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Evaluation of the Impact of Prospecting Projects on Regional Ecosystems and Landscape Systems

-- Taking the Prospecting Project of Mozigou Lead-zinc Mine in Baoxing County as An Example

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Abstract

By evaluating the impact of the Mozigou lead-zinc mine prospecting project in Baoxing County, Ya'an City on the ecosystem and landscape system of the giant panda habitat in Sichuan, corresponding management relief measures and engineering relief measures are proposed for the construction project, which is for the development of mineral resources and ecology. The coordinated development of system protection provides a certain theoretical basis. The evaluation result is that the Mozigou lead-zinc mine prospecting project will have varying degrees of impact on the ecosystem and landscape ecosystem in the outer conservation area of the heritage site, and the landscape ecosystem will be relatively affected. If the various protection measures proposed in this article are implemented during the construction and operation stages of the project, the adverse effects of the operation of prospecting projects on the heritage site will be effectively controlled, weakened or eliminated. Considering the impact of the construction of this project on local economic development and employment, the impact of the Mozigou lead-zinc mine prospecting work in the Sichuan Giant Panda Habitat World Heritage Outer Protection Area on the heritage ecosystem and landscape ecosystem is under control Within range.

Keywords

Prospecting project; ecosystem; protection measures.

1. INTRODUCTION

Lead-zinc mineral resources are an important natural resource that is widely used, which favorably supports the construction of the national economy and promotes social progress. However, in the process of developing mineral resources, mining activities such as digging damage, occupation and mining have caused varying degrees of damage to the geological environment of the mine, which has attracted great attention from relevant state departments and all sectors of society. Baoxing County Yazhibao Mining Co., Ltd., after preliminary investigation and sorting out historical mineral data, discovered that there may be a small-medium-sized lead-zinc deposit with industrial mining value in the Mozigou area of Wulong Township, Baoxing County. Because the prospecting area to be applied for for the lead-zinc mine is located in the outer protection area of the Sichuan Giant Panda Habitat World Heritage, according to the relevant requirements of the "Sichuan Province World Heritage Protection Regulations", the wild animal and plant resources and giant pandas A field survey was conducted on the status quo of the habitat. Based on the survey results and the Implementation Plan for the Investigation of the Mozigou Lead-Zinc Mine in Baoxing County, Sichuan Province,

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the "Mozigou Lead-Zinc Mine Prospecting Project in Baoxing County will contribute to the World Natural Heritage of Sichuan Giant Panda Habitat". Impact Evaluation Report.

2. CONSTRUCTION PROJECT OVERVIEW

The prospective scope of the Mozigou lead-zinc mine is located in Wulong Township, Baoxing County. The geographic extreme coordinates: 102°43′30″~102°46′00″ east longitude and 30°26′45″~30°28′ north latitude 15″, the project's proposed survey area is located in the outer conservation area of the heritage site, covering an area of 8.52 km2. The occupied land area is small, mainly sparse trees, shrubs and grasses. The project adopts the method of drilling holes after stripping the topsoil for prospecting.

3. OVERVIEW OF THE EVALUATION AREA

3.1. Evaluation Area

According to the technical standard of DB/T 1511-2012, the scope of evaluation should include the direct and indirect impacts of all activities at each stage of the construction project. Based on the completeness of ecosystem functions, the ecological habits of the main protected objects, the particularity of geographic units, and the current status of available infrastructure in the region, the evaluation area is comprehensively defined as follows: West River is bounded by the South; The end of the Zigou Gou and the first heavy ridge is the boundary; the east is bounded by Gedagou; the west is bounded by Mozigou. The highest altitude in the evaluation area is 2650 m, and the lowest is 1100 m. The area of prospecting evaluation area is 11.2287 km^2.

3.2. Evaluation Method

(1) Digitize all evaluation project facilities into ARC GIS software;

(2) Basic layers such as the scope of the digital heritage site and functional zoning are transferred to the ARC GIS software;

(3) Comprehensively use the above-mentioned evaluation area delimitation principles, and delimit the evaluation area along a certain geographic unit according to the impact characteristics and effective scope of the mining area.

4. ASSESSMENT OF THE IMPACT OF CONSTRUCTION PROJECTS ON THE ECOSYSTEM AND LANDSCAPE SYSTEM

4.1. Impact Assessment on Ecosystem Area

The actual land occupation impact of prospecting comes from trenching and tunnels, and the waste (slag) piles generated after excavation. As prospecting work is still in the design stage, it is difficult to accurately quantify the specific land occupation of prospecting work. According to the analysis and estimation of preliminary data, the actual area of exploration work is only a few hundred square meters. Therefore, mine prospecting leads to a small reduction in the area of the existing ecosystems in the assessment area.

4.2. Impact Assessment on Ecosystem Stability

As the proportion of land occupied is very small, although prospecting has a certain impact on the ecosystem of the assessed area, the anti-disturbance stability of the ecosystem is not greatly reduced. If vegetation can be restored on various land occupations as soon as possible after the end of exploration, the land occupation can be further reduced In order to ensure that the range of changes does not exceed the tolerance range of the anti-disturbance stability of the

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ecosystem. Therefore, all links of mine prospecting should pay attention to ecological restoration.

4.3. Impact Assessment on Ecosystem Integrity and Diversity

The area of the forest ecosystem in the assessment area is 308.03 hm2, accounting for 27.43% of the total area. The tree species are relatively poor, and the shrub layer and herb layer are relatively developed. The area of the shrub ecosystem is 498.37 hm2, accounting for 44.38% of the total area, which is due to deforestation. The main ecosystems in the assessment area are the yellow vitex and mulberry shrubs formed and naturally generated; the grass ecosystem covers an area of 32.67 hm2, accounting for 2.91% of the total area, and is mainly distributed around abandoned farmland or farmhouses , Is composed of reed bamboo and similar reeds; the agricultural ecosystem area is 281.92 hm2, accounting for 25.11% of the total area, including farmland and economic fruit forest; the construction and road ecosystem area is 1.88 hm2, accounting for 0.17% of the total area, this type of ecosystem Mainly mixed with the agricultural ecosystem, the road acts as a corridor between the patches of various settlements, connecting the various settlements. It is estimated that the land area for prospecting excavation and slag dumping is only a few hundred square meters. The direct impact area is small, and the indirect interference to the surrounding environment is weak. The species composition in the ecosystem will not change. Therefore, the composition of the ecosystem before and after prospecting Have integrity.

Except for buildings and road landscapes, the original five types of ecosystems in the assessment area will all be affected in prospecting activities and their area will be reduced, but the type of ecosystem composition will not decrease. Therefore, the construction of mine projects will not affect the diversity of the regional ecosystem.

4.4. Impact Assessment on Landscape System

Patches: The patch types in the assessment area include five types: forest landscape, shrub landscape, grass landscape, agricultural landscape, building and road landscape. Using ArcGIS geographic information system software, based on the field vegetation survey, the landscape distribution map of the landscape evaluation area can be made. The statistical analysis function of ArcGIS can be used to obtain the basic information of various patches (or landscape elements).

Table 1. Patch characteristics of each landscape type in the evaluation area

Landscape type	Number of plaques		Patch area		Average patch area (hm2)
	Quantity	Proportion (%)	Area (hm2)	Proportion (%)	
Forest landscape	30	13.04	308.03	27.43	10.27
Shrubland landscape	57	24.78	498.37	44.38	8.74
Grassy landscape	13	5.65	32.67	2.91	2.51
Agricultural landscape	128	55.65	281.92	25.11	2.20
Architecture and road landscape	2	0.87	1.88	0.17	0.94
total	230	100.00	1122.87	100.00	4.88

From Table 1, it can be concluded that although the total number of shrub landscapes in the evaluation area only accounts for 24.78% of the total number of patches in the evaluation area,

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its total area accounts for 44.38% of the total area of the evaluation area. The area ratio is the largest, with an average patch area of 8.74 hm2. The total area of forest landscape ranks second, but it has a small number of patches, with 30 patches, accounting for 13.04% of the total number of patches in the evaluation area, with a total area of 308.03 hm2, which is also the average area of the patches in the evaluation area. The biggest. The agricultural landscape is the third in the total patch area. The average area of the agricultural landscape is 2.20 hm2. The agricultural landscape has the largest number of patches, accounting for 55.65% of the total patches in the evaluation area; the smallest patch area is the building and The proportion of road landscape is only 0.17% of the total area. As corridors, buildings and road landscapes have high connectivity. In the landscape ecosystem, they mainly connect to agricultural landscapes and block other natural resource patches.

Using the landscape distribution map of the prospecting engineering evaluation area made by ArcGIS, the dominance values calculated for the various patches in the evaluation area are shown in Table 2.

Table 2. Advantages of various landscapes in the assessment area

Landscape type	D_p (%)	R_f (%)	L_p (%)	D_o (%)
Forest landscape	13.04	26.88	27.43	22.45
Shrubland landscape	24.78	38.45	44.38	35.87
Grassy landscape	5.65	9.52	2.91	6.03
Agricultural landscape	55.65	21.36	25.11	34.04
Architecture and road landscape	0.87	3.79	0.17	1.61

From Table 2 above, it can be concluded that the dominance values of shrubs and agricultural landscapes rank the top two, with dominance values exceeding 30%. Followed by forest landscapes, architecture and road landscapes came last. From the data of each patch, agricultural landscape patches are the most widely distributed, while shrub landscape patches have the largest area and a high degree of integrity. Therefore, shrubs and agricultural landscapes have become the dominant patch types in the evaluation area.

Forest landscape, shrub landscape, and grass landscape are all natural ecosystems in the evaluation area landscape, and agricultural landscapes, buildings and road landscapes belong to artificial ecosystems. The dominance of the natural ecosystem in the assessment area is higher than that of the artificial ecosystem.

Corridor: As a linear landscape unit, the corridor is mainly a road in the evaluation area. The roads in the evaluation area mainly include the roads newly built in the Jiudaoguai Marble Mine, as well as mechanical farming roads and trails connecting various residential areas. The roads in the area are all narrow, with few large vehicles passing by, and the current interference intensity and blocking effect are not obvious. However, after the mine is put into production, large vehicles will increase, and the interference and blocking effect of the corridor will increase.

Matrix: The matrix is the type with the largest area and the best connectivity in the landscape, and it plays an important role in maintaining the structure and function of the landscape. The area of forests and shrubs in the evaluation area is relatively large, the distribution is relatively concentrated, and the connectivity is relatively good, which can significantly control the dynamics of landscape structure and functions.

Impact on the landscape structure of the evaluation area: In addition to the addition of engineering land patches, the basic structure of patch-corridor-matrix in the evaluation area

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has not changed significantly: agricultural landscape, shrub landscape and forest landscape are still the evaluation area landscape Among the elements, patches with larger areas and controlling roles; because there is no disappearance of natural ecosystem types, only artificial patches are added, so landscape heterogeneity does not decrease. The prospecting work did not isolate the various ecosystems in the landscape ecosystem from the outside world, and maintained the openness of the landscape organization.

Impact on the landscape function of the evaluation area: The landscape function is manifested in the energy flow and material circulation within and between each ecosystem, as well as the stability of each ecosystem. After the exploration started, due to land occupation, the productivity of the plant community in the evaluation area declined. This process will continue until the vegetation gradually recovers after the exploration ends and reaches a new balance. At the same time, the land occupied by the project will hinder the energy flow between the various ecosystems to a certain extent, thereby affecting the landscape function of the evaluation area. The original material cycle of the assessed area is mainly manifested in the succession process of vegetation and the material cycle of agricultural production. After the exploration starts, the input of personnel, machinery and other materials will destroy a small amount of vegetation, and produce some waste residues, waste water and other substances, which will affect the stability of the original material circulation in the evaluation area, but the degree of such impact is very weak.

5. NATURAL RESOURCE PROTECTION AND MITIGATION MEASURES

(1) During mine prospecting, try to keep the original big trees as much as possible to reduce the area affected by the ecosystem; with the progress of mine prospecting, gradually deploy plant species according to the invaded community structure to build the original plant community.

(2) No new access roads will be added; waste residues and domestic garbage will be cleaned up in time; the bare surface of the occupied land will be eliminated to reduce heterogeneity.

(3) Train and supervise mine staff to increase awareness of protecting natural resources.

(4) Implement ecological supervision measures

6. CONCLUSION

Based on field investigation, data collection, indoor data collation and analysis, this paper analyzes and evaluates the impact of the prospecting activity area of the mine on the heritage ecosystem and landscape ecosystem. It is considered that the overall area of prospecting work is very small, The reduction ratio of the area of similar ecosystems is extremely small; the existing ecosystem types will not decrease, the patch density and dominance index changes in the landscape ecosystem are relatively low, and the landscape diversity, dominance, uniformity and fragmentation index change Both are low, and the overall impact evaluation result on the heritage site is “small”. In the project construction and operation stage, the various protection measures proposed in this article are implemented, and the methods of trench exploration and tunnels are adhered to. The adverse effects of the prospecting project on the heritage site will be effectively controlled, weakened or eliminated. Considering the important role of this project in local economic development and other aspects, the prospecting work of the Mozigou lead-zinc mine in Baoxing County has entered the Sichuan Giant Panda Habitat World Heritage Outer Conservation Area. The impact on the heritage ecosystem and landscape ecosystem is likely to be Control range.

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