

Research on Landscape Design of Mining Parks under the Perspective of Ecological Concepts

Zhou Jia¹, Kim Soo-bong²

¹Maanshan Teacher's College, Ma'anshan, Anhui, China

²Keimyung University, Daegu City, South Korea

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Abstract: Mining parks have gradually attracted widespread attention as a special type of urban green space. These parks are usually built in former mining areas, where abandoned mines are re-planned and transformed into places for public recreation, entertainment and education. The landscape design of mine parks presents unique challenges and opportunities, as it requires the integration of nature restoration, cultural preservation, ecological sustainability, and urban planning. This study aims to explore how mine parks can be designed and planned under an ecological conceptual perspective to achieve sustainable transformation of mining areas and improve the quality of urban environments.

Mining areas were once centers of resource extraction, but over time many mines have been abandoned, leaving a large ecological imprint. In order to reintegrate these areas into natural ecosystems, the concept of mine parks was born. With the growing importance of ecological protection and sustainable development, the concept of ecology has become one of the core principles in the field of landscape design. Landscape design for mine parks is no exception to the need to incorporate ecological concepts in order to create landscapes that are environmentally friendly, sustainable and socially meaningful.

1. Current status of the mine park landscape

Mining park landscapes, as a product of the history of mining resource development, have gradually attracted widespread attention. In the past, mine areas were once rich in resources and active in production, but with the depletion of resources and the reduction of mining activities, a large number of mine areas have fallen into a state of abandonment and desolation. These abandoned mine areas, once the focus of environmental pollution and ecological destruction, are now facing the opportunity to be redefined and reinvented. With the rise of ecological concepts, people have begun to think about how to transform these abandoned mine areas into ecologically sustainable public spaces in order to realize the harmonious coexistence of nature and human society^[1]. Currently, the current status of mine park landscapes is characterized by diversity, which is influenced by factors such as geographic location, resource type and community needs. Some mine parks have been successfully implemented, demonstrating the potential for sustainability and ecological conservation. These parks have introduced rich ecosystems while preserving original geologic features, providing habitat for wildlife and re-establishing ecological balance, while providing visitors with a wealth of

opportunities for outdoor activities. This type of park has also played a positive role in the local economy and social culture, attracting tourists and investment. However, there are also challenges faced by some mining parks. Some areas still suffer from severe environmental pollution and land destruction due to historical reasons and resource depletion. Ecological restoration and park landscape design in these areas require more time and resources for ecological conservation. In addition, communities in some areas may be cautious about the development of mine parks, fearing possible ecological risks and uncertainties.

2. Mining park landscape design measures under the concept of ecology

2.1 Plant design

Plant design plays a crucial role in landscape planning for mine parks under the ecological concept, which involves ecological restoration on the one hand, and landscape beautification on the other, with the aim of creating a pleasant natural environment that enhances the visitor's experience while ensuring ecological sustainability. In mine parks, plant design is a multi-layered process that includes various aspects such as ecological protection forests, ecological forest areas, open grasslands, ecological pastures, green farmlands, green field areas, flower seas and wetlands. The planning and construction of ecological protection forests play a key role in the periphery of the mine park. These protective forest belts form a green barrier, which not only helps to beautify the surrounding environment, but also has ecological functions such as air purification, noise reduction, and dust removal^[2]. Through reasonable plant selection and color matching, the aesthetics of these protective forest belts can be improved, making them part of the overall landscape of the mine park. This design can enhance the external greening effect of the park and attract more visitors. The planning of the ecological forest area focuses on the internal green landscape of the mine park, utilizing the original ecological woodland and adding various types of plants, including trees, shrubs and flowers, to enrich the hierarchy and landscape effect of the forest area. This plant design not only increases the ornamental value for visitors, but also contributes to the restoration and maintenance of the ecosystem. Through appropriate plant mixing and the guidance of ecological principles, a rich forested environment can be created to provide a pleasant place for leisure and recreation. In addition, the planning of sparse forest meadows focuses on the creation of green gardens where visitors can comfortably engage in outdoor activities such as pitching tents and picnics. This type of area is usually dominated by native plants, which are characterized by their resistance to trampling and their ability to adapt to the needs of visitors. The matching of shrubs can also increase the layering of the landscape. Such landscape design not only meets the needs of tourists, but also helps to protect the ecosystem in the mine park and ensure that it is not excessively disturbed^[3].

2.2 Reorganization of the water system

Water system rectification is an important part of the ecological concept in the landscape design of mine parks. Through effective water system rectification, it can not only improve the water quality and ecological environment inside the mine, but also enhance the landscape attractiveness and ecological sustainability of mine parks. This process requires comprehensive consideration of a number of aspects such as water mobility, water purification effects, water feature design and sustainable management. Water system rehabilitation aims to improve the connectivity between the mine water system and the surrounding environmental water system in order to fully utilize the mobility of water sources and thus improve the water purification effect. This measure requires the remediation of water systems within mines to ensure that they are connected to surrounding environmental water bodies, which helps to promote the natural flow of water, reduce stagnant areas,

and improve the self-purification capacity of water bodies. In order to reduce the burden on contaminated water sources, biological methods, such as microbial placement and greenery cultivation, can be used for water purification treatments. These methods can effectively remove harmful substances in the water and improve water quality. Secondly, water feature design can be divided into two types: dynamic water features and static water features, depending on the abundance of water resources in the mining area. In areas with abundant water resources, large-scale static water features can be constructed for mapping the structure of the mine and creating a landscape view. This design approach not only increases the hierarchy of the landscape, but also provides a pleasant recreational space for visitors. In mining areas where water resources are relatively scarce, small internal cisterns can be constructed for collecting rainwater and meeting the water needs of plants^[4]. This helps to keep the landscape green and vibrant during the dry season. In addition, the landscape design approach of flowing waterfalls can be used to enhance the attractiveness of mine parks. Running waterfalls not only add movement and sound to the landscape, but also help to enhance the visitor experience. These waterfalls can be designed with multiple levels so that the water flows from top to bottom, simulating the landscape effect of a natural waterfall. Through clever layout, these waterfalls can be combined with vegetation, rocks, and other elements to create an engaging landscape. Finally, water system rectification also requires the establishment of an integrated management system for water transmission, storage and purification, and the use of sensors, big data and other advanced technologies to assist in the continuous improvement of the construction of high-quality water systems in mines. This management system can realize the fine management and monitoring of water resources and ensure that the quality and supply of water bodies are effectively controlled. At the same time, it helps to realize sustainable management to meet the long-term development needs of the mine park.

2.3 Rationalization of functional areas

Reasonable division of functional areas is of strategic importance in the landscape design of mine parks under the ecological concept, and the design team can design a plant gallery display area, relief mural display area, and vegetation ecological conservation area, etc., aiming to comprehensively make full use of the resources and characteristics within the mine park, and to realize the diversity of landscapes, sustainability, and integration of social functions. As part of the landscape design, the plant gallery display area creates a green landscape gallery through skillful plant matching and spatial layout. This area not only provides a beautiful environment for visitors, but also incorporates the steep wall formed by granite stone mining, adding diversity and layers to the landscape. This plant design helps enrich the sensory experience of visitors and improves the attractiveness of the park. Secondly, the planning of the relief mural display area makes full use of the characteristics of granite stone, which is regarded as a natural "drawing board" for artistic creation. This area can be integrated with the Chinese history and culture and local characteristics of culture, design stone relief murals, thus increasing the cultural connotation and educational value of the landscape. Such a design not only provides visitors with artistic enjoyment, but also helps to pass on and promote cultural traditions. The planning of the vegetation ecological conservation area emphasizes ecological restoration and protection, through mulching and re-greening, afforestation and other measures to restore the vegetation in the mine area, realizing the synchronous development of stone resources development and ecological environment. This practice not only helps to maintain ecological balance, but also helps to maintain the stability of soil and water, laying a solid foundation for future sustainable development.

3. Conclusion

In summary, the ecological concept provides an important theoretical framework and guiding principles for landscape design of mine parks. The application of ecological concepts such as ecological restoration, resource recycling, ecological protection and social participation makes mine parks no longer just a beautification project for urban space, but also a cooperative ecosystem that benefits both urban and natural ecology. This transformation emphasizes the multifunctionality of mine parks, including ecological, cultural and social functions.

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2) [Project Source: 2021 Anhui Quality Engineering] Interior Art Design Professional Teaching Team (2021jxtd282)

3) [Project Source: 2022 Anhui Province Scientific Research Key Project] "Research on Ecological Construction Based on Ma'anshan Urban Green Space System - Taking Aoshan Geological and Cultural Park in Yushan District as an Example" (No. 2022AH052827)

4) [Project Source: 2021 Anhui Quality Engineering] "Environmental Art Design Professional Resource Library"(Number: 2021zyjxzyk033)

References

- [1] Shi Lin. *Research on Landscape Design of Urban Abandoned Mining Area under the Perspective of Ecological Restoration [D]*. Shandong: Shandong University of Architecture, 2022.
- [2] Xue Yijun, Chen Linqun, Xue Ruiyin, et al. *Landscape design of mine park based on the concept of "double repair of city"*[J]. *Beauty and Age-City*, 2021(10):69-70.
- [3] Lu Weiyun. *Landscape design of mine pitmountain sports park under the background of ecological civilization--Taking the example of Yuhuang Mountain Sports Park in Zibo High-tech Zone [J]*. *Urban Architecture Space*, 2023, 30(7):56-59.
- [4] He Yijun. *Exploration on landscape design of mine pit park based on ecological restoration [J]*. *Architecture and Decoration*, 2021(2):112,114.