

## Study On Ecological Restoration And Tourism Development Model Of Abandoned Mines In Taishan Region

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**Abstract:** In China, the urban development relying on mineral resources is gradually eliminated, and the number of abandoned mines is also increasing. Therefore, the study of mine ecological restoration and tourism development mode has become one of the issues of general concern in the society. Based on taishan area as the research object of abandoned lands of mines, using the methods of literature analysis, investigation and study, according to the type, characteristics, distribution of abandoned lands of mines corresponding ecological restoration research and tourism development mode, as tai shan area and other areas of ecological restoration of abandoned lands of mines and provides the basis for tourism development.

### 1. Introduction

With the progress of science and technology, the use of mining development model is not suitable for the development of social economy, the increasing number of abandoned lands of mines, serious damage to the ecological environment of mining area and the ecological balance. Therefore, it is necessary to actively explore the mode of mine ecological restoration and tourism development, so as to change the target of mine ecological restoration from vegetation restoration to new alternative industries such as tourism.

As early as the 1930s, the United States was aware of the damage caused to the environment by mining, and was the first country to carry out mine ecological restoration and development, and formulated land reclamation laws and relevant legal systems for the implementation of abandoned mining areas. Other countries pay equal attention to the ecological restoration and development of abandoned mines. For example, Germany attaches great importance to land reclamation in abandoned mines, while Australia has advanced technologies to restore abandoned mines. In addition, France, The United Kingdom, the former Soviet Union and other countries have also formulated relevant laws and regulations on mine ecological restoration for systematic planning and research.

Relatively speaking, in the late 1950s and early 1960s, China began to realize the importance of restoration and development of abandoned mining areas, and gradually adopted relevant measures and formulated laws and regulations to control abandoned mining areas. research mainly focus on the ecological restoration of abandoned lands of mines and tourism development, such as zhu scholars of mine ecological restoration technology research <sup>[1]</sup>, is the main study of repair technology, Zhao Xinzhuo scholars for governance countermeasure research <sup>[2]</sup>, Yang Liqin scholars is the ecological recovery and comprehensive exploitation and utilization of the combination of research <sup>[3]</sup>, and so on. All these studies have laid a foundation for the restoration and development of abandoned mine lands into construction lands, forest lands, tourist attractions, leisure resorts and aquaculture lands.

According to the transformation of governance and repair of abandoned lands of mines at home

and abroad development, study of taishan area of different types of abandoned lands of mines, targeted for each type of model study on ecological restoration of abandoned lands of mines and tourism development, transforming it into a suitable for tourism development in tourist attractions and scenic spots, make full of vigor and vitality of abandoned lands of mines<sup>[4]</sup>.

## **2. Analysis of Abandoned Mines in Taishan Area**

### **2.1. Overview of the Study Area**

Taishan region is rich in mineral resources, with about 58 kinds of mineral deposits found, accounting for about 56.9% of the discovered mineral deposits. It is rich in types and reasonable in spatial distribution, among which sulfur and gypsum reserves are the largest in the province. With the development of society, all kinds of abandoned mine lands emerge at the right moment. The abandoned mine lands in Taishan area are mainly coal subsidence lands and abandoned quarries, and a small amount of abandoned tailings ponds, which are concentrated in Xintai and Feicheng.

### **2.2. Types, Distribution and Characteristics of Abandoned Mine Lands**

#### **2.2.1. Coal Mining Subsidence Area**

The coal mining subsidence areas in Taishan area are mainly distributed in Feicheng and Xintai. The Feicheng coalfield covers an area of about 98 square kilometers and has total coal reserves of about 1.1 billion tons. By 2012, nearly 5,500 hectares of land in the Taishan area had collapsed. In the collapsed land, there are different types of collapse degrees in the water accumulation area, deformation land and other land<sup>[5]</sup>. Xintai Coal field has a total area of 242.4 square kilometers. Due to the complex terrain and complex geological structure conditions in the coal mine distribution area, the degree of collapse of coal mining areas is not uniform. By the end of 2012, the collapsed land area of Xintai city was about 6,000 hectares, among which the deformed land area was about 1,450 hectares and the other land area was about 2,150 hectares<sup>[6]</sup>.

#### **2.2.2. Abandoned Open Quarries**

A total of 38 abandoned quarries were found in Taishan area, mainly distributed in Taishan scenic area. Abandoned open quarries have a negative impact on the local natural environment, such as air quality decline, vegetation destruction, etc., and also have a significant impact on the visual effect of the landscape. The mining scale of abandoned quarries varies greatly. There are 4 quarries with an area of more than 6000m<sup>2</sup> and 27 quarries with an area of less than 2000m<sup>2</sup><sup>[7]</sup>. These abandoned quarries are damaged to varying degrees, so targeted ecological restoration and tourism development are needed.

#### **2.2.3. Tailings**

Tailings pond occupies a lot of land, destroys the natural environment, pollutes the air, reduces the biodiversity, and destroys the local ecological environment. It is characterized by the indispensable facilities and equipment in the production process of mine dressing plant, high investment, high operating costs, and is the biggest hazard source of mine plant production. At present, taishan area specific tailings pond statistical data is not comprehensive, relatively typical of the following types: Panchagou Iron ore tailings pond in Xintai City, Xintai Xinsheng Mining Co. LTD tailings pond and Dongzhuang Township Haojie southeastern mine tailings pond.

## **3. Ecological Restoration Models of Different Types of Abandoned Mine Lands**

### **3.1. Ecological Restoration Mode of Coal Mining Subsidence Areas**

Adjust measures to local conditions to take different repair mode, can use farmland reclamation, aquaculture, or planting, artificial wetland, urban construction land and other measures to comprehensive management<sup>[5]</sup>, comprehensive utilization, the classification of ecological restoration measures according to different demand, effect is obvious basically has the following

four patterns.

(1) For areas with long and deep water accumulation, we should dig ponds to raise fish, increase the depth of water surface, and arrange ornamental courts and ornamental chairs around fish ponds. The silt can be transformed into land, and the planned three-dimensional development can be used to construct the mine park and wetland protection area, so as to improve the storage capacity of the mining area. Some villages, such as Shiheng town, open up more than mu of fish ponds for aquaculture or cultivation.

(2) In seasonal waterlogged and shallow water areas, ditches should be dug and drained, terraces constructed, and part of them should be transformed into shallow water planting areas to develop characteristic planting. Other parts can also be used as urban construction land through land leveling, restoration and transformation into cultivated land, or planting trees on the slope for treatment.

(3) For the areas with serious collapse, plan and level them, improve water conservancy facilities, and restore farmland and planting.

(4) Waste fly ash is used to fill the subsidence area, and the subsidence area is reclaimed and returned to the fields for planting, so as to restore its vitality and vitality for development and utilization. For example, this technique is used to reclaim the coal mining subsidence area in Shiheng Town.

### **3.2. Research on Ecological Restoration Model of Abandoned Quarry**

The following ecological restoration models are proposed in this paper.

(1) It is necessary to improve the land in the mining area and protect the slope with different heights. Shrubs, trees, herbs and other vegetation can be planted to protect the slope. The mining pits are backfilled with waste stone and slag, and then leveled off to make drainage facilities.

(2) Remote quarries should focus on natural restoration, supplemented by a small amount of artificial restoration measures, which can achieve a good ecological restoration effect. At the beginning of the ecological restoration also need human intervention, treatment plant growth mechanism within the mining area, such as water, slope instability, the late only needs a small amount of artificial tending can use the self-repair ability to restore the ecological environment of nature, the main purpose of the regional ecological restoration is the use of vegetation ecological protection, the main form is the ecological forest construction.

(3) In the accumulation of water in the quarry, water can be transformed into wetlands, lakes, rivers, etc., providing a good living environment for plants and animals <sup>[8]</sup> and promoting environmental restoration and ecological balance.

### **3.3. Study on Ecological Restoration Model of Tailings Ponds**

The remediation of tailings pond soil can be carried out from the following aspects.

First of all, the regulation of landforms and landforms. large machinery should be used to level off the land near the tailings pond to reduce differences and promote large-scale planting and management of vegetation.

Second, improve the soil matrix. The soil near the tailings pond has been polluted by heavy metals for a long time, and its properties have been damaged, soil erosion has been serious, soil fertility has been reduced, pH environment is harsh, and various nutrients have been lost. Therefore, soil matrix should be improved before ecological restoration.

Then, plants with strong tolerance and resistance were selected and planted. The plants used for soil remediation in tailings ponds usually have the characteristics of strong stress resistance, rapid growth, good soil improvement effect and obvious ecological function. In the process of remediation, pioneer herbaceous plants with strong stress resistance should be planted first to form grass communities and improve the self-remediation ability of contaminated soil, and then other plants can be planted to form a complete plant community <sup>[9]</sup>.

## **4. Tourism Development Models of Different Types of Abandoned Ines**

#### **4.1. Tourism Development Mode of Coal Mining Subsidence Areas**

Currently in product development, there are several types.

(1) Develop into artificial lakes or water parks. Water parks or artificial lakes are built in areas with large cave-in area, which can not only improve the ecological environment quality of coal mining cave-in areas, but also provide places for local residents and tourists for leisure and entertainment, with good social, ecological and economic benefits <sup>[10]</sup>.

(2) Construction of ecological farm, the more popular type is mainly farmhouse. Farmers use their farms to provide accommodation for tourists and process local agricultural and sideline products to meet the needs of guests. So, carried out in coal mining subsidence based on sightseeing and experience of agriculture as the main body of ecological tourism, and show the pollution-free vegetable garden, aquatic planting and breeding garden, poultry or livestock orchard garden, economy, not only can make the visitors understand subsided, the whole ecological agriculture system and through the experience of farming and farmers' production and living, so as to better understand the meaning and importance of ecological restoration, enhance the consciousness of protecting the environment <sup>[11]</sup>.

(3) Developing industrial tourism. Taishan area has advanced coal mining technology and a long history of coal mining, which is attractive to tourists who love mining industry. Through the construction of historical relics exhibition halls of mines in some subsidence areas where conditions permit, the mine production process model and simulation operation system, the mine geological structure evolution history and the taishan area coal mining history are established to reproduce the mining and transportation process and environment of mines, and to show the historical relics formed in the process of mine construction and development. On this basis, national or regional coal museums can also be set up to make use of its unique tourism resources for tourists to visit and let people understand the history and production process of coal, which is an industrial tourism project worth developing <sup>[12]</sup>.

#### **4.2. Research on Tourism Development Mode of Abandoned Open Quarry**

Abandoned quarry through ecological restoration in combination with tourism development, can be turned into a popular science education, entertainment, leisure, science and technology exhibition functions such as scenic spots.

(1) Theme park development mode. Drawing lessons from the development models of mining parks at home and abroad, the abandoned open quarry is themed to build a special park with underground palace, castle, tribe and adventure as the theme. Combined with the six elements of tourism, the park enables tourists to understand mining knowledge while eating, staying, traveling, and shopping and entertainment, and enhance their awareness of environmental protection.

(2) Tourism real estate development mode. Such quarries should have favorable conditions for tourism development, such as suitable surrounding natural environment and no large chemical companies. Governance can be used for such a quarry carving techniques, rock climbing, built a deep pit hotel, mine park, rock climbing, and other tourist attractions, such as the abandoned quarry as a tourist scenic spot.

(3) Lake water storage tourism development model. For the quarry with large mining depth, serious environmental damage and great difficulty in restoration, it is necessary to level off the land for re-greening and then store water in the lake. This can not only conserve water, but also can be used for water cultivation or aquaculture, also can be used to develop aquatic recreational projects.

#### **4.3. Study on Tourism Development Mode of Tailings Pond**

The ecological restoration and the development of the tailings is one of the important issues of concern to the ecological environment protection in China, one of the tailings of land reclamation and ecological rehabilitation development engineering includes physical repair, chemical remediation and bioremediation and so on the many kinds of ecology and environmental protection aspects of the theory and knowledge, after repair of the tailings can provide a beautiful environment of the agriculture and forestry landscape, is one of the important tourism resources of mining area

repair and development<sup>[12]</sup>.Therefore, tailings pond can be developed into an ecological agricultural tourism model or mining industrial tourism and mining culture exhibition hall can be developed by virtue of the mining sites left by tailings pond mining<sup>[13]</sup>.

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