Analysis of Ecological Slope Protection Technology in River Regulation

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Abstract: Ecological slope protection is not only to fix both sides of the river to prevent soil erosion, but also to integrate the slope protection project and the surrounding environment to make it a landscape. This strict ecological slope protection technology has a relatively short history in China, so it is of positive significance to study and discuss it for its implementation. This paper mainly discusses the key technologies and influencing factors of ecological slope protection technology in river regulation.

1. Introduction

The key technology is like the network node, which supports the whole technology network. If these nodes can be penetrated, it will be equivalent to mastering the whole technology. This is also the reason why this paper discusses the key technology of ecological slope protection. In addition, understanding the influencing factors can reduce the construction risk, ensure that the project cost is reduced while achieving the best social benefits.

2. Importance of Ecological Slope Protection Technology

China's natural environment is deteriorating. Many rivers have been cut off in dry season and flooded in rainy season. This has resulted in serious soil erosion, which has a negative impact on the ecology of both sides of the river. Among them, the most common one is the river course change. If the river water is polluted, it will lead to the enlargement of pollution. Especially in urban rivers, if there is no good ecological slope protection technology, the river will be arbitrarily changed, without active intervention, will endanger some important buildings. Traditional slope protection technology tends to be "hardening", i.e. sand bag, stone and concrete reinforcement. Although this method reduces soil erosion to a certain extent, it destroys the integrity of both banks and rivers, and has a negative impact on the micro-environment of rivers as well as the macro-environment formed by rivers and surrounding areas. Especially the inability to absorb heavy metals and other harmful substances in river water makes the concentration of harmful substances in river water increase, and becomes a poisonous river, which increases the cost of river water treatment. The proposal of ecological slope protection provides a good solution for this situation. Contrary to the traditional slope protection, the river and the river bank are regarded as a whole, and the slope is protected by a combination of soft and hard, so that the red-green and green-wild wild birds screaming in the slope protection project become a beautiful scenery. Vegetation roots can grow to the canals under the action of hydrophilicity, which produces a certain purification effect. Moreover, this kind of soft and hard ecological slope protection technology also reduces the difficulty of slope protection and enhances the slope protection effect, which has a positive impact on the healthy and sustainable development of the river environment.

3. The key technologies and influencing factors of ecological slope protection

River regulation ecological slope protection involves the determination of slope protection form, vegetation selection and construction techniques such as planting and geotextile bags. In addition, the analysis of specific influencing factors has a positive impact on the first three. Because of this, this part of the content will be discussed together with key technologies and influencing factors.

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3.1 Slope protection form determination

In the specific construction, it is necessary to survey the river course, and the comprehensive series of influencing factors can be used to determine the slope protection form. For example: the relationship between the slope size, the direction of the water flow, the type of soil and the composition, the characteristics of the surrounding environment, and the hydrogeological conditions of the construction section. For example, it is impossible to use the pure ecological slope protection method for water and soil protection on the river bank with a positive impact on the water flow. Instead, it must use composite means to protect the slope, that is, vegetation, trees, concrete works or other geotechnical products, to increase the water resistance of the project. Or for a river with a torrential flow during the dry season and a flood during the flood season, it is not possible to use the general composite slope protection form, but it is necessary to combine the traditional “hardening“ slope protection and ecological slope protection technology to increase the stability of water and soil on both sides. Of course, for a river with a slow flow rate and a weak impact on both sides of the strait, the slope protection project can adopt a pure ecological slope protection form. In fact, the most ideal form of slope protection is pure ecological slope protection, but its requirements are high, and because of different water flow speeds and different soils, it is not possible to apply to both sides of the river.

3.2 Vegetation selection

Ecological slope protection involves vegetation issues whether it is a purely ecological form or a composite form. Because vegetation not only has a beautifying effect, it also has a great role in stabilizing slopes and purifying river water. Vegetation includes trees, shrubs and herbs, as well as aquatic plants. As the saying goes, one side of the water and soil, the same is true for plants, only local plants have great affinity for the local soil and water. Even if the transplant is faster than other plants, it is not easy to appear pests and diseases, and the local environment is also highly compatible.

3.3 Geotextile geobag and other construction techniques

Nowadays, many river ecological slope protections are in the form of “soft and hard slope protection“, which is a composite slope protection technology. The combination of vegetation design and planting conservation and geotextile geobags can realize soil and water conservation while promoting greening. The construction technology of geotechnical products such as geotextiles is very critical, which directly determines the water resistance and rigidity of the project. Geotechnical products are composed of individuals. In addition to being placed as required, the most important thing is to achieve compactness and stability between individuals. There is a special cement mortar. In the construction, the geotechnical materials should be placed in a scale, so as to avoid the infiltration of water and the stability of the bank. In addition, from the ecological point of view, it is necessary to integrate the base fertilizer into these geotechnical products to achieve sustained release and enhance the vitality of the vegetation.

3.4 River water supply and drainage system

The stability of river ecological slope protection also depends on the rationality of engineering water supply and drainage design. Because vegetation trees need water to nourish. The roots of trees can grow to the river by hydrophilicity, but the turf roots require irrigation. The irrigation is recommended to be taken locally and directly by river water. This requires a scientific water supply and drainage system on the river bank. There are both water and sewage. At the same time, when the rainy season comes, the excess water can enter the river through the sewer system. For example, some construction methods in the sponge city technology can be used to channel the rainwater into the river.

4. Common Form of Concentrated Ecological Slope Protection

The ecological slope protection in the river governance focuses on the governance and slope

protection, which refers to soil and water governance and environmental governance to enhance the stability of water and soil on both sides of the river. Ecology refers to the characteristics of the project and its integration with the surrounding environment. Under such guidance, there are mainly the following types of slope protection in China.

4.1 Plant Slope Protection

Pure ecological slope protection mentioned above is the most ideal form of slope protection, but as mentioned above, the survival rate is low affected by various factors. Two banks and river are normally paralleled. Because such a position is less affected by the impact of river water, the requirement for shear resistance is lower. However, in order to improve the slope stability, trees with developed roots, such as trees and shrubs, should be planted to protect the near water area. From the safety point of view, the plant slope protection project near the water need to set up a fence to prevent people falling into the water when walking in the vicinity of the view.

4.2 Composite Slope Protection

Composite slope protection refers to the form of "vegetation + civil engineering" slope protection, in which civil engineering mainly uses geotechnical semi-finished products and integrates them with fertilizer to fix the soil to ensure the healthy growth of vegetation. This type of slope protection mostly exists in the river channel where the current is rapid and the erosion is obvious. For example, three-dimensional vegetation net slope protection, ecological concrete slope protection and so on. Because the use of semi-finished geotechnical products can increase the construction efficiency to a large extent, reduce the construction cost and also to achieve the supply of fertilizer, which means that a choice serves three purposes. Therefore the composite slope protection form is mostly adopted by the river slope treatment.

5. Suggestions on Ecological Slope Protection of River Courses

First of all, river regulation and ecological slope protection technology developed late in China, the relevant experience is not rich, and the corresponding technical data is also relatively lack. It is necessary to summarize the relevant practical experience at home and abroad. Secondly, project evaluation is one of its weaknesses. Evaluation is the monitoring and testing of engineering functions after the project is put into operation. Combined with the status quo of water and soil loss on both sides of the river, the comprehensive evaluation of the project can help us find out the deficiencies, which is of positive significance for the development of similar projects in the future. Thirdly, cost management is another problem. As these projects are government-led projects for the benefit of people, they should pay attention to quality and standards. As a result, the standards are often excessively high, which will result in construction exceeding the standards and waste a lot of manpower, material and financial resources, which is contrary to the theme of ecology and environmental protection. Therefore, the establishment of financial management system, budget and cost management is very important. Finally, post-care is the key. Whether it is plant slope protection or composite slope protection, it involves the maintenance of vegetation and civil engineering. In reality, it is precisely because this part is so weak that the project rigidity is insufficient and the shear resistance is poor, which reduces the service life of the project and wastes the national investment.

6. Conclusion

The article analyzes the disadvantages of the traditional channel governance slope protection technology, discussed the significance of ecological slope protection, and through the discussion and research on river ecological slope protection technology in slope protection forms, selection of vegetation, earthwork construction technology, four banks of the river water supply and drainage system construction, it introduces river slope protection technology. At last, the paper introduces the two common forms of slope protection and puts forward some suggestions, hoping that these

contents will be helpful to the related work in China.

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