

# Rethinking Landscape Design of Rural Mine Pit Groups Under Ecological Restoration: A Case Study of Yujiagou Mine Pits in Changchun

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## Abstract:

With the rapid economic development in China, mining and industrial production activities have become increasingly frequent, resulting in a large number of mine pits and industrial wastelands. These areas are often plagued by environmental pollution, ecological degradation and landscape destruction, which pose serious threats to the surrounding ecological environment and human health. Therefore, the ecological restoration of mine pits and industrial wastelands has become an important task in current rural environmental governance and ecological construction. In recent years, continuous innovations in concepts and technologies of ecological restoration have provided new ideas and methods for the renovation of such degraded lands. Centering on self-repair of ecosystems and reconstruction of ecological functions, the concept of ecological restoration has gradually become a key theoretical support for landscape ecological restoration. Guided by this concept, landscape restoration focuses on restoring the structure, function and processes of ecosystems, highlights species diversity and niche complementarity, and aims to build a healthy, stable and sustainable ecosystem.

## Keywords:

Ecological Restoration, A Group of Mines, Rural Revitalization, Landscape Design

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## 1. Introduction

Global mining activities have caused severe ecological degradation, leaving nearly 7 million hectares of abandoned mining land. Mine restoration in China has shifted from focusing only on mining technology to multidisciplinary research involving landscape architecture and ecology since the 21st century. Reuse models such as public facility development and tourism utilization have been formed, together with a technical system including macro ecological planning, meso process management, and micro node restoration. At present, mine restoration in China is challenged by accumulated historical debts and complicated practical problems. However, with the promotion of ecological civilization, relevant policies and regulations have been improved, and technologies including biological, physical, and chemical restoration have made progress. The renovation of urban abandoned land must synchronize

ecological restoration and landscape renewal. Based on natural processes and ecosystem protection, the design should simulate natural ecosystems, rationally arrange landscape elements and ecological corridors, balance cultural spirit and aesthetic needs, and finally achieve soil improvement, biodiversity recovery, and stable, healthy development of the ecosystem. [1]

## 2. Analysis and Planning

### 2.1. Basic Information

The Jia Gou Mine Complex on Lianhua Mountain is located in the Lianhua Mountain Ecological Tourist Resort in Changchun City, Jilin Province. It was once an abandoned coal mine pit. Due to long-term coal mining, the land was severely damaged and the ecological environment deteriorated. The mine pits in this base have been out of production for a long time. Each mine pit has water accumulation from groundwater to varying degrees. The climate conditions are harsh, and the landscape has been severely damaged. [2]

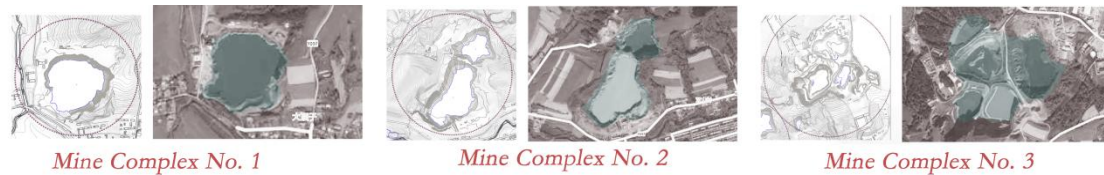
Major problems in mine pit groups can be summarized into five aspects. First, soil pollution: heavy metals from mining infiltrate soil, damage ecological functions, reduce crop yields, kill vegetation, and threaten residents' health. Second, water pollution: direct discharge of wastewater carrying heavy metals and nutrients causes aquatic organism poisoning, algal blooms, water hypoxia, water quality deterioration, and massive fish deaths. Third, biodiversity loss: mining destroys the original ecosystem, weakens water conservation and other services, and indirectly disrupts species distribution and population dynamics by affecting climate change. Fourth, geological hazards: underground mining triggers stratum fractures and ground fissures that endanger buildings; gas accumulation may cause explosions, and aquifer penetration can lead to water inrush and flooding. Fifth, landscape destruction: unbalanced land use reduces farmland and forestland, while collapsed water and industrial land expand, resulting in landscape fragmentation and loss of ecosystem functions. These intertwined problems severely threaten ecological balance, quality of life, and production safety, requiring systematic governance to achieve sustainable development.

The first mine pit group has only one pit, which is already in the development stage. Nearly half of the surrounding cliffs no longer exist, and the ground has well-improved hard surfaces (mainly asphalt and placed stones). The pit has equal parts of water and land, with the deepest part of the lake bottom reaching 50 meters. As the first pit is also the terminal of the entire design flow, we decide to use the interweaving of reality to bring a sense of sudden enlightenment and new life, as well as the true feeling of humans and nature returning to reality.

The second mine pit group consists of two small pits, surrounded mainly by quarries with abundant raw materials. It connects the above-water and underwater spaces, contrasting the mystery of the underwater world with the light on the island. We believe this area can create special effects on the water, taking the oasis in the desert as a prototype to build an isolated island in the pit's water area, bringing people hope and rebirth.

The third mine pit group is the largest among the three, with four small pits. There is a significant height difference on the southern side of the site, and it is the first stop for visitors entering the Yujia Village mine pit group. It has shallow water

accumulation and abundant aquatic plants, with good interactivity and water affinity. Taking advantage of its visual concealment, it adds fun to the design and gives visitors a magnificent start. (Figure 1)



*Figure 1. Ecological characteristics within the mine pit complex.*

## **2.2. Mine pit cluster planning and design**

The site is located at the Yujiagou Mine Pit Group in Lianhuashan, Changchun City, Jilin Province. Due to the suspension of mining operations, the landscape here has suffered severe damage. Each mine pit has varying degrees of groundwater accumulation and harsh climatic conditions. The design integrates the concept of metabolism; based on this principle, we intend to utilize the environment of each pit to create a distinct atmosphere unique to it. The long cycle of mine pits, from development and prosperity to abandonment, is also a process of growth, renewal, and decline. The positioning of the three communities (from Community 1 to Community 3) adheres to the design philosophies of ecological priority, people-oriented approach, serving the scenic area, and adapting to the site and community. The process from the inception to the demise of the mine pits mirrors the journey of life, enabling visitors to not only appreciate the mine pit landscape but also experience and reflect on life during their visit, thus achieving emotional resonance beyond mere visual perception. We plan to utilize the interweaving of reality to bring people a sense of sudden enlightenment and new life, as well as an authentic feeling of returning to nature and reality.

Ecological restoration attempts to recreate, guide or accelerate the natural evolutionary process. Humans cannot restore a true natural system, but we can assist nature by assembling the essential local plants and animals in a certain area, allowing natural evolution to ultimately achieve restoration. Therefore, the goal of ecological restoration is not to plant as many species as possible, but to create favorable conditions to promote the development of a complete ecosystem composed of local species. Meanwhile, with the deepening understanding of green mine construction, improving mine soil, restoring slope vegetation and developing mine tourism have gradually become the main methods for managing abandoned mine pits .

The landscape planning and design of this mine pit group strictly adheres to the principle of “adapting to local conditions”, fully respects the objective law of regional differentiation, and is based on the original natural conditions and industrial relics of the site. Guided by a main thread, it connects three themed stations, thus forming a progressive spatial narrative and emotional experience. [3]

The first station is themed “Leisure and Exploration”. In view of the large water area of Pit 1, the original terrain and site relics are preserved and redesigned to construct a natural tourist space. It strengthens the interaction between the vertical space and the water surface to enhance visitors’ immersive experience with nature. The second station focuses on “Extreme Sports” and serves as a key section of the mine pit design. Centering on the design concept of “experiencing the mine and feeling the cliff”, it offers composite sports projects, including rock climbing,

industrial sports, bungee jumping, trampoline, cliff sports, jumping platforms, and mine treasure hunting. By making full use of the unique topographic height difference and industrial texture of the mine pit, it activates the adventurous spirit and industrial memory of the site.

The third station takes “Ecological Restoration” as the final chapter, which conforms to seasonal changes and natural rhythms to witness the continuation and reproduction of new life. This space deliberately avoids triggering painful memories and creates a reflective atmosphere of a “pure and empty place”, enabling visitors to place their sorrows, recall life, and achieve spiritual purification and sublimation (Figure 2 ).

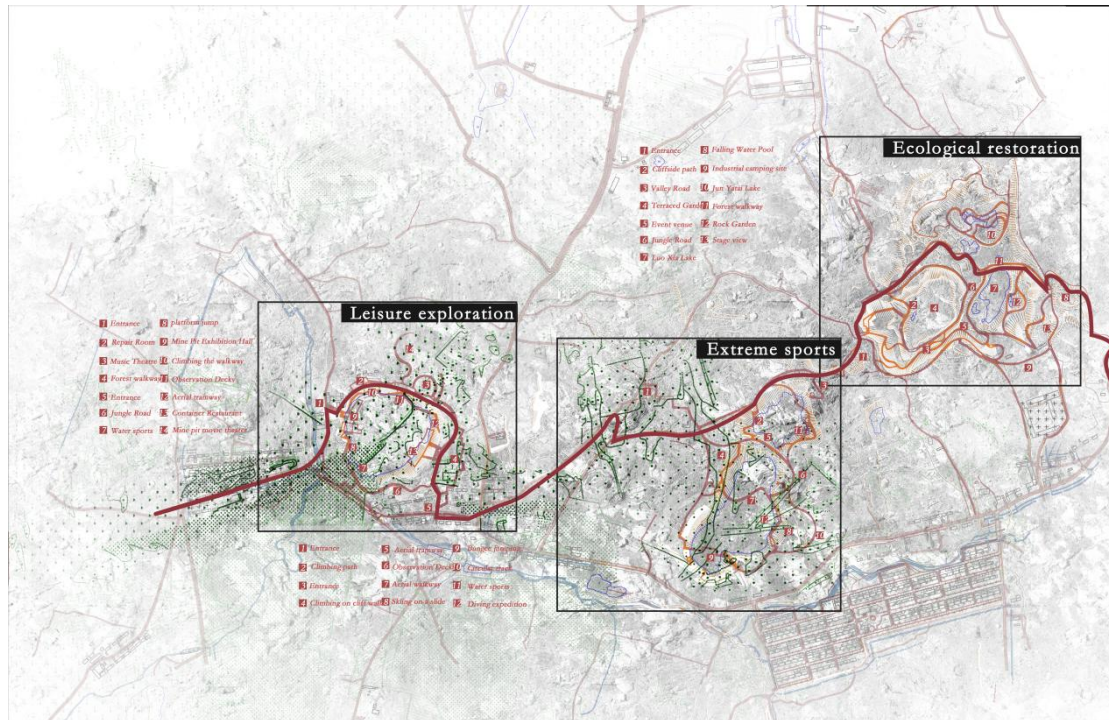


Figure 2. Planar block diagram.

### 3. Results and Discussion

The overall design concept emphasizes creating a unique reflective space through the original environment of the site, using the natural environment of each mine pit to create a differentiated atmosphere, and organically integrating industrial wastelands with natural conditions to inherit and sustain the original vitality of the site. It aims to return the design to the essence of nature, realize the complete restoration of the site and its ecology, and ultimately achieve the sustainable development goal of harmonious coexistence between humans and nature.

### 4. Conclusions

In the planning and design of mine pit groups, we have fully considered the natural environment, cultural background, and economic conditions to pursue sustainable development. Through rational spatial organization, functional transformation, ecological restoration, and cultural inheritance, we aim to build the mine pit area into a comprehensive space integrating ecological protection, recreation, science education, and creative industries. It will provide a distinctive venue for local residents and

visitors, while protecting and utilizing the unique mine resources to support urban construction and development in China.

In short, the planning and design of mine pit groups is a project full of challenges and opportunities. We look forward to further exploring the potential of mine pit areas in future practice, creating more excellent works and making greater contributions to urban planning and design in China.

## Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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