



Significance and Prospect of Urban Soil Pollution Investigation

Siqi Liu ^{1,2,3}, Biao Peng ^{1, 4, 5}

¹Shaanxi Provincial Land Engineering Construction Group Co., Ltd. Xi'an 710075, China

²Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd. Xi'an 710075, China

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

⁴Shaanxi Provincial Land Consolidation Engineering Technology Research Center. Xi'an 710075, China

⁵Land Engineering Technology Innovation Center, Ministry of Natural Resources. Xi'an 710075, China

Abstract: Soil is the carrier of human activities, and human activities affect the soil environment. Because the soil of agricultural land directly affects the quality of crops, it has been widely concerned by society and scholars. With the continuous improvement of urbanization level, the scale of the city and the number of populations are increasing. In recent years, many human health events caused by soil pollution have occurred, and people begin to pay attention to the urban soil environment. The permeable layer of the city is mainly concentrated in the urban green space. However, in the process of urban land development, the land is easy to be exposed to the external environment. Whether parks and landscape belts in cities, or urban brownfields and open spaces to be developed, they all have direct or indirect contact with human body, causing potential harm. With the progress of science and technology, more soil environmental investigation methods are used to find urban environmental problems. On the basis of traditional sampling analysis, hyperspectral remote sensing and portable X-ray fluorescence spectroscopy (XRF) instrument can provide data support for sampling analysis. Through on-site rapid detection, mathematical modeling and other methods, we can realize the urban medium and large-scale soil environment investigation. This is of great significance to protect human health and promote urban sustainable development.

Keywords: Urban soil pollution; XRF; green land; sustainability.

1. Introduction

For a long time, due to the overall extensive mode of economic development, unreasonable industrial structure and layout, and high total pollutant emission, soil, as the final receptor of most pollutants, has a significant impact on its environmental quality, which greatly restricts the safe reuse of land resources [1]. Especially in some cities with high urbanization level, on the one hand, land is urgently needed for transformation and upgrading; On the other hand, the urban environment is overburdened [2]. There are great potential environmental safety hazards in the construction land vacated from urban key areas. Living environment has been greatly affected [3].

In the past century, with the rapid development of industry, the acceleration of urbanization and the sharp rise of population, there have been a series of contradictions between human and land supply and demand, especially the contradiction between human survival and the quality of construction land. Half a century ago, the Raf canal incident aroused the world's understanding of the quality of construction land because it had a great impact on the ecological environment and human health; In 2004, the Beijing subway soil toxic gas incident, the chemical poisoning of organophosphorus and organochlorine pesticides among construction workers in Wuhan in 2006, the arsenic poisoning incident in Jinchengjiang District, Hechi City in 2008, and the toxic incident in a campus in Changzhou, China until 2016. All these show that at present, our construction land is suffering from all kinds of pollution, the quality of construction land is seriously degraded, our body is always facing the harm brought by land pollution, and our health is seriously threatened. The quality and safety of construction land is happening more and more frequently around us.

The overall situation of construction land quality in China is grim, and some areas even have serious pollution of construction land. The survey data show that nationwide, 34.9% of the industrial wasteland exceeds the standard, and 36.3% of the land used by heavily polluting enterprises and surrounding exceed the standard. About 1/3 of the contaminated sites will be redeveloped and utilized as construction land [4]. Therefore, strengthening the supervision, treatment and restoration of contaminated soil, especially ensuring the quality and safety of construction land, has become an inevitable problem and a political task for economic and social development.

With sustainable development as the core concept, adhere to improving the environmental quality of construction land as the core, take the safe use of land and soil risk control as the main line, take ensuring the safety of human settlements as the

starting point, take the source control of new pollution of construction land as the starting point, and focus on protecting the soil environmental quality of residential land and educational land, Adhere to the principle of "prevention first, protection priority and risk control", highlight key areas, key industries and key pollutants, implement treatment by category, purpose and stage, strictly control new pollution, gradually reduce stock, form a soil pollution prevention and control mechanism of "government led, enterprise governance, market driven and public participation", and promote the sustainable use of land resources, Provide good soil environmental protection for high-quality urban development. However, the large area of urban construction land, many impermeable layers and complex human factors directly lead to the problems of difficult sampling, large sampling volume and many restrictive conditions in soil investigation. The existing investigation methods are mainly suitable for local small-scale site pollution investigation, and lack of fast and accurate investigation methods suitable for large-scale urban construction land [5].

2. Investigation Methods

2.1 Data Collection

The soil environment survey of construction land should be based on land use planning and overall urban planning, combined with the land use classification map of each administrative region, and take the rapidly developing and densely populated areas as the key survey areas. Among them, previous studies have shown that the soil pollution risk of industrial land is significantly higher than that of other land types. Industrial land is the focus of urban soil pollution investigation. In addition, the soil pollution of land for transportation facilities, commercial service facilities and public facilities can not be ignored (Fig. 1). Through information retrieval, department visit, telephone consultation and other means, widely collect the natural environment status, environmental pollution history, geology, hydrogeology and other information of the site and surrounding areas. Judge the validity of the data according to professional knowledge and experience, and analyze the possible hazardous substances involved in the site, as well as the use and storage areas of these hazardous substances. The main contents of data collection are based on the technical guidelines for site environmental investigation .

The collected data include traffic map, soil map, geological map, large-scale topographic map, soil historical data, remote sensing, soil utilization and evolution process in the survey area for the preparation of sampling working map and marking of sampling points.

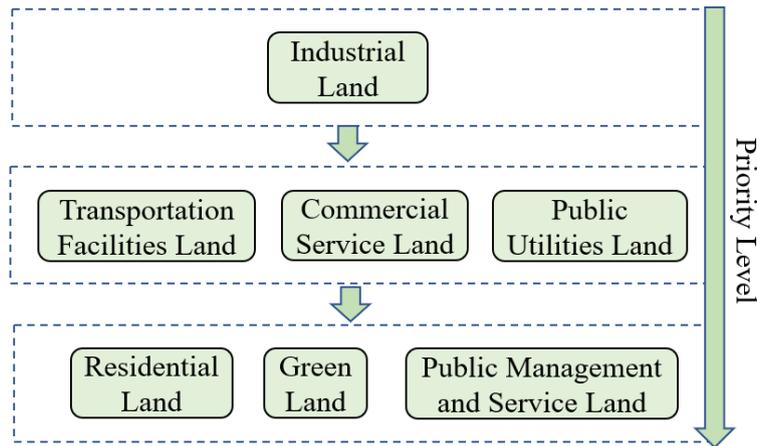


Figure.1 Priority levels of urban soil investigation based on different land uses ‘

2.2 On-Site Survey

The purpose of on-site survey is to observe the pollution trace and verify the accuracy of data collection through the on-site investigation of the construction land and its surrounding environmental facilities. Environmental investigators carefully observe, identify and record the important environmental conditions and suspected pollution traces of the construction land and its surroundings by means of professional investigation forms and video equipment, and judge the pollution status. First, observe the location, type Scale and control facilities (e.g. anti-seepage materials, structure, aging degree), and analyze the contaminated areas and potential pollution routes of suspected pollutants (such as sewage pipes, irrigation channels, etc.) and the possibility of pollution. Secondly, we should also investigate the pollution traces of construction land, such as vegetation damage, sewage facilities damage and corrosion traces, odor, ground stains and corrosion traces in the land. Different construction land has different pollution characteristics, different types of pollutants and links causing pollution. Therefore it is necessary combining various types of pollution and carrying out site survey according to the characteristics. In addition, the informed persons of the surveyed land were interviewed in the form of consultation and questionnaire, including relevant management institutions and local governments, competent environmental protection departments, users in the past and present stages, staff and residents of adjacent land.

3. Sample Collection and Analysis

Sample collection can generally be divided into three stages: large-area screening, formal sampling and supplementary sampling. According to the background data and field investigation results, a certain number of samples are collected for analysis and determination. Large area screening is used to preliminarily verify the spatial

heterogeneity of pollutants and judge the degree of soil pollution, so as to provide a basis for formulating the investigation plan. Large area screening can be carried out simultaneously with field investigation. In the screening process, hyperspectral remote sensing and portable XRF equipment can be combined to carry out rapid and efficient pollution screening in urban areas (Fig. 2). For the analysis of heavy metal content in soil, XRF equipment can realize on-site rapid sample analysis, which meets the requirements of American EPA method 6200. Soil samples are divided into topsoil and deep soil. Generally, topsoil sampling is the main method in large-scale urban soil pollution investigation. On the one hand, the spatial distribution characteristics of soil surface pollution are clear. On the other hand, the relationship between topsoil and human health is the most close; For small-scale site investigation, the potential pollution risk can be judged according to different site characteristics. The topsoil and deep soil can be collected comprehensively.



Figure .2 Portable XRF instrument(Sciaps) and on-site detection

4. Prospect and Development

Due to the large urban area, complex pollution sources and dense population, it is very difficult to investigate urban soil pollution. In particular, the content of heavy metals in soil has the characteristics of point distribution. The traditional sampling and analysis results are difficult to represent the real soil environment in a certain area of the city. However, with the progress of technology, geographic information, hyperspectral remote sensing and other technologies have promoted the progress of investigation methods and solved the problem of insufficient manpower and materials in the investigation process. Soil environmental investigation is of great significance for discovering potential pollution and ensuring human health. In the past 30 years, a large number of researchers have analyzed the soil pollution of agricultural land. Due to the particularity of urban underlying surface, many people ignore the impact of urban soil on human health. The use of scientific approaches of prediction, investigation and sample analysis will help to promote urban green development.

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