How to effectively prevent toxic and harmful land after the implementation of the " *Ten Articles of Soil Pollution Prevention and Control Action Plan* "

SIP Lvse Jiangnan Public Environment Concerned Centre

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1 Background

In *the Action Plan for the Prevention and Control of Soil Pollution* (also known as the "*ten articles on soil*") issued by the State Council on May 31, the State Council put forward the goal that the safe utilization rate of contaminated cultivated land will reach about 90% and that of contaminated plots will reach more than 90% by 2020. By 2030, the safe utilization rate of contaminated cultivated land will reach more than 95% and that of contaminated land will reach more than 95%.In response to this, the "*ten articles on soil*" put forward 10 articles, 35 specific measures, from carrying out soil pollution investigation, establishing and improving the system of laws and standards, to classifying management of agricultural land, carrying out pollution control and remediation, and finally stricting accountability.

A few months ago, the toxic land incident of Changzhou Foreign Language School and Jingjiang hog farm continued to attract the attention of the media and society, and once again, sounded the alarm for the problem of soil pollution in China. In fact, the national soil pollution problem has always been very serious. According to the *Bulletin of National Soil Pollution Survey* released in April 2014, the overall over standard rate of soil in China is 16.1%, and the over standard rate of cultivated soil points is 19.4%.Among the 775 soil points of 81 industrial wastelands investigated, the exceeding standard points account for 34.9%. The main pollutants are zinc, mercury, lead, chromium, arsenic and polycyclic aromatic hydrocarbons, mainly involving chemical industry, mining, metallurgy and other industries.

In recent years, there have been many similar incidents such as acute poisoning caused by site pollution. The main reason is that with the acceleration of urbanization, in the adjustment of industrial structure and urban land use structure, many polluting enterprises which were originally located in the superior position of the urban area have been relocated and transformed due to land development, leaving a large number of toxic and harmful land seriously polluted. The existence of these contaminated sites has brought severe environmental and health risks. Some toxic and harmful land is directly "used normally" without treatment; Some toxic and harmful lands have been or are being repaired by the site, but for the domestic policies, regulations and technical framework for environmental remediation of

contaminated sites are not perfect, the site remediation faces many challenges.

For a long time, soil pollution has not been paid enough attention due to its concealment, which leads to the intervention of toxic and harmful land. Following suggestions are put forward in combination with the "ten soil articles" issued byLvse Jiangnan Public Environment Concerned Center to prevent this potential pollution effectively.

2 Suggestions on effective prevention of toxic and harmful land

(1) Emergency sorting and centralized census

In recent years, thousands of heavily polluted chemical enterprises have been relocated in Jiangsu Province, leaving a large number of sites with unknown pollution. Among them, due to the lack of awareness of environmental protection, simple environmental protection facilities, general old plants took simple treatment methods of pollutants. For example, many pesticide factories in those years lack information disclosure and opacity in the treatment of pesticide residues and other harmful chemical residues, which may cause the residual concentration of pollutants in the local soil to exceed hundreds of times the relevant standards, and even cause groundwater or air pollution. According to the types and concentrations of pollutants, the incubation period may be very long.

In the "*ten articles on soil*", it is proposed to master the status of soil environmental quality through in-depth investigation of soil environmental quality, construction of soil environmental monitoring network and improvement of soil environmental information management level. Master the distribution of contaminated plots and their environmental risks in the land used by enterprises in key industries by the end of 2020. Establish a regular investigation system of soil environmental quality, which shall be carried out once every 10 years.

It is suggested that the whole province should urgently and effectively sort out the list of enterprises that have relocated or are producing toxic and harmful substances, so as to provide basis for the development and use or accountability of contaminated sites. The efforts of the US government in this regard are worth learning. The US Environmental Protection Agency has counted more than 47000 contaminated sites since 1982, and listed more than 1700 of them in the national priority list. In the contaminated site data, it is divided into four categories: **those that have been studied and suggested to be cleaned up; those whose clean-up hasn't been finished; the necessary facilities have been cleared, and those which the cleaning may continue indefinitely; which has been cleaned up and deleted from the list.**

Then, environmental protection departments shall conduct material review and on-site verification on the sorted toxic and harmful "enterprise land", including soil environmental quality investigation and pollution source investigation. Prevention in advance should be the focus of toxic and harmful land treatment, and comprehensive monitoring can comprehensively and timely understand pollution information, which has become the top priority. According to different characteristic of pollutants, comprehensive monitor of the surrounding air, soil and groundwater of the combed "enterprise land" were carried out. In addition to direct site distribution, relying on traditional sampling methods and laboratory analysis, the site conceptual model can also be used in the process of contaminated site investigation. By establishing a site conceptual model to analyze the hydrogeological conditions of the site and the migration of pollutants, it can further reduce the investigation cost, shorten the investigation time, and improve the investigation resolution and certainty. Through comprehensive monitoring, establish and gradually improve the database of contaminated sites, and manage them by classification according to the degree of pollution, so that relevant departments can determine prevention and remediation plans for different levels of contaminated sites.

(2) Scientific demonstration, risk assessment

The "toxic land incident" has exposed the defects of China's environmental risk assessment. Although the health risk is mentioned in the environmental assessment, it is only mentioned in a few words. For sites contaminated with soil, risk assessment can determine whether there are health risks and clarify the remediation objectives. It mainly analyzes the risk of site pollution, controls the impact of contaminated site on human health and environment, and reduces uncertainty based on the identification of the characteristics, migration mode, exposure route and final impact on receptors of site pollutants.

China has become the largest pesticide producer in the world, and the output of many other highly polluting chemical products has also increased in the world. Various highly polluting chemical parks have been established one after another. The type and quantity of toxic substances discharged and the flow direction of treatment and transfer of these substances are unknown, and there is a lack of social supervision. Once enterprises lack awareness of environmental responsibility and there are loopholes in supervision, it is difficult to be effectively accountable for land problems.

In 2014, the Ministry of Environmental Protection issued *the Technical Guidelines for Risk Assessment of Contaminated Sites*, which stipulated the principles, contents, procedures, methods and technical requirements of risk assessment of contaminated sites. See Figure 1 for the specific risk assessment procedures and contents. The standards belonging to the same series of contaminated sites include *Technical*

Guidelines for Site Environmental Investigation, *Technical Guidelines for Site Environmental Monitoring* and *Technical Guidelines for Soil Remediation of Contaminated Sites*, which aim to strengthen the supervision and management of environmental protection of contaminated sites and standardize the human health risk assessment of contaminated sites. These four guidelines initially constitute a technical system for environmental management of contaminated sites suitable for China's national conditions. However, how to integrate the four technical standards and identify the key links is the primary task of scientific risk assessment. At present, there are few historical files dedicated to the environmental situation of domestic contaminated sites, the localization of the value of key parameters of site risk assessment is not sufficient, and there are few practitioners with site environmental risk assessment knowledge and experience, which are also the limitations of the development of contaminated site risk assessment.

By the end of 2016, the technical regulations on soil environmental investigation and assessment of construction land shall be issued., local environmental protection departments at all levels shall strengthen the supervision of soil environmental risk assessment of construction land, strictly manage the access of construction land and prevent human settlement environmental risks.

It is suggested that a pollution monitoring risk assessment mechanism combining government investigation and enterprise monitoring should be established, especially pay attention to the risk of soil pollution and groundwater pollution diffusion. It shall be mandatory that the environmental risk assessment of soil and groundwater shall be conducted before the transfer, transfer, lease and recovery of industrial land, and the developer must conduct site pollution investigation and risk analysis. There are many kinds of characteristic pollutants produced by chemical enterprises such as pesticide factories, many of which are not within the detection scope of national standards, risk analysis should be carried out for characteristic pollutants in different production links of different enterprises.

(3) Joint supervision and introduction of repair scheme

On the one hand, there is a lack of regulatory authorities for the reuse of contaminated sites. At present, except that the environmental protection departments in Beijing and Chongqing have pollution site management sections, other cities are basically in a regulatory vacuum, and there are no mandatory requirements for site pollution investigation and analysis of the original industrial land before secondary development and utilization. The practices of relevant departments in Beijing and Chongqing are worth learning from.

During the land auction, the bidding document of Beijing land reserve center clearly requires that the bid winner must formulate and implement relevant plans according to the contaminated soil disposal plan formulated by Beijing Environmental

Protection Bureau to avoid secondary soil pollution. In this process, the environmental protection department intervenes in the whole process to ensure the implementation of site cleaning and risk control. Chongqing stipulates that before changing production or relocation, production and business operation units shall remove the toxic and harmful substances left or discharged, and treat the contaminated soil.

On the other hand, there is also a lack of supervision of contaminated site remediation units. At present, the price of general soil remediation projects is quite expensive. According to the statistics from 2014 to September 2015, the average cost of soil remediation projects in China is as high as 57.53 million yuan (data from Jiangsu Yixing Environmental Protection Industry Technology Research Institute). Most soil remediation projects in China adopt the method of engineering removal of contaminated soil, then harmless treatment, and then covering appropriate new soil. In recent years, a large number of enterprises have recognized its great prospect and entered the soil remediation industry. In 2011, more than 20 enterprises were engaged in soil remediation business in China, rising to about 500 in 2014 and more than 900 in 2015 (data from China environmental remediation industry alliance). Inconsistent with the huge cost, soil remediation projects generally show the characteristics of "short work period".According to the data, from 2014 to September 2015, only 12.6% of the projects with a construction period of more than 500 days and 66.7% of the projects with a construction period of less than 200 days. For the contaminated site, sometimes it may be temporarily closed, but if the unscientific repair process may bring risks. Soil remediation is a complex project, in addition to understanding the existing conditions of pollutants and soil, it is also necessary to consider the "dynamics" of soil. There are many key nodes to consider, which need to be done by a team with corresponding qualifications and professional technology. At present, China has no corresponding qualification regulations for the remediation of contaminated sites, and the work level of relevant enterprises is uneven, once the problem of cost is tilted, the level and ability of remediation may be greatly reduced, bringing great hidden dangers to the environment.

In the "ten articles on soil", it is proposed to strengthen the coordination and linkage of departments, and all relevant departments should cooperate in the prevention and control of soil pollution according to the division of responsibilities.

It is suggested that the remediation of contaminated sites should be jointly supervised by multiple departments and the remediation scheme should be jointly issued, clarify the management process, implement the responsible subjects in the process of land use right transfer, and all departments play an effective synergy. At present, in terms of remediation technology, *the Technical Guidelines for Remediation of Contaminated Site Soil* can be followed, but there are no rigid provisions on the specific implementation of remediation projects. In many site restoration projects, government departments only organize experts to technically

check the restoration scheme, but lack the supervision of relevant departments on whether the actual operation process of restoration is standardized or not. It is necessary to strengthen the qualification review of remediation units of contaminated sites and the verification of remediation process. The joint supervision of toxic and harmful land by multiple departments can ensure the comprehensiveness of the remediation scheme, so as to prevent problems such as only paying attention to soil remediation and ignoring the treatment of groundwater pollution, or only paying attention to the treatment of contaminated sites and ignoring the impact on the surrounding environment in the remediation process.

(4) Timely disclosure of information and promotion of social supervision

With people's increasing concern about the harm of environmental pollution, the importance of the right to know environmental information has been gradually recognized. Although China has formed a certain system of environmental laws and regulations for the disclosure of environmental information, the protection of citizens' right to know environmental information is not that satisfactory. *The Regulations on the Disclosure of Government Information* stipulates that government information involving the vital interests of citizens, legal persons or other organizations or requiring the wide knowledge or participation of the public shall be made public on their own initiative, and the contaminated site is related to the safety, health and vital interests of thousands of households, so it should be made public. The regulations of the United States on environmental information disclosure procedures of contaminated sites have great reference significance for us.

In the United States, *the Emergency Planning and Community Right to Know Act* stipulates that enterprises have the obligation to reduce the impact of toxic chemicals on the environment and must disclose relevant information about toxic chemicals to the public. *The Pollution Prevention and Control Law* stipulates that if an enterprise uses more than the specified amount of toxic chemicals, it must report its treatment of toxic waste every year. The U.S. Environmental Protection Agency included about 650 kinds (categories) of toxic waste management data of more than 2,3000 industrial enterprises in *the toxic substances release list*, as well as relevant data on disposal and discharge, recycling, heat recovery and treatment of all toxic wastes, which can help the public know how enterprises deal with chemical wastes, especially toxic wastes.

It is proposed in the "ten articles on soil" to determine the list of key supervision enterprises of soil environment, which shall conduct soil environment monitoring on their land and make it public to the public. After the repair project is completed, the responsible unit shall entrust a third-party organization to evaluate the treatment and repair effect, and the results shall be made public to the public.

It is suggested to publicize the sorted list of enterprises relocated or producing toxic

and harmful substances, soil environmental quality investigation and pollution source investigation details to the public. The openness and transparency of land pollution data is one of the effective measures for social supervision of pollution site treatment. Generally, soil remediation is difficult and long process, which may involve multiple interests. Therefore, the repair process must be subject to public supervision, and the repair results should also be evaluated by an independent third party. The whereabouts of the excavated soil in the contaminated site remediation project shall also be publicized to the society in time and subject to public supervision.

(5) Improve laws and regulations and formulate industrial pollutant emission standards

The management of contaminated sites of industrial enterprises is still a new thing to China, the relevant laws and regulations are not perfect, and the operation procedures and approval system need to be improved. At present, it is urgent to establish a sound legal system for land pollution remediation, strengthen the legal responsibility of land pollution, and establish the urban land pollution remediation system.

It is proposed in the "ten articles on soil" to complete the revision of pesticide management regulations by the end of 2016, at the end of 2017, the soil environmental quality standards for agricultural land and construction land issued.

Soil remediation is a helpless action, and the more important thing is to prevent soil pollution. Therefore, it is particularly important to control from the source and impose strict industrial pollutant emission standards on enterprises producing toxic and harmful products. Most of the products or by-products of pesticide production enterprises are toxic substances, some even contain highly toxic substances, some may have low acute toxicity, but they have chronic toxicity or environmental hormone effect, or "three causing" effect (carcinogenic, teratogenic and mutagenic), which has a great impact on the soil environment. However, in terms of water pollution emission control of pesticide industry, only the water pollutants of production enterprises of heterocyclic pesticides imidacloprid, triadimefon, carbendazim, paraquat, atrazine and fipronil are discharged in accordance with the discharge standard of water pollutants for heterocyclic pesticide industry, in addition to the above six technical drugs, the water pollutant discharge of pesticide production enterprises shall be implemented in accordance with *the Comprehensive Wastewater Discharge Standard*. The comprehensive emission standards are not targeted, lack of comprehensive toxicity indicators, and the coverage of characteristic pollutant indicators is insufficient. The toxicity and harm of these pollution factors are often great., if not be controlled, they will pose a serious threat to the ecological environment and human health. Therefore, it is necessary to formulate water discharge standards for pesticide industry in order to play an important role in

standardizing production processes, pollution control and promoting technological upgrading, so as to reduce the pollution risk to the land.

(6) Establish a market mechanism and implement repair funds

One of the difficulties of toxic land remediation is that it is difficult to define the responsibility of soil pollution. According to the principle of "Who pollutes, who governs", the responsibility of the contaminated site should lie with the original enterprise. However, soil pollution often has a strong concealment, which is formed in historical accumulation and has a long time span. The subject of responsibility may change, transfer or disappear, it is difficult to trace the responsibility of historical polluters. Most of the relocated high polluting enterprises are state-owned in recent years, so it is difficult to be responsible for the polluted site. The cost of site restoration is usually very high, which is unrealistic to rely on government investment. It is necessary to establish a scientific market mechanism, including charging mechanism and payment mechanism.

Chongqing is exploring new ideas, organizing the Development and Reform Commission, Finance, Land and other departments to use the financing platform to arrange special financial funds to repair and treat the land before the contaminated site enters the auction process, and looks forward to forming a virtuous circle of contaminated site treatment through the income from land transfer. In 1980, the United States Congress passed *the Comprehensive Environmental Response, Compensation and Liability Act*, which approved the establishment of the pollution site management and remediation fund, namely the "superfund". The funds of the fund come from taxes on domestically produced oil and imported petroleum products, taxes on chemical raw materials, environmental taxes, regular appropriations, restoration and management expenses recovered from those responsible for pollution, etc.

In the "ten articles on soil", it is proposed to give full play to the leveraging function of financial funds through the cooperation mode between government and social capital(PPP), so as to drive more social capital to participate in soil pollution prevention and control. We will actively develop green finance, explore the issue of bonds, and promote soil pollution control and remediation.

It is suggested to implement the repair funds in a multi pronged manner. On one hand, improve the list of enterprises that have relocated or are producing toxic and harmful substances, implement the responsible subjects of incremental soil pollution, and find potential buyers for the follow-up treatment of contaminated sites, on the other hand, we should establish a scientific financing mechanism to attract social capital to participate in the repair.

For estate development projects, many contaminated sites locate in the core area of

the city. Government departments can require developers to participate in soil remediation while transferring land to developers, for urban public soil projects (such as parks and green spaces), we can try to learn from the American "super fund" model to ensure the source of funds for contaminated site remediation through multiple channels.

(7) Risk control to avoid the outbreak of group events

Chen Jining, Minister of Environmental Protection, said that the focus of the "ten articles on soil " is to consolidate two foundations, namely, find out the family background, carry out detailed investigation of soil pollution, and improve the system of laws, regulations and standards. The " ten articles on soil " has promoted three major tasks, namely how to do and protect uncontaminated land, how to deal with polluted land, how to do a good job in risk management and control of polluted land, and how to repair it under the condition of risk management and control. Soil pollution is completely different from water and air pollution, the key is the risk control.

Risk control is to conduct scientific demonstration and risk assessment on the basis of clarifying the information of contaminated sites and soil conditions, issue safe soil remediation schemes under the effective joint supervision of multiple departments. Reduced the risk through the supervision of the repair process and the timely disclosure of relevant information. Compared with other group events, group events caused by environmental pollution have a large number and momentum, and the government's response and control ability is weak. Doing a good job in risk management and control can enhance the response capacity of government departments to emergencies. Once hazardous substances are released, government departments can respond quickly to reduce the public's concern and aversion to pollutants, reduce the public's loss of life and property, and avoid the outbreak of mass events caused by contaminated sites.

3 Conclusion

Soil pollution endangers food security and people's life and health, active and effective measures must be taken to prevent the major harm of toxic and harmful land. The "ten articles on soil" defines the main body of soil pollution control and remediation, formulates the plan for control and remediation, and puts forward a series of hard tasks for effective control and remediation of contaminated soil. Lvse Jiangnan Public Environment Concerned Center puts forward the above suggestions on how to effectively prevent harmful and toxic land on the basis of the tasks and measures put forward in the "ten articles on soil ".

In the process of the rapid urban expansion, we should sort out the list of enterprises which were relocated or which are producing toxic and harmful substances as soon as possible, carry out soil environmental quality investigation and pollution source investigation, establish a pollution monitoring risk assessment mechanism combining government investigation and enterprise monitoring, issue remediation plans under the joint supervision of multiple departments, and strictly supervise the process, timely disclosure of relevant information, acceptance of social supervision, establishment of scientific market mechanism, multi-channel guarantee of capital sources of contaminated sites, and treatment by stages according to priorities may become a breakthrough strategy for poisonous land control.

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