous Chemicals Environmental Pollution Prevention and Control Approach"^[8], which provides concrete methods for management on abandoned hazardous chemicals transportation, storage and disposal.

On February 10, 2006, SEPA together with the Ministry of Finance, Ministry of Land Resources issued "Guidance on Establishment of Mining Environmental Management and Ecological Restoration Accountability Mechanisms" and proposed gradually establishment of a mining environmental management and ecological restoration accountability mechanisms from 2006.^[9]

2.3 Local Laws and Regulations Policy Standards of Beijing

On January 17, 2007, the Beijing Municipal Environmental Protection Bureau (BMEPB) issued a circular to implement the "Site Environmental Assessment Guidelines"^[10]. Although regulatory policies and standards are still not perfect yet, it was the first step taken on local standards setting in both exploration and practice. Using the experience of U.S. Superfund Act and combining with the actual operation, BMEPB standardized environmental assessment of contaminated sites, the content, procedures and evaluation criteria.

3 REMEDIATION STRATEGIES OF CONTAMINATED SITES IN BEIJING

The practice of site remediation in Beijing began to draw public attention around 2004. For one thing, large-scale renovations of manufactured sites were proceeding to improve the city's air condition for the coming Olympic Games; for the other, several accidents related to the previous chemical factories' legacy took out in the new residential development projects and new traffic facility construction. Practical problems brought challenges to the government agency on the administrative approaches for the related remediation actions. To response to the increasing practical challenges, Environmental Protection Bureau (EPB) of Beijing began to absorb existing abroad experiences and experiment new adapting mechanism, and have harvested some workable results.

3.1 Supervision Agency

Environmental Protection Bureau (EPB) of Beijing is the local governance institutions of contaminated sites management. As a governmental agency, EPB carries out the management, coordination, supervision, review and so on in activities of remediation. Environmental Protection Bureau of Beijing is under the lead of both Ministry of Environmental Protection (MEP) of the People's Republic of China and Beijing Municipal Government (Figure 2). One of the most important responsibilities of MEP is to supervise environmental protection actions of the entire country. By setting agencies at all levels of governments, MEP fulfills this responsibility. Beijing EPB is such a governance agency under direct leading of MEP. Meanwhile, Beijing municipal government also leads Beijing EPB by controlling its personnel and finance etc. In remediation actions, Beijing EPB play roles mainly on determining the implementation entity and liability entity, examining and monitoring remediating programs, combing the specific funding channels etc..

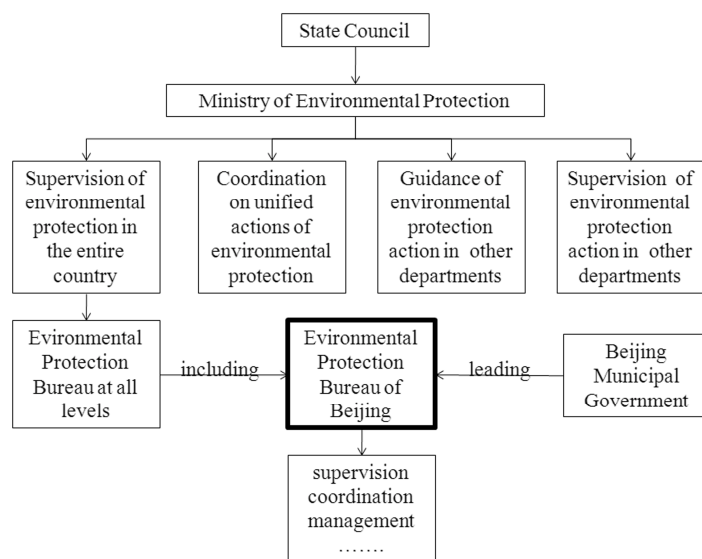


Figure 2 Beijing Environmental Protection Bureau's position in administrative system

3.2 Liability Entity

"Polluters take the liability according the law" is the first principle to determine the liability entity. It is enterprise that usually carries out polluting behaviors and cause contaminated results. If the enterprises close down, the transferees take responsibility of the contamination remediation. If those liabilities cannot be identified, or the responsible person cannot afford the liability, it has to be committed to the government.

3.3 Sources of Funding

Source of funding for treatment are divided into three categories, namely, funded by the Government, by the plot subscriber and by the developer. In government-funded mode, the Land Office purchases the plot for storage from the state-owned enterprise which is closed down or moved away. The land will be managed by land center. Then, Land Office funds the remediation and lists the land transactions. The cost of remediation is contained in the land transaction costs. Another way is as following. Land Office purchases plot first and then commit a professional institution to assess the situation of pollution. The result of the assessment is to be submitted to the EPB for approval. The assessment is required to include the rough estimate of remediation cost. After the report is finished and approved, without any treatment, the plot is to be list transactions directly together with assessment report, EPB's approval and the results of cost estimate. Plot subscribers weigh according to the above to determine the purchase of land. Although these two methods of remediation are funded by either the government or subscriber, the remediation costs are both to be contained in the plot purchasing cost in land purchasing and storage process. In the third situation, the remediation is funded by corporate enterprise. The relocation of large state-owned industrial enterprises usually accompanies with new residential development projects to resettle laid-off workers. The owner of such projects is the enterprise itself, so the polluter and user are the same entity. In this case, land-pollution remediation is to be funded by the enterprise itself.

3.4 Procedures

First of all, site environmental assessment is carried out by professional institution, according to the standards of evaluation guidelines. The assessment report is supposed to identify the contaminant. If the contamination is detected, the report should contain pollution identification, risk assessment and management proposal. After the report is approved by EPB, competitive bidding is to be proceeded to decide the remediation organizer. The specialized organizer is responsible to work out project program according to the assessment report and submit the program to the EPB for examination and approval. In the end, after the EPB's approval of the program, the project will be recorded and monitored by EPB in the whole process.

3.5 Technology

In current completed remediation projects in Beijing, off-site technologies are the only implemented technologies, mainly including incineration and landfill. Incineration with lime-kiln burning is a very effective, low-cost approach to deal with organic contaminant. Main cost of this method occurred in the transport process. Because contaminated soil has to be transported to disposal sites and after incineration, it has to be transported to the receiver sites. A large number of soils and long-distance transportation result in a very high cost. At the receiver sites, the treated soil can be used for different purposes according to different quality levels such as concrete additives. Another off-site technology is landfill. Landfill disposal is very demanding, which is similar structure as landfill dump, which need for underground-waterproof facilities, gas and leachate gathering and treatment facilities as well as surface of the isolation facilities. What's more, in the landfill process, the contaminated soil pile was strictly limited to a certain area, which cannot be nearby farmland, orchards, gardens and other land-use in order to strictly prevent pollutants from entering the food chain, affecting human health.

4 PROBLEMS OF CONTAMINATED SITE REMEDIATION MANAGEMENT IN BEIJING

4.1 Imperfect Laws and Regulations

Existing relevant laws and regulations lack of specific regulations of contaminated sites soil. The contents in existing "Environmental Protection Law" don't provide any specific measures and requirements about contaminated sites and soil. And other laws and regulations, such as the Land Management Law and Solid Waste Law etc., which involve a number of the requests the on contaminated soil and contaminated sites, cannot stand with regard to remediation of contaminated sites on legislative point and have no specific requirements on the differences and relationship between solid wastes, contaminated sites and contaminated soil. On the other hand, although BMEPB took a trial to the local standard, they are not managed to comprehensive standard indicators of the soil. For example "Soil Environmental Quality Standard" (GB15618-1995) didn't regulate the pollutant components and lack of the standard of pollution control, neither the classification of contaminated sites and grading control standards.^[11]

4.2 Inadequate Supervision and Management mechanisms

Nowadays there are still no specific organizations and personnel to manage the contaminated sites yet. There is nether adequate basic data of contaminated sites, nor national survey of soil pollution situation^[12]. Although BMEPB has tried to organize contaminated sites investigation, there still little knowledge on the several of types, quantities, pollutants, and proliferations of contaminated sites, with the difficulties of shortage on financial support and manpower etc. In addition, the completed remediation projects need long-term monitor and management, however for the reason of present corresponding system, social awareness and the drag of construction corps, the long-term management cannot be achieved recently.

4.3 Divorced Treatment and Development

In the context of rapid economic development, on contaminated sites remediation or redevelopment projects, the developers tend to propose the remediation program before the construction, so that they can clean up the site in a short time, and pursuit the highest profit in the shortest time as well as get high returns for redeveloping manufactured plots in Beijing. The drastic measures to deal with the contaminated sites in such a short period of time must follow more stringent environmental standards, which accompanies much higher remediation costs. Although this strategy and development mode accelerates the pace of redevelopment and ensures the rapid harvest of profit, it rules out other possibilities that based on land-use program, which originally targets to develop a comprehensive sustainability of restoration and development.

5. SUMMARY

Under the situation of the rapid process of industrialization and urbanization, manufactured sites remediation and redevelopment are driven by market discipline and the government's public service responsibility. It becomes increasingly compelling in urban renewal and the further development. By exploration on contaminated sites management policies of Beijing, the lack of relevant laws, regulations and management mechanism is clarified, which leads to a broken linkage of contamination detecting,

remediating process with site designing and planning process. In the trend of ecological civilization developing, high-input extensive redevelopment mode is bound to be turned into sustainable and smart development mode. It is helpful to prepare for the developing mode transform to think out the development of laws and policies from the initial stage of contaminated sites remediation in China. And ultimately, it will contribute to the sustainability, integration of remediation with development.

REFERENCES

- [1] A Blue Book of Interpretation of China's Industrialization Process [M/OL]. [2009-05-27]<http://www.acs.gov.cn/cms/www/news/2362926434121.cgp>
- [2] "Urban Blue Book Conference and China Urban Development Summit Forum in 2009" [M/OL]. [2009-06-15] http://www.china.com.cn/zhibo/2009-06/15/content_17930782.htm
- [3] Zhu Yuming, Su Haitang, Guo Peng. "Comparative Study on Re-development of Brown Land Management Policies and Regulations in China and Abroad". *Environmental Science*, 2009, 35 (3) :40-43.
- [4] "Dangerous Chemicals Management Ordinance" [M/OL]. [2006-05-30]. <http://www.dffy.com/faguixiazai/xzf/200903/20090307072056.htm>
- [5] "Solid Waste Pollution Prevention and Control Act of The People's Republic of China" [M/OL]. [2004-12-26]. http://www.sepa.gov.cn/law/law/200412/t20041229_65299.htm
- [6] "authorized to issue: The People's Republic of China National Economic and Social Development 10th Five-Year Plan (Full Text)". [M/OL]. [2006-03-16] http://news.xinhuanet.com/misc/2006-03/16/content_4309517.htm
- [7] "Notice on the Effective prevention and Control of Environmental Pollution during the Enterprise Relocation" [M/OL]. [2004-06-01] http://www.zhb.gov.cn/info/gw/huanban/200406/t20040601_90520.htm
- [8] "Abandoned Hazardous Chemicals and environmental pollution Prevention and Control Approach" [M/OL]. [2009-05-30] <http://www.zjkepb.gov.cn/XingZhengFaGui/2009-04/3504.htm>
- [9] Ministry of Finance, Ministry of Land Resources, Environmental Protection Administration. "Guidance for Gradual Establishment of Mining Environmental Management and Accountability Mechanisms of Ecological Restoration". *Choi Kin* (2006) 215 document 2006.2.10
- [10] Beijing Municipal Environmental Protection Bureau: Notice on the promulgation of implementation of the "Guidelines for Environmental Assessment Site" [M/OL]. [2007-02-06] <http://www.bjepb.gov.cn/bjhb/tabid/68/InfoID/13483/frtid/40/Default.aspx>
- [11] Zhao Nana, Huang Qifei, Yi Aihua, Wang Qi. "The status quo of China's management of contaminated sites and environmental measures". *Environmental Science and Technology*, 2009, 29 (12) :39-40
- [12] "The 6th National Environmental Protection Assembly to implement the spirit of soil pollution prevention and control". *Journal of Ecology and Rural Environment*, 2006, 22 (3): I-II
- [13] Niu Ruiping, "Blue Book of Cities in China: Annual Report on Urban Development of China (NO.1)" Beijing, Social sciences academic press, 2007
- [14] Chen Guijia, "Blue Book of Industrialization: The Report on Chinese Industrialization" Beijing, Social sciences academic press, 2007
- [15] Deng Jiwen, "Constructing Ecological Civilization Needs to Reform the Management System of Environmental Protection in Our Country", *Ecological Economic*, 2008(6). pp. 156-159