

# The Current Situation and Development Trend of Contaminated Land Restoration

Yulu Wei<sup>1,2,3,4</sup>, Wang Jing<sup>1,2,3,4</sup>

<sup>1</sup> Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an 710075, China

<sup>2</sup> Shaanxi Provincial Land Consolidation Engineering Technology Research Center, Xi'an 710075, China

<sup>3</sup> Key Laboratory of Degraded and Unused Land Consolidation Engineering, the Ministry of Natural Resources of China, Xi'an 710075, China

<sup>4</sup> Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an 710075, China

## Abstract

**In recent years, the situation of land pollution has become increasingly serious, exacerbating the contradiction between supply and demand of land resources, and seriously threatening the red line of arable land and food security. In order to alleviate conflicts, ensure the red line of arable land, protect food security, and increase construction land, it is necessary to combine government policy guidance and use engineering technology to turn polluted land into usable land. By consulting literature and studying the policy orientation of contaminated land, combined with the engineering and technical experience of contaminated land restoration in recent years, this paper explores and summarizes the current situation of contaminated land, the policy orientation and technical means of contaminated land restoration, and finally looks forward to the development trend of global contaminated land restoration technology.**

## Keywords

**Contaminated Land; Policy Orientation; Repair Technology; Expectation.**

## 1. Status of Contaminated Land and its Restoration

Land resources are the mother of wealth and the material basis for human survival and development. With the continuous deepening of global industrialization and urbanization, a series of social and environmental problems have been triggered, exacerbating the contradiction between supply and demand of land resources. Dirty land refers to the pollution and destruction of land caused by human activities or natural factors, resulting in a decrease in the quantity of existing land and more importantly, the destruction of its quality, resulting in the complete or partial loss of its original use value and construction function, including polluted and damaged land. The problem of land pollution not only exists in the past and present stage, but may also exist in the future. Land pollution poses a serious threat to the red line of arable land and food security, posing a huge survival risk to 7.3 billion people worldwide [1,2].

During the "Tenth Five Year Plan" and "Eleventh Five Year Plan" periods, through projects such as the "863" Plan of the Ministry of Science and Technology and the Environmental Protection and Public Welfare Science and Technology Special Project, we focused on supporting technological research on the remediation of contaminated soil such as heavy metals, pesticides, persistent organic pollutants, and petroleum, and carried out small-scale demonstration and

verification work; During the 12th Five Year Plan period, the Ministry of Science and Technology launched a major project in the field of resource and environmental technology under the "863" plan, promoting innovation in key technologies and equipment for soil remediation. A batch of independently developed soil remediation technologies have entered the engineering demonstration stage, and a batch of advanced domestic and foreign technical equipment and remediation materials have also been used. A batch of pilot projects for soil pollution control and remediation on arable land and remediation projects for polluted land have started. The number of consulting institutions, professional remediation and supporting service enterprises engaged in soil pollution control and remediation has sharply increased, and the soil remediation industry and market have developed rapidly, It has gradually become a growth point for emerging environmental protection industries and economic pillar industries.

## 2. Policy Guidance for Remediation of Contaminated Land

In terms of the governance of polluted and damaged land, based on the experience of developed countries in governance, the following three characteristics are summarized: firstly, it is necessary to formulate comprehensive laws and regulations, implement the strictest protection system, and establish a red line for adhering to 1.8 billion acres of arable land without breaking through, and designate "permanent basic farmland" around the city to limit the expansion of urban occupation and destruction of arable land; Secondly, through preferential measures such as fiscal and tax policies, encourage and guide enterprises to actively participate in protection and restoration; The third is to focus on public participation in the entire process of governance and development of contaminated land, establish a database of contaminated land, regularly publish information on contaminated land, and mobilize the participation enthusiasm of various stakeholders.

Based on these three characteristics, five measures can be taken to strengthen soil environmental protection and pollution control, and resolutely declare war on soil pollution.

Firstly, the prevention and control of soil pollution should focus on improving the quality of the soil environment, ensuring the safety of agricultural products and the health of the living environment as the starting point, driven by reform and innovation, based on legal construction, adhering to strict control at the source, implementing graded and classified management, strengthening scientific and technological support, continuously playing a market role, guiding public participation, and effectively curbing the trend of increasing soil pollution nationwide by 2020, The overall quality of the soil environment remains stable, and the soil environmental safety of agricultural and construction land is basically guaranteed, and soil environmental risks are basically controlled.

The second is to accelerate the legislative process of soil environmental protection and establish a sound system of regulations and standards. Clear regulations should be made on the ways and types of legal liability (such as civil liability, administrative liability, and criminal liability), as well as the identification departments for land pollution. By setting responsibilities to prevent and constrain people's behavior of polluting land. Until 2020, the legal and regulatory system for soil pollution prevention and control was basically established, and local governments can combine reality and also study and develop local regulations for soil pollution prevention and control.

The third is to further carry out detailed investigation of soil pollution status. On the basis of the existing investigation of soil pollution status, organize a detailed investigation of soil pollution status, further understand the soil environmental quality status, and better combine with reality to study corresponding control measures. At present, an overall implementation plan has been preliminarily formed.

The fourth is to implement soil remediation projects. Accelerate the ecological protection and restoration of mountains, rivers, forests, fields, and lakes, achieve pattern optimization, system stability, and functional enhancement. Timely implementation of mine environmental governance and restoration, promotion of land remediation and pollution restoration, promotion of watershed water environment protection and governance, coordination of urban aboveground and underground construction, promotion of sponge city construction, making the city not only "face" but also "inner", and achieving comprehensive and comprehensive governance and restoration in all aspects.

Fifth, strengthen soil environmental supervision. The state will strengthen the supervision function of soil environment and establish a lifelong accountability mechanism for soil pollution; Strengthen supervision and inspection of the treatment of wastewater, exhaust gas, waste residue, etc. in heavy metal enterprises; Strictly control the indiscriminate use and abuse of agricultural inputs in the agricultural production process, standardize the collection, storage, transfer, transportation, and treatment and disposal activities of hazardous waste, and prevent new soil pollution.

### **3. Technical Means for Repairing Contaminated Land**

At present, physical, chemical, biological and other remediation measures can be taken to reduce the risk or harm of contaminated land both domestically and internationally, in order to gradually restore its function. However, due to the complexity of soil pollution, it is sometimes difficult to restore it using a single method, and multiple supporting technologies need to be adopted, requiring a large amount of funds and a long period of continuous restoration [3,4].

The remediation technology for contaminated land abroad has developed from a single remediation technology to a multi technology joint and comprehensive engineering restoration; In terms of equipment, from ectopic repair based on fixed equipment to on-site in-situ repair of mobile equipment; In terms of application, it has moved from a single factory site to a composite site in mega cities, and has developed from a single remediation technology to a multi technology and multi equipment collaborative site soil groundwater comprehensive remediation that integrates atmospheric and water monitoring.

Compared to other remediation technologies for polluted land, comprehensive land engineering technology can accelerate the clock of natural restoration and soil quality evolution, completely solve ecological problems such as land desertification, effective disposal of toxic chemical pollutants, delay the sharp reduction of forest resources, and eliminate garbage disasters faced by human society in a short period of time, and contribute to the continuous improvement of human living environment; It can greatly shorten the restoration cycle of contaminated land, improve restoration efficiency, accelerate ecological restoration, and save the cumulative cost of restoration, reducing ecological environmental risks. Especially for damaged land, it is difficult to achieve land reclamation without land engineering [5,6].

### **4. Prospects for Remediation of Contaminated Land**

The concept of contaminated land restoration should integrate the concepts of innovation, coordination, green, openness, and sharing, establish a four in one land remediation concept of "quantity, quality, ecology, and humanity", and take "sustainable development" as the development direction to strengthen the overall restoration of the "mountains, rivers, forests, fields, and lakes" life community. The goal of restoring contaminated land should balance the security of food supply, urban development, and ecological environment, ultimately achieving synchronous reconstruction of regional production, life, and ecology. The model of restoring contaminated land should shift from "homogeneous assimilation" to "differential remediation", and precise implementation of policies. The funds for repairing contaminated land should shift

from "financial burden" to "diversified co investment" to ensure the continuous and orderly progress of the restoration work.

The quality of soil determines the quality of all things. To ensure human food safety and living environment safety, it is necessary to implement the "Pure Land" strategy and develop a "Prevention, Control and Restoration" action plan for contaminated land. This requires strong support from governments and society around the world for the research and development of remediation technologies for contaminated land. Domestic and foreign scientists should communicate, learn from each other, strengthen cooperation, learn from each other, and leverage the wisdom and strength of the group to contribute to the world while promoting a more harmonious coexistence between humans and nature on Earth.

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