Application of river sediments to soil improvement in urban green space

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Abstract. At present, there are two main problems in urban green space soils. One is the change of soil properties due to human treading. The other is the invasion of guest soil and solid waste, which leads to poor soil physical status and fertility. A large amount of dredged sediment is generated every year in urban rivers, and if it is not handled properly, it will cause secondary pollution. Since the dredged sediment contains nutrients such as N and P required by plants, the dredged sediment can be applied to the problem of soil improvement in urban green space to achieve an ecological disposal effect.

1. Status of urban sediment disposal
The complete river water concept includes overlying water, sediments at the bottom of the water body, and various environmental conditions. The sediments at the bottom of the water body, that is, sediments, are usually clay, sediment, organic matter and various mineral mixtures. After a long time, it is formed by physical, chemical and biological effects and water transport and is deposited on the bottom of the water body [1]. Long-term accumulation of sediment will cause serious river siltation and weakened flood discharge capacity. The major rivers in China carry out dredging and dredging every year, and the amount of dredged sediment produced by dredging projects is increasing. For example, the annual dredged sediment produced in the Pearl River Delta reaches 80 million m3; the dredging and consolidation of the lower reaches of the Yellow River started from the Luokou test in Jinan in 1965. At present, 400 million m3 of dredged sediment has been completed [2], which is equivalent to three Three Gorges Earth-rock excavation and filling capacity of the dam (the earth-rock excavation and filling capacity of the Three Gorges Dam is about 134 million m3). Due to the large amount of sediment produced after dredging, if directly stacked as solid waste, it will not only occupy a large amount of land, but also cause secondary pollution to the environment. Therefore, there is a problem of disposal of dredged sediment. At present, the methods of sediment dredging post-treatment include drying, solidification stabilization, and resource treatment methods [3-5]. Drying and solidification stabilization methods cannot achieve the purpose of real treatment and digestion of...
sediment, which is the most effective. The effective treatment method is the resource utilization of sediment. Before the sludge can be reused, the sludge needs to be pretreated. After sampling and analysis of the sediment, analyze the possible pollution situation, and use a reasonable method for pre-treatment.

(1) Heavy metal content exceeds the standard: If the content of heavy metals in the sediment exceeds the limit for heavy metals in "Greening Planting Soil" (CJ / T 340-2016), the physical adsorption method or leaching method is used for treatment. Kosobucki et al. [6] found that when clinoptilolite with a concentration of 2% and a particle size of 0.7 to 1.0 mm was added for 5 h, the adsorption effect was the best; Wang Weiya et al. [7] used EDTA to rinse heavy metal bottom sludge. The results show that 0.1mol / L EDTA has the best leaching effect under the condition of liquid-solid ratio of 10: 1, and 70% ~ 80% of copper and cadmium can be removed by rinsing for 30min.

(2) The content of reducing substances is too high: If the content of reducing substances (such as sulfides) in the sediment is too high, the corresponding stabilizer should be used for treatment. Sun Yuanjun [4] found that potassium permanganate, hydrogen peroxide, calcium peroxide and calcium nitrate can increase the redox potential of the sediment, improve the reducing environment of the sediment, and reduce the content of acid volatile sulfides, among which the effect of calcium nitrate is most obvious.

(3) Nutrient elements are too high: If the nitrogen, phosphorus and other nutrients in the sediment are too high, then the amount of sediment should be adjusted to control.

2. Urban green space soil status
For a long time, soil research has mainly focused on agricultural soils and forest soils, and relatively little research has been done on urban soils. The research on heavy metals in urban soils carried out by large cities represented by London, England during the 1970s opened the prelude to the study of urban soil issues. China's urban soil research started in the 1990s. Compared to the world's urban soil research, it started late. All aspects of urban soil research are covered. The research areas are mainly concentrated in large cities such as North, Shanghai, Guangzhou, and Shenzhen [8-9]. With the development of urbanization, the supporting urban greening and landscaping have also developed rapidly. According to the entire Chinese urban planning, the per capita public green space area increased from 6.42m² in 2002 to 11m² in 2010 [10]. As an important part of the urban ecological environment, urban green space soil is a growth medium and nutrient supplier for urban plants, a habitat for soil microorganisms, and a collection place and purifier for urban pollutants. It is important for maintaining a good urban ecological environment. And sustainable development is of great significance. Under the situation that urban soil resources are becoming increasingly tight, natural space is decreasing, and the quality of urban ecological environment is degrading, research on soil quality of urban green space is very necessary.

In summary, there are two main problems in urban green space soils in China:

(1) Changes in soil properties caused by mechanical compaction and human treading.

In order to meet the needs of urban construction and rapid greening, large machinery has been used in urban construction and greening construction for many times. Coupled with the high urban population density, the green space is usually subject to human trample after it is completed. Therefore, compaction of urban green space soils is common. phenomenon. Compacted soils generally have small porosity, poor air permeability, and good agglomerate structures are destroyed, which changes the solid, liquid, and gas three-phase composition and pore distribution status of the soil, as well as soil water, fertilizer, gas, and heat conditions, making urban green space soils Significant changes in physical, chemical, and biological characteristics have directly threatened greening and landscaping.

(2) The source of urban soil is complex. Most of the soil and solid wastes invade, and the physical state and fertility are poor.

Due to the shortage of urban soil resources, soil sources are complex, soil layers are chaotic, and topsoil is mostly removed or buried in the subsoil in urban greening construction. Most of the new
green space soil is guest soil, and it is mixed with a lot of gravel and buildings. Garbage and other intrusive bodies lead to disordered soil structure and physical state, and poor fertility.

The quality of urban green space soil has not only become one of the main reasons limiting the development of urban greening and beautification in China, but also has prevented the exertion of urban soil ecological functions and the improvement of urban ecological environmental quality and landscape. It has been an urban environmental manager and environmental science research. Concerns. A large amount of literature indicates that the pH value of urban green land soils in China is mainly alkaline, organic matter is at a moderately low level, total nitrogen and alkaline hydrolysis nitrogen are at a low level, soil bulk density is large, the structure is chaotic, spatial differences are large, and compaction Severe [11-13]. Therefore, in order to improve the ecological function of urban green space, it is a prerequisite to solve the physical status and fertility of urban green space soil.

3. Utilization of Urban Sediment-Improving Urban Green Soil

The eutrophic nature of the sediment guarantees the content of nutrients such as organic matter, nitrogen and phosphorus, which are suitable for plant growth, and its composition contains a large amount of clay lost on the land surface and abundant secondary minerals, which is a good renewable resource [14-16]. Canet R.; Chaves C.; Pomares F. et al. [17] mixed the sediment with soil at an appropriate ratio to improve the properties of the soil, and considered that the application of the sediment to agricultural planting is more feasible; Zhu Guangwei et al. [18] Research on comprehensive agricultural utilization of dredged sludge was also carried out. Dredged sediment was used as a soil improver, and dredged sediment was mixed in a large amount in garden soil and agricultural soil. Experiments and analysis of agricultural use and landscaping were conducted. The determination of germination rate indicated that the soil improved by dredged mud had a certain effect on the germination rate of agricultural seeds; Zhu Benyue et al. [19] used West Lake dredged sediment waste and mixed it with chemical fertilizer at a ratio of 2: 8, which reduced the cost of fertilizer. Yield is basically the same as that of compound fertilizer. Therefore, it is feasible to carry out resource treatment and utilization of sediment.

Applying the sediment to the improvement of urban green space soil and comprehensive utilization of resources can not only avoid the harm of the sediment to the environment, solve the problem of urban sediment disposal, but more importantly provide an effective way to improve the quality of urban green soil soil. Method to generate new available resources to form a circular economy and green economy. In view of this, it is of certain economic, social and ecological significance to carry out research on the mechanism and application of sediment in the organic reorganization of urban green land soil.

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