

# Risk analysis and management in the construction process of mining engineering projects

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**Abstract:** This paper takes the risk management in the construction process of overseas mining projects as the research object, puts forward effective risk management strategies, such as identifying risks in advance, establishing emergency plans, etc., discusses the key elements of risk management, such as leadership, cultural construction, etc., and takes Power Construction Corporation of China (POWERCHINA) as an example to share its successful experience and innovative practices in risk management. Through the research, it is found that the implementation of effective risk management strategies and key elements can help overseas mining projects identify, evaluate and cope with risks, and ensure the smooth progress of the project.

**Key words:** mining engineering; Project construction; Risk analysis; management

## Introduction

The construction of overseas mining projects involves many factors such as complex environment, technology and personnel management, and faces various potential risks and challenges. Therefore, effective risk management plays a key role in the successful implementation and operation of the project. This paper aims to explore the risk management strategies and key elements in the construction process of overseas mining projects, and share its successful experience and innovative practices in risk management by taking POWERCHINA as an example. Through in-depth research and analysis, this paper aims to provide useful reference for other similar projects and improve its risk management ability and effect.

## 1. Characteristics and risks of overseas mining projects

### 1. Characteristics and challenges of overseas mining projects

Overseas mining projects have unique characteristics and challenges. First, overseas mining projects involve cross-border investment and require investors to understand and abide by the laws and customs of multiple countries. It implies complexity and risks, and requires investors to be able to communicate and cooperate across cultures. Second, overseas mining projects face a complex legal and political environment. Investors need to consider the political stability of the country in which they are located, and changes in government policies can have a significant impact on the operation and profits of the project. In addition, overseas mining projects also face technical and resource risks and need to deal with different construction conditions and environmental requirements. Investors need to have the relevant technical capabilities and resource management experience to ensure the sustainability and profitability of the project. In addition, overseas mining projects are also under pressure for social responsibility and environmental protection, and need to maintain communication and cooperation with local communities and environmental protection organizations to build a good corporate image. To sum up, overseas mining projects require investors to have cross-cultural management capabilities, legal knowledge of the host country, professional technical knowledge and other capabilities to cope with complex and changing challenges.

### 2. Common risks in overseas mining projects

Common risks in overseas mining projects include political and legal risks, social and environmental risks, geological and engineering risks, capital and financial risks, and risks of personnel and cultural differences. First of all, political and legal risks are important issues in overseas mining projects. Policy changes, political conflicts or political and diplomatic relations may have a significant impact on project management and increase operational uncertainty. However, due to the imperfect laws and changes in industry regulations in the host country, investors need to pay close attention and respond in time. Secondly, social and environmental risks are also important issues that overseas mining projects must pay attention to and manage. When the project is opposed by local communities, environmental protection organizations and stakeholders, especially when construction is carried out in sensitive areas, reasonable handling of social relations, environmental protection and promoting community development are the keys to ensure the successful operation of the project. Third, geological and engineering risks are common problems in all mining projects. Variable geological conditions, large changes in reserves and increased difficulty in construction can have an impact on project safety and operations. Careful geological assessment, effective project management and risk assessment are the keys to reducing geological and engineering risks. In addition, overseas mining projects also face capital and financial risks. Due to the large scale and long period of investment, they may face financial risks such as difficulty in obtaining financing or fluctuations in interest rates and exchange rates. Investors need to ensure the stability of project funding and the sustainability of financing. Finally, it is also necessary to pay attention to the risk of cultural differences. Overseas mining projects involve employees and partners of different faiths, and differences in language communication, living habits and management modes may become challenges during project implementation. Investors need to have the ability of cross-cultural management, and establish good communication and cooperation relationship with the host country.

## 2. Advantages of POWERCHINA Overseas Mining Industry

Power Construction Corporation of China (POWERCHINA) is a state-owned enterprise in China, founded in 1982 and headquartered

in Beijing. As one of the largest integrated energy enterprises in China, it has contracted a large number of power, grid, energy and related infrastructure construction and operation projects at home and abroad. Powerchina also has extensive experience and rich achievements in the overseas mining sector. It has carried out a number of mining projects in Africa, Asia, South America and other places. Its business covers mining, ore refining, processing and mine infrastructure construction. As a demonstration enterprise in overseas mining projects, PowerChina has the following characteristics and advantages:

First, it has rich experience in resource development. Powerchina has participated in mining projects in many countries and regions and accumulated rich experience in resource exploration, development, construction and management. The company has a sound technical team, able to provide the whole process of mining services. The second is the global layout and market expansion. With a global footprint, PowerChina has been deeply engaged in market development in many countries and regions. By working closely with local enterprises and governments, it can provide targeted solutions. The third is a strong engineering implementation capability. Powerchina has the ability of large-scale project construction and management, has the ability of efficient project implementation, technical management and engineering quality control, and can complete the project on time and quality.

### 3. Identification and resolution of risks

The success of Powerchina overseas mining is inseparable from its ability to identify and solve risks.

#### 1. Country risk assessment

Overseas mining projects are affected by political, legal, economic, social and other factors in different countries. The country risk assessment can analyze the political stability, legal environment, market potential and other factors of the target country to assess the degree of risk of the project in that country.

#### 2. Cross-cultural risk analysis

Overseas mining projects often involve multiple countries, cultures and languages, so cross-cultural risk analysis is crucial. By analyzing the communication, exchange and management among different cultures, the potential risks caused by cultural differences can be prevented and dealt with.

#### 3. Analysis of policies and regulations

Overseas mining projects are often affected by the policies and regulations of the target countries. In the risk analysis, a careful analysis of the target country's mining policies, environmental regulations, labor laws, etc., is needed to understand their potential impacts and limitations on the implementation of the project.

#### 4. Social and environmental risk assessment

Offshore mining projects usually require engineering and production activities in local communities. Conducting a social and environmental risk assessment can assess the social and environmental impact of the project on the local community and identify risks related to social responsibility, community relations, environmental protection, etc.

#### 5. Contract and business risk analysis

Overseas mining projects involve complex contracts and commercial relationships. Conducting a contract and business risk analysis can assess the risks associated with financiers, contractors, suppliers, partners, etc., including price fluctuations, supply chain risks, quality control, etc.

In recent years, with the development of ESG rules for overseas projects, enterprises are required to implement and disclose information with stricter standards. ESG rules can also be used to predict risk points and make solutions in advance.

### 4. Risk management strategies and measures in the construction process of overseas mining projects

#### 1. Put forward effective risk management strategies

(1) Identify risks in advance: Before the project starts, conduct a comprehensive risk identification and assessment. Various possible risks, including technical, environmental, political and economic risks, were identified by means of research, data collection and expert interviews.

(2) Establish emergency plans: Establish corresponding emergency plans for the identified key risks. The plan should include a clear division of responsibilities, response measures, communication and coordination mechanism, so as to respond quickly and effectively when risk events occur and mitigate the impact of risks.

(3) Continuous risk monitoring and assessment: During the implementation of the project, continuous risk monitoring and assessment should be carried out. Through regular risk assessment, the risks in the progress of the project are tracked and managed. Take timely measures to address newly identified risk points and ensure that the project is progressing as expected.

(4) Strengthen communication and cooperation: Establish smooth communication channels to promote effective cooperation and information sharing among project participants. Regular meetings, the establishment of liaison mechanisms and the formulation of communication processes are effective means to strengthen communication and cooperation, which will help to obtain timely project progress and jointly discuss and solve risk problems.

(5) Cultivate risk awareness and ability: Through training and education, enhance the project team members' risk awareness and ability. Incorporate risk management into the training plan, so that team members can proactively identify and assess risks, and take appropriate

measures to manage and cope with them.

## 2. Explore the key elements of risk management

(1) Leadership: Effective risk management requires the support and participation of the leadership. Leaders should have risk awareness and decision-making ability, establish the importance of risk management, formulate clear risk management strategies and objectives, and provide necessary resources and support for the team.

(2) Culture building: Establishing an enterprise culture of risk management is essential. Cultivate a risk management culture, encourage employees to take the initiative to report risks, advocate a transparent and open communication atmosphere, and establish a risk management culture of shared responsibility and full participation.

(3) Organizational structure and division of responsibilities: Establish a reasonable organizational structure and a clear division of responsibilities to ensure the effective implementation of risk management. Clarify the roles and responsibilities of the risk management team, and establish a cross-departmental communication and collaboration mechanism in order to effectively identify, assess and respond to risks.

(4) Risk management policies and processes: Establish clear risk management policies and processes to ensure the standardization and continuity of risk management work. Formulate risk management standards and guidelines, and establish corresponding processes, including risk identification, assessment, control and monitoring, to help the team carry out risk management work in an orderly manner.

(5) Knowledge and skills training: Provide necessary risk management knowledge and skills training, so that the project team can recognize and understand the importance of risk management, and have the ability to apply relevant tools and methods. Investment in training and education can not only improve the risk management ability of team members, but also improve the overall level of project management.

(6) Reasonable reward and punishment mechanism: Establish a reasonable reward and punishment mechanism to motivate team members to actively participate in risk management. Reward excellent performance of risk management, but also appropriate punishment for poor risk management or neglect of risk behavior, in order to promote the landing of risk management and continuous improvement.

## 3. The successful experience and innovative practices of Powerchina as an example

In terms of risk management, PowerChina has some successful experiences and innovative practices:

Establishment of a sound risk management system: PowerChina has established a mature risk management system, including risk identification, risk assessment, risk control and risk monitoring. Through the risk management of the whole process, the company can effectively identify and deal with various risks in the project.

(2) Organic combination of risk management and project management: PowerChina closely combines risk management with project management, and integrates risk management into each stage of project management. In the project initiation and planning stage, the risk is carefully assessed and planned, and the corresponding risk management measures are formulated.

(3) emphasizing full participation: Powerchina attaches importance to full participation in risk management, through training and education, to enhance the risk awareness and risk management ability of employees. Encourage employees to take the initiative to participate in risk identification and assessment, discover and propose potential risks.

(4) Innovative risk management methods: PowerChina constantly innovates risk management methods and adopts new technical means and tools to improve the efficiency and accuracy of risk management. For example, intelligent risk assessment tools have been introduced, combined with big data and artificial intelligence technology, to make risk assessment more scientific and accurate.

(5) the pursuit of continuous improvement: Powerchina attaches importance to the continuous improvement of risk management and has established a monitoring and feedback mechanism for risk management. Through regular risk assessment and review, sum up project experience and lessons, and constantly improve the methods and processes of risk management.

## Conclusion

To sum up, risk management in the construction process of overseas mining projects is the key to ensure the smooth progress of the projects. By identifying risks in advance, establishing emergency plans and other strategies to pressure down economic losses; The implementation of factors such as leadership and cultural construction can effectively reduce the loss of corporate reputation. In addition, the successful experience and innovative practices of Powerchina provide useful reference and inspiration for other enterprises in the field of risk management. In the future mining project construction, if properly used, and constantly improve and innovate the risk management methods and processes, the success rate of the project will be improved.

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