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Study on sustainable landscape design of abandoned quarries

An example: Zhushan ecological park in Xuzhou

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Abstract

With a growing concern about ecological issues nowadays, an unceasing re-greening tide of abandoned quarries is throughout the nation (China). However, with the rapid development of urbanization and the comprehensiveness of urban functions, we can't fully realize the social, economic and cultural values of abandoned quarries by simply conducting green-mountain projects of abandoned quarries just from ecology. We takes Zhushan ecological park in Xuzhou as an example, analyzes the park's ecological and landscape characteristics, refers to the projects of abandoned quarries at home and abroad, and puts forward a sustainable development strategy of a systematic design-landscape for ecosystem, economy and culture. By this means, the ecological restoration and landscape reshaping can be favorable for the ecosystem, local economy, and improvement of people's living standards and the preservation of mining culture.

Keywords Labandoned quarry; sustainable landscape; landscape design

1. Introduction

In the process of the underground construction in cities, we cannot avoid engaging in the activity of mountain mining. Particularly, the economy of China has a soaring, prosperous and strong growing in the past 30 years of the Opening and Reform, therewith a growing demand for the stone resources, and leading to a continual rise of the stone price. Driven by profits, different interest groups extravagantly mine the mountains, which results in quarries left behind everywhere. But the activity of mountain mining leaves behind us is the fragmentary bare mountains and mining pits seen everywhere and brings about a series harms and problems to the ecological environment and landscape nearby.

1) Destruction of vegetation

The destruction of vegetation is rather serious in that large vegetation areas, which can approximately be five times as large as the area of a mining pit in general and are separated and destroyed due to random mining and piling of spoilage and waste residue.^[1]

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2) Destruction of landscape

Mountains of the quarries have already got a thousand boils and a hundred holes, left lofty broken crags and all the original vegetation gone. The whole massif is in fragmentary piles and in a state of devastation seen in the distance. The landscape environment is extremely destroyed in this way.

3) Destruction of biodiversity

The long-term mountain mining activity in large areas decreases the species number of plants and deteriorates the plants, and poses a threat to the biodiversity there. On the other hand, because of the noise made by mining, forest is no longer peaceful and many wild animals including birds run away, which worsens the living conditions of the wild animals in turn.

4) Destruction of ecology

Almost without any protective measures in quarries, such as building block sandbanks and soil walls, or making any reforestation, mining bring about many ecological problems like water and soil loss, debris flow, landslide and river block-up, thus leads to serious ecological consequences.

In conclusion, in the times of rapid urbanization and comprehensiveness of urban functions, it's important for us to study how to turn the abandoned quarries around the city into valuables, and realize their ecological, economic and social benefits in a manner of sustainable development. This paper first analyzes the landscape ecological planning of the abandoned quarry in Zhushan of Xuzhou, then deals with the complicated integral issues from the perspective of landscape, and finally employs the landscape strategy in practice to show its great potentials in managing the abandoned quarry.

2. Cognition and landscape design categories of abandoned quarries

2.1. Cognition of abandoned quarries —Characteristics of current landscapes

From the viewpoint of landscape ecology, quarry is a unique kind of landscape, which is formed by severe human disturbance, and a region severely reformed by human activities to obtain usable resources. Constant mining activities driven by economic profits increased the number of quarries. Different kinds of stones and different mining manners can damage the terrain and topography in different ways. The present terrain left behind can be classified into the following four typical categories^[2]: precipice, slope, terrace and mining pit.

In conclusion, precipices, terrace and mining pits are important components of the abandoned quarries, and the important design elements in the landscape designs.

2.2. Categories of landscape designs

As far as the abandoned quarries are concerned, of which the main target of reforming and using is to realize the harmonious integration of human and nature, and at the same time to realize the sustainable development of social values, economic values and cultural values alt together. First, ecology is essential to park constructions. What's more, economy is safeguard to enhancement. Last, but not least, culture is the key to permanent prosperity. Ecology, economy and culture are three subsystems of the sustainable development which are associated with each other as well as contained by each other. Therefore, much importance should be attached to a harmonious, steady and beneficial landscape ecosystem in the landscape design of the mining quarry, an ecosystem which can boost regional sustainable development and can satisfy its basic needs, i.e. biological production, cultural support and social service.

1) Landscape for ecosystem

Upon the 21st century, ideas of ecology and widespread concerns about environment have been penetrated into the field of landscape design, which can be evidently seen by the reuse of refuse facility, the recycle of resources and the preservation of natural secondary vegetation.^[3] The main thought of ecological restoration is penetrating through restoration and construction of mountains in mining quarry, and the rehabilitation of vegetation and construction of communities of animals and microorganisms is on the go. For instance, the design idea of "saving nature in a manner of natural restoration" used in the mining quarry of a hydroelectric power station in Guri Venezuela combines the affected area with its surrounding ecosystems. In this case, local plant species, introduced

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