

Discussion on Ecological Development and Governance Technology of Urban Land

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Abstract

New urbanization is the only path to modernization and an important way to solve the problems of agriculture, rural areas, and farmers. The premise of ecotype city construction is to make our land cleaner, healthier and safer. Land is the foundation of urban construction and sustainable development, so how to save, intensively, and efficiently use land to make new space for rural urbanization development. This article summarizes the comprehensive development and governance technology of urban land ecology through literature analysis and years of engineering practice. Taking the Shichuan River Comprehensive Development Project in Fuping, Shaanxi Province, China as an example, it provides a detailed introduction to the new model of land ecological remediation promoting the future construction of new rural areas and urbanization in China, with the aim of providing theoretical basis and technical guidance for the construction of new urbanization in China.

Keywords

Urban Land; Ecological Transformation; Comprehensive Development; Engineering Practice; Theoretical Technology.

1. Introduction

Land ecological remediation is a measure that can fundamentally improve the quality of urban land, solve urban land problems, ensure urban land safety, and coordinate human land relations. According to the requirements of different land uses in cities for soil structure, quality, and environment, we will rebuild it to meet the standards of land use, safety, and construction. We will always adhere to the organic integration with urban ecological construction, and achieve the goal of livability and business suitability [1,2]. At present, most land improvement projects in China do not take ecological environment protection as a consideration. From the long-term experience of land consolidation abroad, it is necessary to strengthen the ecological consideration in land consolidation. Land consolidation should follow the principle of ecological priority. The focus of land consolidation should be shifted to ecological protection with land as the core, so as to achieve the goal of improving the permanent and sustainable production capacity of agricultural land, optimizing the ecological structure of agricultural land, protecting biodiversity and balance of nature[3,4]. Therefore, studying how to

comprehensively consider the construction of land remediation projects from the perspectives of ecology and sustainable development, and refining and standardizing the relevant planning, design, and management content of land remediation projects, plays an important role in maintaining the structure and function of the land ecosystem. This article summarizes the comprehensive development and governance technology of urban land ecology through literature and years of engineering practice. Finally, taking the Shichuan River Comprehensive Development Project in Fuping as an example, it introduces in detail the new model of land engineering promoting the future construction of new rural areas and urbanization development in China.

2. Urban Land Ecological Comprehensive Development and Management Technology

Urban land carries the most concentrated production and living activities of human beings. In the process of urban land construction, the soil structure bears the requirements of stability, land health and safety, and beautiful ecological environment. For example, in cities, urban and rural wastes such as litter, domestic garbage, and domestic sludge are used to produce compost and matrix to replace natural soil, which realizes the combination of soil mass in Urban green space, improves the current situation of soil hardening, low organic matter, poor ventilation and water permeability, thus promoting plant growth, improving soil, purifying pollutants, improving rainwater permeability and other ecological functions, At the same time, it also promotes the recycling of waste, reduces the pressure of waste treatment and disposal, and ultimately can achieve a virtuous cycle of the entire Urban ecosystem[5].

The research on the soil structure of urban construction should first ensure the long-term safety and stability of the soil structure, and implement the overall mechanical reconstruction, particle reconstruction, profile reconstruction, biochemical reconstruction, biological nutrition guarantee, ecological environment and aesthetic design of the system from the micro and macro levels, so as to ensure the stability and safety of the soil structure, a beautiful ecological environment and related Functional requirement [6]. In the process of urban construction, by improving the soil structure, the horizontal and vertical profiles of the soil are reconstructed. By setting reasonable compaction layers, filter layers, water storage and drainage layers, and moisture retention layers, the strength, deformation, and permeability of the soil are changed to meet the requirements of different engineering projects [7]. A typical case of soil structure is the ecological Rain garden. Through the optimization of soil structure, the ecological Rain garden has formed an effective rainwater infiltration and collection system. Effectively infiltrate and collect rainwater to alleviate road water accumulation; Purify rainwater through plants and soil in a hierarchical manner to eliminate pollutants in rainwater; Utilize micro degradation mode to recycle garbage resources and repair soil; Create rich natural landscape and improve environmental microclimate [8].

3. Cases of Ecological Development and Governance of Urban Land

Taking the Shichuan River Comprehensive Development Project in Fuping as an example, this article elaborates on the application of urban land ecological comprehensive development and governance technology, and provides a detailed introduction to the ecological governance technology and new development models of urban land.

3.1. Project Overview

Shichuan River is an important tributary of Weihe River in China. It originates from Jiaoping North Mountain in Tongchuan City and Yaoqu Town in Yaoxian County, Shaanxi Province, and flows into Weihe River from northwest to southeast. The total length is 137 km, rich in fine sand

and pebbles, making it a river of stones, hence the name Shichuan River. The total drainage area is 4154.0 km², and the average riverbed gradient is 6.0 ‰. The total length of the river in Fuping County is 37 km, with a drainage area of 132.4 km². The development and utilization of water resources in the Shichuan River has a history of 2200 years, with a maximum peak flow of 1300 m³/s in history (1969). After the 1970s, due to the construction of reservoirs and river closure in the upstream, the Shichuan River became a seasonal river.

Through detailed on-site investigations, it was found that the sources of pollutants in the Shichuan River water body are mainly divided into point sources and non point sources. The Point source pollution comes from the industrial wastewater and domestic sewage discharged into the surface water in the urban section of Shichuan River. Non Point source pollution is mainly agricultural non Point source pollution. There are a lot of farmland around the Shichuan River. Soil particles, nitrogen, phosphorus, pesticides and other organic or inorganic substances in agricultural production activities enter the water body through surface runoff, farmland drainage and underground leakage during precipitation or irrigation, causing pollution [9]. At the same time, due to the fact that river sediment is not only a sink that receives various pollutants from the water body, but also a source of water pollution in the river. Under certain conditions, various organic and inorganic pollutants accumulated in the sediment become the secondary pollution source of the river channel through the physical, chemical and biological Exchange interaction with the overlying water body, directly endangering aquatic organisms and human health.

3.2. River Management Technology

As an important natural geographical element in the urban ecological land construction system, the significance of river course ecological construction has been concerned by builders, and the application of its ecological function has gradually been introduced into the construction of Ecological engineering [10]. Based on the theory of ecological engineering, the Shichuan River polluted river regulation applies the pollution control concept of "System integration, treating both symptoms and root causes, focusing on ecology, and putting people first", and takes comprehensive ecological control measures of "sewage interception, dredging, water storage, bank control, and management". River management mainly uses soil reconstruction to control the migration and transformation of contaminated soil, providing a stable soil structure and a clean soil environment. Comprehensive use of physical, chemical, and biological methods for river management.

Physical methods mainly refer to dredging of sediment, mechanical algae removal, water diversion and sedimentation, and water regulation. Dredging contaminated sediment means removing pollutants from the river system, which can greatly reduce the pollution of sediment on the overlying water and improve water quality. The purpose of water diversion is to introduce clean water sources upstream or near polluted rivers through the regulation of water conservancy facilities (such as gates and pumping stations) to improve the water quality of downstream polluted rivers [11].

Chemical methods such as coagulation precipitation, adding chemical agents to kill algae, adding iron salts to promote phosphorus precipitation, and adding lime for denitrification. Research has shown that this method has a good removal effect on turbidity, COD, SS, TP, and also has a certain removal effect on TN, heavy metals, etc., with a small daily dosage of chemicals. Ecological biological methods mainly include river aeration technology, Bioremediation method, Aquatic plant purification method, etc. [12].

3.3. Soil Reconstruction Technology

Soil reconstruction includes two major parts: land leveling and soil improvement. Land leveling is the main project in the construction of land use projects, especially in mountainous or hilly

areas. With the increasing shortage of construction land, there are more and more actions to transform unused barren hills, ditches and slopes into urban construction land relying on leveling measures. For example, the "flat mountain land" project in Lanzhou City and the "mountain cutting and city building" project in Yan'an City are typical construction land preparation projects [13]. In the process of land leveling, it is not only simple earthwork excavation and filling, but also necessary to determine the method of land leveling engineering and accurately calculate the quantity of land leveling engineering based on natural conditions such as terrain and topography. The amount of error in earthwork calculation directly affects the investment of the project. When the filling volume of construction land is greater than the excavation volume and there is not enough earth and stone, a borrow area needs to be set up for backfilling, or the earth and stone can be purchased from elsewhere for backfilling. After the completion of soil borrowing in the borrow area, soil and water conservation measures should be taken to restore and protect its ecological environment [14].

In the renovation of construction land, there are two aspects of soil reconstruction. For the land that will be constructed with ground structures in the future, it is necessary to carry out soil inorganic reconstruction; For green land and ecological land, organic soil reconstruction is necessary. Based on the actual situation of the project, the materials are first selected. Through measures such as replacement, addition, reduction, and compounding, research is conducted on the physical properties, macro and micro structures of the materials, and suitable materials are selected for use. Through organic and inorganic processes, soil cultivation, pollutant remediation, and other methods, considering the strength, deformation, and permeability of the soil, the soil meets the land use requirements [15,16]. Fertilization is necessary for the planted soil, and various agronomic and fertilization measures are taken to continuously improve the soil properties and fertility.

3.4. Reconstruction Technology for Contaminated Land

Due to the discharge of wastewater and sewage, garbage dumping, and the extensive use of fertilizers in the surrounding farmland around the Ishikawa River, the original land of the Ishikawa River has been severely polluted. The reconstruction of contaminated land in the Ishikawa River mainly adopts physical reconstruction technology and bio organic reconstruction technology. The physical reconstruction technology mainly involves soil replacement technology. During the land planning and consolidation process, the garbage, riverbed sediment, and surrounding contaminated surface soil of the Shichuan River were removed, and the clean soil was backfilled, effectively reducing the degree of land pollution [18]. Biological reconstruction technology mainly utilizes plant technology. Over 130 species of seedlings and shrubs, approximately 15613 plants, and 190000 square meters of grass are planted in the river channel. Plants are utilized to enrich certain or certain chemical elements, or their rhizosphere microbial system is used to degrade pollutants into non-toxic substances, covering a large area of vegetation and effectively improving the soil environment.

3.5. River Water Treatment Technology

In response to the point source pollution sources in the urban section of the Shichuan River, in order to achieve river pollution interception, sewage channels are constructed to uniformly discharge the sewage downstream for unified treatment. At the same time, the downstream adopts the wastewater treatment method of a reclaimed water treatment station, reducing the water quality pollution caused by the discharge of wastewater from the Shichuan River and improving the surrounding environment. At the same time, the fresh water treated with reclaimed water can also be used as water for firefighting and greening, forming a new model of "open source- purification- utilization- discharge- regeneration" for sustainable utilization of urban water resources.

From the perspective of ecological restoration, the improvement of water pollution in the Ishikawa River through river aeration fully utilizes the water drop from rubber dams and the near natural treatment of river longitudinal sections for aeration and oxygenation. The design of stagnant water areas mainly relies on artificial oxygen enrichment through landscape fountains. Landscape fountains can not only increase the concentration of dissolved oxygen in water, reduce water temperature, improve water quality, and inhibit anaerobic conditions[19]. Aquatic plant purification method: use emergent plants such as reeds to improve water purification capacity; Restore the natural wetland along the river bank, plant typha and other wetland plants, and improve the self purification effect by using the thin layer flow method and Contact process according to the principle of biofilm self purification. At the same time, the growth of Aquatic plant creates a good environment for the growth of microorganisms in the riverbed substrate, and changes the unity of the ecological chain structure of the water environment [20].

4. Conclusion

Land is the foundation of urban construction and sustainable development. If the land has quality problems, no matter how good the urban planning, road engineering, architecture, garden, etc., can ensure that the city can progress towards the direction of Ecotype sustainable development. How to make our land clean, healthy, and safe is the premise of Ecotype urban construction. In the construction of Ecotype cities, we must always adhere to the development goal of livable cities and suitable for business. Under the background of ecological civilization construction, we must follow the "ecological" planning concept. By repairing the regional ecological environment, optimizing the allocation of water and soil resources, improving infrastructure, and rebuilding a new type of human land relationship, we must achieve the organic ecosystem of harmonious coexistence of water, soil, gas and ecology, and achieve the sustainable urban development model of "nature, humanity and life".

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