Construction of Mining Green Development Index System
Relying on Consistent Matrix Fuzzy Analytic Hierarchy Process

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Abstract. Mining operation technology refers to the operating technical means selected for obtaining mine resources. Among them, the more commonly used types are empty-field mining mode, immersion mining mode, rock formation solidification and cave-in mining mode. With the continuous progress of today's society, the influence of natural mineral resources on people's daily life is constantly strengthened. The economic development of the entire society and the progress of industrial economy have continuously increased the scale of demand for mineral resources. It is important to analyze the green development index for its healthy and long-term development.

Keywords: Analytic Hierarchy Process, Mining Development, Index

1. Introduction
Coal mines are one of the basic energy sources for social development and the smooth development of all walks of life. The stable operation of the country cannot be guaranteed without coal energy sources. Therefore, coal energy has become an essential basic energy in today's society. With the rapid advancement of reform and opening up process, Chinese industrial areas are diversified and their demand for coal mines is increasing. If they only rely on existing mining areas and mining processes at this stage, the development of Chinese coal mine industry cannot be tight. Keep pace with the development of the times. Regardless of the mining process or mining equipment, the existing operating technology and equipment are behind the international average. Facing the development status of the coal industry, relevant departments need to promptly urge coal enterprises to carry out technological and conceptual changes, find processes and technologies that are suitable for the development needs of the times and require environmental standards to promote the healthy
development of the entire coal industry[1].

2. Overview of fuzzy analytic hierarchy process

2.1. Algorithm Overview

The fuzzy analytic hierarchy process refers to optimizing a complex decision problem by decomposing many elements. It mainly decomposes the elements related to it into the target layer, criterion layer and so on and then conducts qualitative and quantitative analysis on the basis of these objectives and criteria to finally arrive at a specific decision plan. This analysis method is more suitable for evaluation systems that have stratification and are difficult to quantitatively analyze the target value. As a layered and relatively clear system, due to its huge data flow, it is difficult to make strict quantitative analysis of data information. Therefore, it is very suitable to use AHP to make cache decision research[2].

The fuzzy analytic hierarchy process is a method combining qualitative and quantitative methods, which avoids the disadvantages of using qualitative or quantitative analysis methods alone. The main feature of this method is that it can be used to analyze the influencing factors of complex problems. Mathematical thinking of targets with less quantitative information provides a simple analysis method for decision makers[3].

2.2. Basic steps

(1) Construct a hierarchical structure pattern. Hierarchical analysis to abstract specific issues such as general goals, sub-goals, standards, and specific implementation plans into a hierarchical decision-making system structure model. It mainly includes the following.

Target layer. In this level, there is only one element, which is the final ideal goal or estimated goal that can be achieved in this analysis. Its advantages are mainly reducing traffic redundancy and optimizing cache resources.

Guide layer. This level includes all the intermediate links involved in achieving the task of the target layer. It can be combined by several levels. Generally it will not be lower than two levels. There are mainly criteria and sub-criteria that need to be considered[4].

Scheme layer. That is to say, in order to achieve the target layer content, alternative implementation schemes are listed. For example, after obtaining the initial values of the required parameters, an evaluation model is constructed and the variables and formulas of the ring evaluation model are used to subsequently iteratively solve the parameters we studied in order to continuously optimize the results of the parameters studied.

(2) Construct a comparison matrix. The main work of this step is to compare several different influencing factors to the same target and verify their ability to influence the given target, so as to determine the proportion of different influencing factors on this target. The hierarchical structure can reflect the relationship between influencing factors, but it is worth noting that the proportion of each criterion in the criterion layer in the target layer is different, which will be an important way to influence the decision-maker's final judgment. These different influencing factors are listed as criteria, a comparison matrix is formed for analysis, and finally it is attributed to a more unified choice[5].

(3) Calculate weights and do consistency check. The comparison matrix is calculated using the
consistency check index, the random consistency index and the consistency ratio to obtain the largest feature root and feature vector and the consistency check analysis is performed. If the test passes, its criterion is the weight criterion; otherwise, the contrast matrix needs to be reconstructed and tested again until the test passes.

(4) Calculate the combination weight vector and do consistency check. In the end, all the obtained lowest-level weights for the target layer are sorted and a single criterion is synthesized through a top-down approach. Then check the consistency of the completed levels. If they pass, the analysis result is considered acceptable and the solution will be resolved according to instructions.

3. Status Quo of Mining Development
Mining has always had a great impact on social life. In view of this, mining operations will not easily decline and still have a long active period. Under the premise of such a long-term existence, the mining process still has great development space. The current mining technology has largely ensured the benefits, but it is still relatively lacking in environmental protection. With the progress of society, people pay more and more attention to environmental protection and the mining industry urgently needs greener mining technology[6].

3.1. Digitalization of coal mining
Digitalization of coal mines is the mainstream trend of the future development of the coal mine industry. By establishing safety monitoring and monitoring systems and personnel positioning systems, the mine's internal geological conditions, specific mining plans and other mining information are combined with dynamic information such as equipment, personnel and the environment. Therefore, the digitalization of coal mines is realized using a computer network management system.

3.2. Intelligentization of coal mining
Intelligent mining is the ultimate goal of the coal industry. To achieve this goal, it is necessary to continuously develop new mining technologies and optimize various mining technologies. At the same time, it is necessary to use the role of network technology and information technology to improve the efficiency of mining information transmission and to carry out information management of the entire coal mine project around the management and management goals of coal mine enterprises.

4. Construction of mining green development index system

4.1. Determination of indicators
(1) Technical equipment. Mining technology should be updated in a timely manner. According to relevant practical investigations and studies, timely updating of mining equipment by enterprises will be beneficial to the smooth implementation of mining operations and will also greatly improve the efficiency of mining. Therefore, chinese coal enterprises should try more cutting-edge scientific equipment, introduce advanced operating concepts and operating equipment into production and lay a solid foundation for its transformation and development.

(2) Environmental pollution. The development of the coal industry needs to pay attention to the relationship between people and the environment. While ensuring production, it can also ensure the health of the natural environment. Therefore, at this stage, coal enterprises need to scientifically and
rationally plan the development direction of coal, reduce the waste of coal resources and reduce the loss caused by coal resources during mining.

(3) Quality of personnel. Relevant personnel must also maintain a rational mind and improve chinese coal industry in a step-by-step manner. According to the actual situation of chinese coal mine industry, the introduction of related equipment or operating concepts, combined with the comprehensive literacy of enterprise employees to purchase, enterprise employees have sufficient ability to use the equipment can effectively improve the construction efficiency.

4.2. Weight determination
Authorities in the field of mining green development and related professional fields are invited to form an expert group to establish the required evaluation data through Delphi method and expert survey method, compare the evaluation indicators of mining green development quality and construct the required judgments. Matrix, the resulting matrix result is:

\[
\begin{bmatrix}
1 & 1/2 & 1/3 \\
2 & 1 & 2/3 \\
3 & 3/2 & 1 \\
\end{bmatrix}
\]

(1)

Calculate the importance ranking of construction quality evaluation indicators for mining green development. Combined with relevant theoretical knowledge of operations research and engineering mathematics, the feature vector corresponding to the maximum eigenvalue of mining green development construction quality is obtained. The most critical step is to normalize it. These result are shown in following figure and table.

![Figure 1. Indicator Weight](image)

Inspection of the quality evaluation indicators for mining green development construction. Due to subjective deviations and force majeure factors in the establishment of indicators by experts, the construction of feature vectors based on the green development quality judgment matrix of mining industry can be applied to actual assembly projects.
Table 1. Indicator Weight

| Indicator | Technology | Environment | Quality |
|-----------|------------|-------------|---------|
| Weight    | 0.1667     | 0.3333      | 0.5000  |

5. Conclusion

Chinese coal development is facing unprecedented challenges, so all relevant departments and related enterprises should promptly propose reasonable solutions and provide suggestions for the long-term development of the coal industry. With the continuous deterioration of the natural environment, it is necessary to use the concept of green mining for mining.

Acknowledgments

Research on City Green Development from the Perspective of Cultural Creativity——Taking Chifeng as an Example.

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