

# Research on the integration of mine ecological restoration and ecological tourism

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## Abstract

This paper explores the integration and innovation of mine ecological restoration and ecotourism in mining areas, which is an important way to achieve the transformation and development of mining areas. The paper analyzes the necessity and feasibility of mine ecological restoration and ecotourism in mining areas, and summarizes the principles and paths of mine ecological restoration and ecotourism in mining areas. The paper also introduces five examples of completed mine parks in China and abroad, and evaluates their characteristics and achievements. The paper points out the problems and challenges faced by mine ecological restoration and ecotourism in mining areas, such as the imperfection and inconsistency of policies and management, the mismatch and imbalance of input and output, and the instability and uncontrollability of quality and effect. The paper puts forward some suggestions for improving and optimizing the policy and management of mine ecological restoration and ecotourism in mining areas, such as establishing and improving the coordination mechanism, the investment and financing mechanism, the evaluation and monitoring system, and the information platform of mine ecological restoration and ecotourism in mining areas. The paper aims to provide reference and reference for the theory and practice of mine ecological restoration and ecotourism in mining areas in China.

## Keywords

Innovative development, Mine park, Ecological restoration, Tourism pattern.

## 1. Introduction

Mineral resources are important strategic resources for the country, which play an important role in promoting economic and social development, safeguarding national security and people's well-being. However, for a long time, the mining development process in China has been extensive, inefficient and highly polluting, resulting in a large number of abandoned mines and environmental damage in mining areas, which not only cause waste of resources and ecological degradation, but also affect the quality of life and social stability of the residents in mining areas[1-3]. According to statistics, by the end of 2020, there were 126,000 historical legacy mines in China, accounting for 77.8% of the total number of mines in the country, of which only 9.4% had been treated, and 90.6% of the mines were in a state of untreated or inadequate treatment. How to effectively treat abandoned mines, restore the ecological environment in mining areas, and achieve sustainable development in mining areas, is a major issue that needs to be urgently solved.

The purpose of mine ecological restoration is not only to improve the natural environment in mining areas, but also to enhance the social and economic level in mining areas, and to achieve the transformation and upgrading and green development in mining areas[4, 5]. Therefore, mine ecological restoration should not only stay in the simple environmental treatment, but also combine the factors such as resource endowment, location conditions, development needs, etc. of mining areas, and explore the effective integration of mine ecological restoration and

industrial development in mining areas, and form a diversified mode and path of mine ecological restoration.

Ecotourism in mining areas is an important form of mine ecological restoration and industrial development in mining areas[6-8]. It can not only use the achievements of mine ecological restoration, improve the tourism attraction and popularity of mining areas, but also promote the employment, income, tax revenue and other aspects of mining areas through the development of tourism industry, and promote the economic and social benefits of mining areas. In recent years, China has seen a number of successful cases of mine ecological restoration and ecotourism in mining areas, such as Nanjing Tangshan Mine Pit National Park, Shanghai Sheshan Shimao Deep Pit Hotel, Chongqing Tongluoshan Open-pit Mine, etc. These cases provide useful reference and inspiration for the integration and innovation of mine ecological restoration and ecotourism in mining areas in China.

This paper takes the integration and innovation of mine ecological restoration and ecotourism in mining areas as the research theme, aims to explore the necessity and feasibility of mine ecological restoration and ecotourism in mining areas, analyze the principles and paths of mine ecological restoration and ecotourism in mining areas, summarize the experience and enlightenment of mine ecological restoration and ecotourism in mining areas, and provide reference and reference for the theory and practice of mine ecological restoration and ecotourism in mining areas in China.

## **2. Models and Practices of Ecotourism in Mining Areas**

Ecotourism in mining areas is an important form of mine ecological restoration and industrial development in mining areas[9, 10]. It can not only use the achievements of mine ecological restoration, improve the tourism attraction and popularity of mining areas, but also promote the employment, income, tax revenue and other aspects of mining areas through the development of tourism industry, and promote the economic and social benefits of mining areas. In recent years, China has seen a number of successful cases of mine ecological restoration and ecotourism in mining areas, such as Nanjing Tangshan Mine Pit National Park, Shanghai Sheshan Shimao Deep Pit Hotel, Chongqing Tongluoshan Open-pit Mine, etc(Figure 1). These cases provide useful reference and inspiration for the integration and innovation of mine ecological restoration and ecotourism in mining areas in China.

### **2.1. Development Background**

The ecological environment damage caused by mining development not only affects the natural landscape and biodiversity of mining areas, but also threatens the health and safety of the residents in mining areas, and reduces the living quality and social stability of mining areas. Therefore, mine ecological restoration has become an important task for the transformation and development of mining areas, and also provides the basic conditions and opportunities for the development of ecotourism in mining areas.

The exhaustion and transformation demand of mineral resources. With the continuous exploitation of mineral resources, mining areas face the crisis of resource depletion, the development space and potential of mining industry are limited, and the singularity and dependence of mining economy also lead to the unbalanced and unsustainable development of mining areas. Therefore, industrial transformation has become an inevitable choice for the sustainable development of mining areas, and also provides the motivation and direction for the development of ecotourism in mining areas.

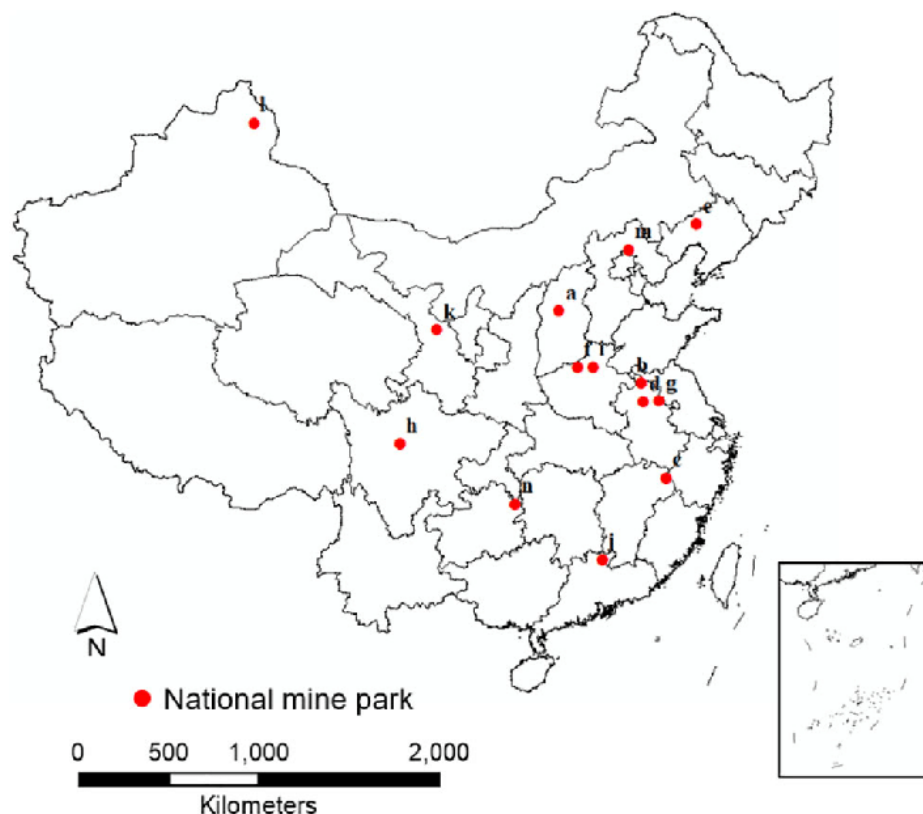


Figure 1. Map showing locations of the 14 studied national mine parks in China[11]

The expansion and diversification of tourism market demand. With the development of social economy and the improvement of people's living standards, tourism industry has become an important pillar of national economy and an important content of people's happy life. The scale and demand of tourism market are constantly expanding and diversifying. Therefore, ecotourism in mining areas, as a new type of tourism industry, can meet the needs of tourists for nature, culture, innovation and other aspects, and also provide the market and opportunities for the development of ecotourism in mining areas.

## 2.2. Development Trend

The scale and scope of ecotourism in mining areas will continue to expand, involving more types and regions of mining areas, covering various kinds of mineral resources and administrative divisions. The content and form of ecotourism in mining areas will become more abundant, combining the natural characteristics and cultural connotations of mining areas, developing various tourism products and projects, meeting the different levels and types of tourism demand. The quality and level of ecotourism in mining areas will continue to improve, paying attention to the planning, design, management and operation of ecotourism in mining areas, enhancing the brand image and market competitiveness of ecotourism in mining areas. The benefits and functions of ecotourism in mining areas will become more significant, realizing the coordinated development of economic, social and ecological benefits of ecotourism in mining areas, and promoting the green transformation and beautiful countryside construction of mining areas.

## 3. Examples of Completed Mine Parks

### 3.1. Nanjing Tangshan Quarry Park

This is a quarry park located in Nanjing, Jiangsu, designed by Z+T Studio, covering an area of 40 hectares. It consists of four different functional pits and other landscapes, showing the natural and cultural relics of the mine, and providing places for leisure and education[12].

### 3.2. Tangshan Kailuan National Mine Park

This is a national mine park located in Tangshan, Hebei, designed by Beijing Tsinghua Tongheng Planning and Design Institute, covering an area of 9.5 square kilometers. It is the first national mine park in China[13], and also the largest coal mine park in the world, reflecting the development history of China's modern coal industry, and also a model of ecological restoration.

### 3.3. Stearns Quarry Park

This is a quarry park located in Chicago, USA, designed by SITE, covering an area of 10.6 hectares. It is transformed from an abandoned quarry site and a construction waste landfill site[14], with unique terrain and landscape, and also an example of sustainable design.

### 3.4. Suichang Gold Mine National Mine Park

This is a national mine park located in Suichang, Zhejiang, designed by Zhejiang University Architectural Design and Research Institute, covering an area of 4.5 square kilometers(Figure 2). It is the first gold mine national mine park in China, showing the history and technology of ancient and modern gold mining in China, and also a comprehensive park integrating popular science, tourism and leisure.



Figure 2 The national mine park of Suichang gold ore

### 3.5. Wanshan Mercury Mine National Mine Park

This is a national mine park located in Wanshan, Guizhou, designed by Guizhou Provincial Geological Environment Monitoring Institute, covering an area of 6.5 square kilometers[15]. It is the first mercury mine national mine park in China, preserving the largest mercury mine site in the world, and also a window to display the utilization and environmental management of mercury resources.

## 4. Evaluation and Monitoring of Ecotourism in Mining Areas

Mine ecological restoration and ecotourism in mining areas are important ways for the transformation and development of mining areas, and also important goals and functions of mine ecological restoration. In order to evaluate the effectiveness and level of mine ecological restoration and ecotourism in mining areas, it is necessary to establish a scientific and reasonable evaluation and monitoring system, so as to effectively supervise and manage the process and results of mine ecological restoration and ecotourism in mining areas, improve the quality and benefit of mine ecological restoration and ecotourism in mining areas, and promote the sustainable development of mining areas.

Understand the basic information of the ecological environment, tourism resources, and tourism market demand of mining areas, analyze the potential and advantages of ecotourism in mining areas, determine the development goals and strategies of ecotourism in mining areas, and formulate the overall plan and specific scheme of ecological restoration and ecotourism in mining areas[16].

Monitor the implementation of mine ecological restoration and ecotourism in mining areas in real time, detect the key indicators of ecological environment change, tourism resource utilization, and tourism industry development in mining areas, evaluate the economic, social

and ecological three-dimensional benefits of mine ecological restoration and ecotourism in mining areas, find out the existing problems and risks, and put forward improvement measures and suggestions.

Establish a database and information platform for ecological restoration and ecotourism in mining areas, form evaluation reports and monitoring reports for ecological restoration and ecotourism in mining areas, publicize the achievements and levels of ecological restoration and ecotourism in mining areas to relevant departments and society, accept the supervision and evaluation of society, and provide reference for the supervision and management and policy formulation of ecological restoration and ecotourism in mining areas.

## **5. Evaluation Principles and Methods**

The evaluation and monitoring of mine ecological restoration and ecotourism in mining areas is a complex system engineering, which requires following certain principles and methods, to ensure the scientificity, effectiveness and operability of evaluation and monitoring. According to the relevant research and practical experience at home and abroad, the evaluation and monitoring principles and methods of mine ecological restoration and ecotourism in mining areas mainly include four aspects.

### **5.1. Systematicity**

Mine ecological restoration and ecotourism in mining areas is a system engineering, involving the ecological environment, tourism resources, tourism industry and other aspects of mining areas. It requires evaluation and monitoring from a system perspective, comprehensively considering the interrelationship and influence of various aspects, and avoiding isolated and one-sided evaluation and monitoring.

### **5.2. Dynamicity**

Mine ecological restoration and ecotourism in mining areas is a dynamic process, which is influenced by the natural conditions, social and economic situation, policies and regulations and other factors of mining areas. It requires adjusting the content and method of evaluation and monitoring flexibly according to the actual situation and development changes of mining areas, and realizing the dynamic updating and optimization of evaluation and monitoring.

### **5.3. Goal-orientedness**

The evaluation and monitoring of mine ecological restoration and ecotourism in mining areas is to achieve the goals of ecological protection, economic income increase, social harmony and so on in mining areas. It requires determining the purpose and direction of evaluation and monitoring according to the ecotourism development goals of mining areas, selecting the indicators and standards of evaluation and monitoring, and the results of evaluation and monitoring should be able to reflect the level and effect of ecotourism development in mining areas.

### **5.4. Feasibility**

The evaluation and monitoring of mine ecological restoration and ecotourism in mining areas is a practical work, which requires considering the actual conditions and capabilities of mining areas, choosing the methods and techniques of evaluation and monitoring suitable for mining areas, ensuring the feasibility and operability of evaluation and monitoring, and avoiding too complex and idealized evaluation and monitoring.



## 6. Challenges and Opportunities of Ecotourism in Mining Areas

### 6.1. Facing Challenges

In recent years, China has made some progress in mine ecological restoration and ecotourism in mining areas, and a number of ecotourism projects with characteristics and influence have emerged, such as Jinma Mining Area in Kunming, Yunnan, Pingba Mining Area in Anshun, Guizhou, and Hengyang Mining Area in Hunan. At the same time, China has also formulated a series of relevant policies and regulations, such as the Regulations on Mine Land Reclamation, the Regulations on Mine Geological Environment Protection, and the Notice on Mine Ecological Restoration and Ecotourism in Mining Areas, which provide legal basis and policy guidance for the development of mine ecological restoration and ecotourism in mining areas. However, the development of mine ecological restoration and ecotourism in mining areas also faces some problems and challenges, mainly manifested in the following aspects:

The imperfection and inconsistency of policies and management. At present, mine ecological restoration and ecotourism in mining areas involve multiple departments, such as natural resources, ecological environment, culture and tourism, agriculture and rural areas, etc. The responsibilities and authorities of each department are not clear, the policies and standards are not unified, and the supervision and coordination mechanisms are not sound, resulting in duplication, omission or conflict of planning, implementation, evaluation, supervision and other links of mine ecological restoration and ecotourism in mining areas.

The mismatch and imbalance of input and output. Mine ecological restoration and ecotourism in mining areas is a long-term project, but its output benefits are often difficult to quantify and account for, and are distributed in different subjects and regions, resulting in the mismatch and imbalance of input and output of mine ecological restoration and ecotourism in mining areas, affecting the sustainable development of mine ecological restoration and ecotourism in mining areas.

The instability and uncontrollability of quality and effect. Mine ecological restoration and ecotourism in mining areas is a complex system engineering, which is influenced by the natural conditions, social and economic situation, policies and regulations and other factors of mining areas. It requires long-term observation, monitoring, evaluation and management to ensure the quality and effect of mine ecological restoration and ecotourism in mining areas. However, the current technical level, management level and supervision level of mine ecological restoration and ecotourism in mining areas are not high, and there is a lack of scientific and reasonable evaluation and monitoring system and standards, resulting in the instability and uncontrollability of the quality and effect of mine ecological restoration and ecotourism in mining areas.

### 6.2. Development Suggestions

In order to promote the healthy development of mine ecological restoration and ecotourism in mining areas, improve the quality and benefit of mine ecological restoration and ecotourism in mining areas, and achieve the goals of ecological protection, economic income increase and social harmony in mining areas, the author thinks that the following aspects should be improved and optimized for the policy and management of mine ecological restoration and ecotourism in mining areas:

Establish and improve the coordination mechanism of mine ecological restoration and ecotourism in mining areas. The responsibilities and authorities of each department should be clarified, the communication and cooperation between departments should be strengthened, the unity and coordination of policies and standards should be formed, and the duplication, omission or conflict of policies and standards should be avoided. At the same time, the coordination and cooperation between the government and the society should be strengthened,

and the guidance and promotion of policies and markets should be formed, so as to avoid the disconnection or imbalance of policies and markets.

Establish and improve the investment and financing mechanism of mine ecological restoration and ecotourism in mining areas. Give full play to the guiding and leveraging role of fiscal funds, increase the fiscal input for mine ecological restoration and ecotourism in mining areas, optimize the use mode and efficiency of fiscal funds, and establish the performance evaluation and assessment mechanism of fiscal funds. At the same time, social capital should be actively introduced, and social forces should be encouraged and supported to participate in the investment and operation of mine ecological restoration and ecotourism in mining areas, explore and innovate the market-oriented operation mode of mine ecological restoration and ecotourism in mining areas, such as government and social capital cooperation (PPP), franchise, equity cooperation, etc., and realize the diversified investment and financing of mine ecological restoration and ecotourism in mining areas.

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