Suitability Evaluation of Land Reclamation——Taking the Project Area of Baoguo Old Town in Beipiao City as an Example

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Abstract. The evaluation of land reclamation suitability can predict the damaged land and it is of great significance in determining the best direction of land reclamation. Taking the abandoned land of Laojiao old town in Beipiao City as an example, this study selects the evaluation factors and establishes the evaluation index system based on the actual research situation. The evaluation results show that the drainage conditions in the project area are good, of which 36.6367hm² is suitable for reclamation as cultivated land; 31.5327hm² is suitable for reclamation as forest land.

1. Introduction
Industrial and mining wasteland is widespread in China, and many areas have already started the rehabilitation of industrial and mining wasteland [1-3]. According to statistics, at the end of 2012, the area of reclamation for various types of land in the country has reached 1.13 million hm², of which 530,000 hm² is abandoned for industrial and mining [1]. Therefore, research on industrial and mining waste reclamation is imminent. At present, there are many problems facing the reclamation of industrial and mining wasteland in China, such as the lack of technology and the form of national conditions [2]. The research on industrial and mining wasteland mostly focuses on the research of problems and countermeasures, the evaluation of comprehensive benefits and the potential evaluation of reclamation [3-5]. The applicability is rarely evaluated. Therefore, this paper evaluates the suitability of the project in the industrial and mining waste project area of Beipiao City, in order to provide reference for the development of land reclamation work.

2. Research area overview and research methods

2.1 Overview of the study area
The location of the project area is a low hilly area. The geomorphic unit is mainly low-land hills and hills, small-scale mountain valleys, poor vegetation development, and complex landforms. It is composed of gneiss, quartzite, and a small amount of Baiyunhe marble. Granite, streamlined trade
Anshan rock and other components. It belongs to the continental climate, with large temperature difference between day and night. The annual average temperature is 8.4 degrees, the precipitation is 481mm, and the frost-free period is 145 days. It is sandy soil, which is very suitable for all kinds of miscellaneous grains. The grain produced is good in taste and excellent in quality. It is completely in line with pollution-free. Testing requirements. The soil parent material in the project area is loess or laterite layer and all kinds of parent rock weathering, including cinnamon soil, leaching cinnamon soil, carbonate cinnamon soil and meadow soil, and distributed a large area of modern river accumulation. Leaching cinnamon soil and meadow soil account for a small area. The zonal soil types in the area are mainly cinnamon soil. The non-zonal soil types are mainly alluvial soils, distributed in the plains of the valleys, with deep soil layers, high fertility, loose soil, granular structure, and many resurgence and warmth. It has the characteristics of large fertilizer effect and wide variety of species. The soil surface pH is about 6.5~7.0. Soil fertility is moderate and suitable for plant growth.

The total land area of the project area is 68.3457 hectares, the construction scale is 68.3457 hectares, the newly added cultivated land area is 36.6367 hectares, the newly added cultivated land rate is 53.60%, the newly added forest land area is 31.5327 hectares, and the newly added forest land cover rate is 46.14%. Among them (the newly cultivated land in Baoguo Old Town Block 001 to 007 is 7.5313 hectares, and the newly added forest land is 2.1601 hectares; the newly added arable land of 008-025 in the North Tower Township is 8.1953 hectares, and the newly added forest land is 6.5888 hectares; Blocks 026 to 034 added 3.1953 hectares of new land and 3.0199 hectares of new forest land; from 035 to 050 in Yanjadian, the new cultivated land was 17.7163 hectares and the newly added forest land was 19.7373 hectares). The current situation is abandoned industrial and mining land, and the land use status table is shown in Table 1.

|                      | First class           | second class | area  | proportion |
|----------------------|-----------------------|--------------|-------|------------|
| Urban villages and   | Mining land           |              | 68.3457 | 100        |
| industrial and mining|                       |              |       |            |
| total                |                       |              | 68.3457 | 100        |

2.2 Research methods

In this study, through the field investigation, combined with the type and extent of land damage in the mining area, the utilization status and production level before the land destruction and the objective conditions of the reclaimed land resources, the selection factors were determined, the evaluation unit was delineated, and the evaluation model was constructed.

3. Land reclamation suitability evaluation

The land reclamation suitability evaluation is based on the investigation of the destructive land and the overall plan of land use, and analyzes and evaluates the suitability of land reclamation, so as to design the land reclamation technology and method, and to rationally determine the reclamation land. The best solution provides a theoretical basis.

3.1 Determination of the evaluation object

According to the analysis of the status quo of the destroyed land in the project area, the object of land reclamation suitability evaluation in the project area is determined as waste slag stone and some residential areas.

3.2 Division of evaluation units

In the evaluation of land reclamation suitability, when the evaluation unit is divided, the classification of land destruction, restrictive factors and manual remediation measures shall be used as the basis for the determination of waste slag and some residents according to the actual situation of land destruction in the project area. The point is the evaluation unit.
3.3 Determination of evaluation factors
The suitability evaluation of the land to be reclaimed in the project area should select a set of independent and complementary evaluation factors and leading factors. The participating factors (or factors) should meet the following requirements: First, measurability, the factors can be measured and can be expressed by numerical values or serial numbers; second, the relevance, that is, the increase or decrease of selected participating indicators, marking the evaluation of land The improvement or decrease of the unit quality; the third is the stability, that is, the quality and continuity of the selected factors are reflected under any conditions; the fourth is non-overlapping, that is, the boundaries between the participating factors are clear and do not overlap each other.

According to the evaluation criteria of agricultural, forestry and grassland land in the northeast region, combined with the actual conditions of the project area, the land evaluation grade of the land area to be reclaimed in the project area was formulated, and the land suitability evaluation factor was determined to be soil texture and effective. Guest soil thickness, irrigation conditions and drainage conditions, terrain slope. It constitutes an evaluation index system reflecting the quality of land reclamation in the project area. The reclamation mode is selected as forest land, cultivated land and grassland. See Table 2 for details.

Table 2 Evaluation criteria for major limiting factors of land to be reclaimed in the project area

| Limiting factors and grading indicators | Woodland evaluation | Cultivated land evaluation | Grassland evaluation |
|-----------------------------------------|---------------------|---------------------------|----------------------|
| slope (°)                               |                     |                           |                      |
| <5                                      | 1                   | 1                         | 1                    |
| 5~25                                    | 1                   | 2                         | 1                    |
| 25~45                                   | 2                   | no                        | 1                    |
| >45                                     | 3                   | no                        | 2 or 3               |
| Soil texture                            |                     |                           |                      |
| Clay, sandy loam                        | 2 or 3              | 3                         | 1                    |
| Heavy clay, sand                        | 3                   | no                        | 3                    |
| Gravel, sandy soil                      | no                  | no                        | no                   |
| Effective soil thickness                |                     |                           |                      |
| >0.5                                    | 1                   | 1                         | 1                    |
| 0.3~0.5                                 | 1                   | 2                         | 1                    |
| <0.3                                    | 2 or 3              | 3 or no                   | 2                    |
| Irrigation condition                    |                     |                           |                      |
| Stable irrigation conditions at specific stages | 1 | 1 | |
| Irrigation water source guarantees poor | 2 | 1 | |
| No irrigation water source              | 3                   | 3                         |                      |
| Drainage condition                      |                     |                           |                      |
| Not drowning or accidentally drowning, draining well | 1 | 1 | 1 |
| Seasonal short-term flooding, better drainage | 2 | 2 | 2 |
| Seasonal long-term flooding, poor drainage | 3 | 3 | 3 or no |
| Long-term flooding, poor drainage       | no                  | no                        | no                   |
3.4 Evaluation methods and results

According to the characteristics of land reclamation in the project area, the limit condition method is adopted for the suitability evaluation of land reclamation. According to the principle of minimum factor law, that is, the suitability and grade of land reclamation, it is determined by the factor of the smallest factor (the maximum level of restriction) among the selected factors. The nature of the land corresponding to the standards of each participating unit in the project area is shown in Table 3.

Table 3 Land characteristics of the reclamation unit to be reclaimed in the project area

| Evaluation unit          | Terrain slope (°) | Soil texture | Effective soil thickness (m) | Irrigation condition | Drainage condition |
|--------------------------|-------------------|--------------|------------------------------|----------------------|-------------------|
| Industrial and mining land | <5                | Loam         | 0.5                          | no                   | better            |
|                          | 5~25              | Loam         | 0.5                          | no                   | better            |

Comparing and analyzing the grading standards of the land evaluation unit and the limiting factors in the project area, the results of the feasibility evaluation of the land reclamation of each participating unit are obtained, as shown in Table 4.

Table 4 Reclamation feasibility evaluation result

| Serial number | Evaluation unit          | area (hm²) | Evaluation results | Remarks |
|---------------|--------------------------|------------|--------------------|---------|
|               | Industrial and mining land | 36.6367    | arable land        | feasible|
|               |                          | 31.5327    | woodland           | feasible|

According to the analysis results, the land reclamation in the project area is feasible, of which 36.6367hm² is suitable for reclamation as cultivated land, of which 31.5327hm² is suitable for reclamation as forest land. 4 Statistical analysis of publications published in the literature.

4. Conclusions and recommendations

In the process of reclamation and utilization of industrial and mining wasteland, we must adhere to the objective and scientific principles to evaluate its suitability and adapt to local conditions to ensure its sustainable development. When paying attention to the quantity, we must also pay attention to the quality. In accordance with the principle of easy to adapt, difficult to adapt to local conditions, arrange the implementation of the mining and wasteland reclamation to ensure the smooth completion of the reclamation project.

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References

[1] Peng, J., Jiang, Y., Wu, J., & LIU, S. (2005). Eco-environmental Effects of Mining and Related Land Reclamation Technologies in China [J]. Progress In Geography, 2.
[2] SONG, S. Q., & ZHOU, Y. Z. (2001). Mining Wasteland and its Ecological Restoration and Reconstruction [J]. Conservation and Utilization of Mineral Resources, 5, 43-49.
[3] Chauhan, S. S. (2010). Mining, development and environment: a case study of Bijolia mining area in Rajasthan, India. Journal of human ecology, 31(1), 65-72.
[4] Li Haibo. Research on the problems and countermeasures of reclamation and utilization of industrial and mining wasteland [D]. Jiangsu Normal University, 2018.
[5] Li Shuzhi, Zhou Jin. Prevention and Control Technology of Ecological Damage in Mining Area [M]. Beijing: Coal Industry Press, 1993.
[6] Chu Dejiang. Innovative research on the contracting right of farmland and the exit mechanism of the right to use the house site[M]. Guangzhou: World Book Publishing Guangdong Co., Ltd., 2015.
[7] Key Laboratory of Land Consolidation of the Ministry of Land and Resources. Investigation and Evaluation of Land Reclamation Potential [M]. Beijing: China Agricultural Science and Technology Press, 2013.

[8] Li Shuzhi et al. Land reclamation technology in coal mining subsidence area [M]. Beijing: Coal Industry Press, 2014.