

Mine Ecological Restoration Fund: Decentralized Management Model and Accounting Process

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Abstract. The mine ecological restoration fund system is a key task in the construction of ecological civilization. However, the existing accounting system, basic framework, and process handling are insufficient to meet the market-oriented demands of the mine ecological restoration fund. Based on this, this paper, using a decentralized logic approach, designs a decentralized management model for the mine restoration fund, incorporating's classified financing-blocked usage layered management. This model explores the accounting elements of the fund, and based on the characteristics of fund management and flow, accounts for fund income, expenditure, and termination stages, presenting a comprehensive view of the fund's flow process. This paper explores the design of the mine ecological restoration fund's accounting system and the optimization of its funding sources, providing theoretical and empirical support for the accounting of the fund by mine enterprises, government departments, and social investors, and contributes to the improvement of the mine ecological restoration fund system framework.

Keywords: Mine ecological restoration found; Diversified financing mode; Accounting.

1. Introduction

Mineral resources are essential for society, but the "heavy development, light protection" approach has led to abandoned mines and severe ecological damage [1]. In 2017, the Guiding Opinions introduced the mine environmental restoration fund, followed by policies like the General Plan for the Protection and Restoration of Important Ecosystems (2021–2035) [2]. The 20th National Congress emphasized accelerating ecological restoration, prompting provinces and cities to implement fund management measures, making the restoration fund a key solution for abandoned mines.

Despite established regulations on fund management, China lacks a comprehensive accounting system for mine ecological restoration funds, leading to inadequate supervision and inefficiencies [3]. This paper proposes an accounting framework based on the decentralized logic of "classified financing-blocked usage-layered management." It examines fund income, expenditures, and termination processes, applying a case study from the TJS Coal Mine District. The study offers accounting guidance for enterprises, government agencies, and investors, enhancing fund management and operational efficiency [4].

2. Literature Review

2.1 Mine Restoration Fund System

Mine restoration is a legal obligation aimed at mitigating environmental damage from mining. Many countries have established restoration funds to address these issues [5]. In the U.S., the Reclamation Act assigns restoration responsibilities to the government for abandoned mines and to enterprises for active sites [6]. Canada funds restoration through enterprise contributions and government-managed funds [7]. In China, the Mineral Resources Law and Environmental Protection Law enforce the "polluter pays" principle, with the 2017 Guiding Opinions specifying that the restoration fund covers costs if the responsible enterprise no longer exists.

The 2017 Guiding Opinions and the guarantee deposit system emphasize enterprise accruals as the primary funding source for mine restoration, creating financial strain on enterprises and requiring government allocations [8]. China's restoration efforts focus on pilot ecological projects funded by the Ministry of Finance, but enterprises face cash flow challenges, often shifting the financial burden to the government. Scholars suggest diversifying funding sources by incorporating industry investment, carbon trading, and resource utilization to encourage social capital participation [9].

International restoration fund management systems offer valuable insights for China's mine ecological restoration fund. In the U.S., the fund is managed by the Open Pit Mining Reclamation Enforcement Office, with support from relevant agencies [10]. Canada follows a federal-provincial co-management model, where the central government coordinates policies while provinces legislate their own restoration systems [11]. Drawing from these models, Chinese scholars propose a two-level environmental protection fund system with a decentralized management approach to oversee diverse funding sources.

2.2 Accounting for Mine Restoration Funds

Fund accounting standards differ significantly from corporate accounting standards and are commonly used in government and non-profit organizations [12]. In the U.S., fund accounting applies to government, equity, and trust funds, all using accrual accounting. The key difference lies in income and expenditure recognition: government and equity funds follow the accrual basis, while trust and agency funds adhere to measurement-specific accounting principles.

The mine ecological restoration fund belongs to the category of environmental protection funds, which can be classified into special funds, financing funds, and public welfare funds, each with distinct accounting treatments. Special funds focus on grants, loan subsidies, and capital investment, while public welfare funds manage donations and assets to enhance fund utilization [13]. Financing funds, supported by government capital, mobilize social investment but have more complex accounting due to diverse funding sources [14].

Current accounting practices still rely on enterprise-accrued guarantee deposits, lacking substantial changes to accommodate diversified financing needs. Research remains limited to single-source funding, failing to support a market-oriented approach. To address this gap, this paper compares different environmental fund accounting methods and introduces a decentralized management model ("classified financing-blocked usage-layered management"), providing new insights into accounting processes and information disclosure [15].

3. Design of the Decentralized Management Model for the Mine Ecological Restoration Fund

3.1 Classified Financing Model

Mine ecological restoration is a long-term, capital-intensive process requiring continuous funding for management, assessments, and monitoring. China's restoration industry is still developing, with limited financing channels relying mainly on enterprises and central government funds. In contrast, international models incorporate polluter contributions, government subsidies, and private capital. To ensure sustainable funding, a multi-channel classified financing mechanism should be adopted.

Financing Channels for the Mine Ecological Restoration Fund:

3.1.1 Government Financial Investment

This refers to the portion of the central and local mine ecological restoration funds derived from government sources, including funds from environmental taxes, fines imposed on enterprises, and revenue from mineral rights transfers.

3.1.2 Environmental Protection Tax

Mining enterprises have long paid environmental protection taxes. These funds, according to the earmarking principle, should be invested in mine restoration projects and are an important source of funding for the restoration fund.

3.1.3 Donations from Various Sectors

Donations for abandoned mine ecological restoration are relatively small and are generally used in the preparatory stages of large-scale abandoned mine restoration projects. They support small-scale abandoned mine restoration projects and those in resource-depleted cities. The donations mainly come from development investment institutions' grants, national subsidy programs, NGO-managed grants, and donations from private foundations.

3.1.4 Green Credit

Green credit refers to loans provided by banks and other financial institutions to ecological industries or enterprises for environmental protection projects through their financing policies. Mine ecological restoration, as a key measure to ensure environmental sustainability, can fully utilize green credit policies provided by banks and other financial institutions.

3.1.5 Social Capital Investment

First, private companies can obtain the land use rights for the restoration of abandoned mine lands through leasing or franchising, paying usage fees to the landowners (state or collective), which directly funds the mine ecological restoration fund. Secondly, funds can be raised through bonds or equity from private equity funds, traditional investors, and natural persons with high net cash flow. Investors gain benefits by leasing the restored land for sustainable production or use.

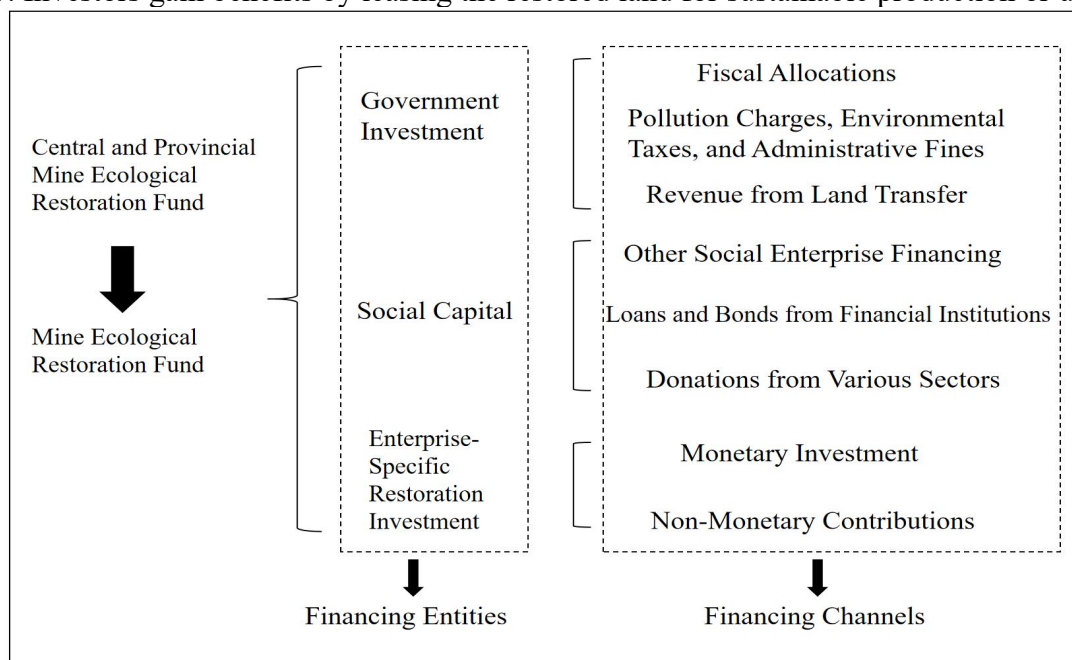


Fig. 1 Financing Entities & Financing Channels

3.2 Blocked Usage System

The blocked usage of funds refers to allocating the mine ecological restoration fund based on the principle of "total control, staged allocation." This method precisely defines the fund's usage functions and application fields, allocating funds to different blocks based on their usage scope, conducting detailed analysis of budget plans, and precisely matching the restoration funds. This approach aims to achieve both efficient fund usage and effective pollution control. Although the establishment of the fund system is intended to achieve mine ecological restoration, not all mines are eligible for funding support. Mines with less significant environmental damage or limited

marginal benefits can adopt natural restoration methods, avoiding blind and indiscriminate investments.

Table 1. Scope of Blocked Usage of the Mine Ecological Restoration Fund

Cost Categories	Scope of Use
Geological Environmental Survey Costs	Used to investigate the damage to topography and landscape, mine geological hazards, land resource degradation, and water resource destruction, obtaining data on ecological and environmental damage to provide a factual basis for the implementation of restoration projects.
Assessment Costs	Used for the assessment of ecological and environmental issues in the early stages of restoration projects, to define the restoration scope, key restoration areas, and major restoration challenges.
Restoration and Management Costs	Used for the restoration and management of ecological issues, including ecological degradation of abandoned construction sites, ecological damage to water bodies (ponds), ecological degradation of water bodies (rivers), ecological damage to forested areas, and agricultural ecological degradation.
Post-Restoration Effect Evaluation Costs	Used for evaluating the effectiveness of restoration projects conducted by the restoration entity.
Technology Research and Development Costs	The mine ecological restoration fund is allocated for the improvement and procurement of key technologies and advanced equipment for soil remediation, water source restoration, and geological environment restoration.
Fund Management Costs	Used for the management and operation of the mine restoration fund, primarily covering expenditures such as fund operation and management fees, salaries of management personnel, and legal consulting fees.
Emergency Response Costs	Used for addressing emergency mine ecological restoration incidents.

3.3 Layered Management Mechanism

The layered management of the mine ecological restoration fund decentralizes decision-making, assigning risks and responsibilities accordingly. The Ministry of Finance initiates the fund, while the Ministry of Ecology and Environment manages it. Government funds provide support, social capital plays a key role, and professional companies handle operations. Management is structured at central and provincial levels.

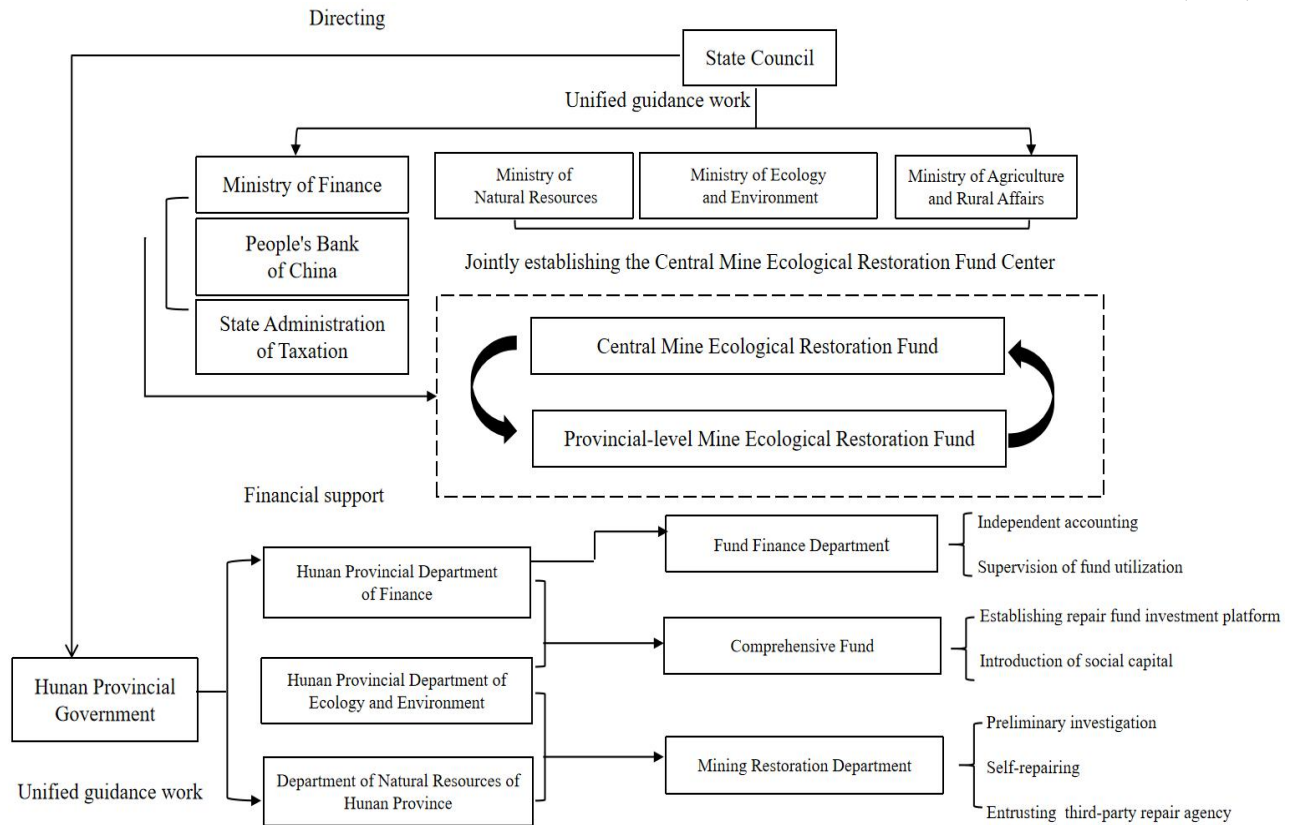


Fig. 2 Mine Restoration Fund Management Mechanism

At the central level, the Ministry of Finance initiates and funds the mine restoration fund, serving as the highest management authority, while the Ministry of Ecology and Environment oversees its implementation and local fund management. Together with the Ministry of Natural Resources, these departments establish the Central Mine Ecological Restoration Fund Center to coordinate and allocate restoration funds based on actual needs.

The provincial mine ecological restoration fund manages local restoration efforts. In Hunan Province, the Environmental Protection, Natural Resources, and Finance Departments oversee fund management through a dedicated committee that sets regulations and defines responsibilities. The fund operates through four key departments: fund management, trustee agency, finance, and mineral restoration. The layered management mechanism is illustrated in Figure 2.

4. Case Study

The TJS Coal Mine Restoration Area is located on the left bank of the Xiangjiang River. To the southeast is the first-level tributary of the Xiangjiang River, Sanmen River, and to the northwest is the first-level tributary, Zijing River. The restoration area belongs to the Zijing River Basin and covers an area of approximately 17.7 km². The primary ecological and geological issues in the restoration area include terrain and landscape destruction, mine geological hazards, land resource degradation, and water resource destruction, which have led to ecological problems such as land degradation in abandoned areas, aquatic (mountain pond) ecosystem damage, aquatic (river) ecosystem degradation, forest ecosystem damage, and agricultural ecological degradation. The specific restoration projects include six main categories: (1) Mine geological disaster management projects; (2) Ecological protection and restoration projects; (3) Ecological water replenishment and water system restoration projects; (4) Comprehensive land management projects; (5) Wetland restoration projects; (6) Monitoring projects and the repair of unsafe buildings.

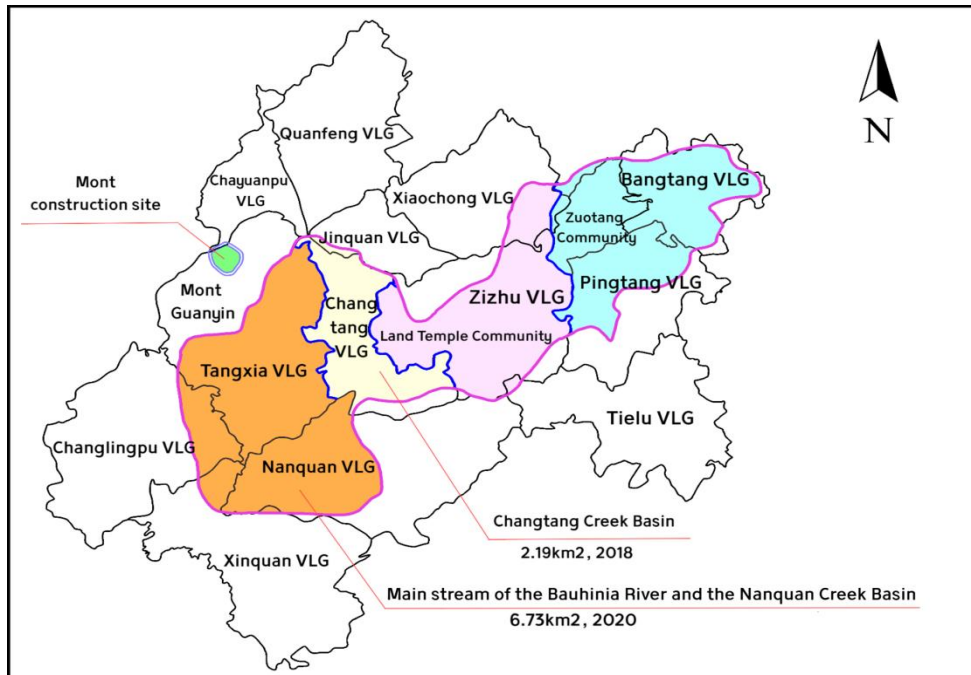


Fig.3 Schematic diagram of the villages involved in the red line of the TJS coal mining area

The XT County TJS Coal Mine Ecological Protection and Restoration Project is one of the third batch of national pilot projects for the ecological protection and restoration of mountains, water, forests, fields, lakes, and grasslands. This project actively utilizes the mine ecological restoration fund for restoration activities and financing. The TJS restoration fund was established in October 2018, pioneering a new model for mine restoration and first exploring the path of mineral ecological restoration. Due to data limitations, this paper explains the main economic matters and accounting treatments related to the TJS restoration fund in 2018 and 2019, as shown in Tables 2 and 3. Since the fund has not yet terminated, its termination accounting table cannot be provided at this time.

Table 2. Income mainly related to economic matters and accounting treatment

Affairs	Content of the affair	Accounting treatment (unit: 10 thousand yuan)
Government investment	In 2018, the TJS repair project received a total government financial allocation of 122.56 million yuan.	Dr: The available credit limit for the zero balance account 12,256.; Cr: Receivable investment funds 12,256
	In 2018, the Provincial Restoration Fund invested 10 million yuan in the TJS Mine Ecological Restoration Fund on behalf of the Central Restoration Fund	Dr: The withdrawal limit for a zero balance account 1,000; Cr: Financial grant income - Central restoration fund subsidy of 1,000
	In 2018, the TJS Restoration Fund received 7.66 million yuan in environmental fines and taxes allocated by the provincial finance department	Dr: The available amount for withdrawal from the zero balance account 766; Cr: Fiscal tax revenue Environmental protection fines tax revenue 766
TJS Coal mine investment	In 2018, TJS Coal Mine invested 12 abandoned industrial squares into the restoration fund, with a book value of 21.84 million	Dr: Intangible assets - land use rights 2,184; Cr: Actual funds received - Responsible party invested 2,184
Social capital investment	In 2018, Hunan Xiangtou Holding Group Co., Ltd. invested 200 million yuan in the restoration fund	Dr: Bank deposit 20,000; Cr: Paid-in capital - investment of social capital 20,000

Debt financing	In 2018, the Restoration Fund raised 50 million yuan from the XT branch of the Agricultural Development Bank of China	Dr: Bank deposit 5,000; Cr: Long-term loan 5,000
	Year 2018. 50 million yuan of special bonds for pollution control in the Xiangjiang River Basin	Dr: Bank deposit 5,000; Cr: Special Payables - Special Bond Subsidy 5,000
Donation income	In 2018, the China Environmental Protection Foundation donated 500,000 yuan to the TJS Restoration Fund	Dr: Bank deposit 500; Cr: Donation Income - China Environmental Protection Foundation 500
Interest income	On December 31, 2018, the construction of the restoration project has not yet started, and the interest income from October to December 2018 was 3.33 million	Dr: Interest receivable 333; Cr: Interest income 333

Table 3. Expenditures mainly related to economic matters and accounting treatment

Affairs	Content of the affair	Accounting treatment (unit: 10 thousand yuan)
Basic expenditure	In October 2018, TJS Fund was established, and the salaries of the management personnel amounted to only two months' expenses, totaling 360,000 yuan	Dr: Manager's remuneration 36; Cr: Compensation for the manager 36 Meanwhile, Dr: Compensation for the manager 36; Cr: Bank deposit 36
	Annual audit fee for TJS Fund 30,000 yuan	Dr: Management expenses - audit fees 3; Cr: Bank deposit 3
Debt expenditures	Construction not yet commenced in 2018, and the interest needs to be expensed	Dr: Financial expenses 100; Cr: Interest payable 100; Meanwhile, Dr: Interest payable 100; Cr: Bank deposit 100
Project expenditure	In 2018, the TJS Restoration Fund's mining restoration department began investigating geological disasters and topographical damage at mining sites, incurring preliminary investigation and assessment expenses of 2.44 million yuan prior to the restoration project	Dr: Intangible Assets - Other Costs of Engineering Construction - Preliminary Assessment 244; Cr: Bank deposit 244
	In January 2019, the repair project paid Hunan First Engineering Co., Ltd. a demolition fee of 3.71 million yuan for the abandoned industrial square and other related expenses	Dr: Intangible assets - Other costs of construction projects - Demolition expenses 371; Cr: Bank deposit 371
	In March 2019, demolition fees amounting to 158.39 million yuan were paid to 1,398 households in areas with significant ground subsidence	Dr: Intangible assets - Other costs of construction projects - Demolition expenses 15,839; Cr: Zero balance account withdrawal limit 15,839
	In April 2019, a prepayment of 5 million yuan was made to the Hunan Provincial Resource Planning and Survey Institute for the repair project of Section I	Dr: Prepaid expenses 500; Cr: Zero balance account withdrawal limit 500
	In April 2019, a payment of 1.2 million yuan was made to the Hunan Provincial Institute of	Dr: Intangible assets - Lot I. -

	Hydraulic Engineering and Geological Survey for the survey and design fee of Section I of the repair project	Other costs of construction 120; Cr: Bank deposit 120
	At the end of 2019, Section I completed the river channel dredging and other projects, with the pending project payment amounting to 40% of the total project cost, which is 4.82 million yuan. The remaining advance payment is 80,000 yuan. According to the budget arrangement of the Hunan Provincial Resource Planning and Survey Institute, an additional 5 million yuan is required	Dr: Intangible assets - Lot I. - Project construction cost 482; Cr: Prepaid expenses 482; Meanwhile, Dr: Prepaid expenses 500; Cr: Zero balance account withdrawal limit 500

5. Conclusion and Discussion

This paper reviews domestic and international environmental protection fund systems and mine restoration fund accounting research. It proposes a decentralized management model for the mine ecological restoration fund based on "financing-usage-management," identifies key accounting elements, and clarifies processes for financing income, expenditure allocation, and fund termination. This approach enhances fund efficiency, strengthens management, supports financing innovation, and promotes environmental protection in China.

The paper's conclusions are twofold: first, it designs a decentralized management model ("classified financing-blocked usage-layered management") to meet the information needs of various stakeholders. Second, it proposes an accounting system for the mine ecological restoration fund. Finally, the TJS Coal Mine District restoration project is used as a case study to validate the proposed system.

(1) The mine ecological restoration fund remains closed, relying solely on polluters and the government, creating financial strain and lacking independent accounting and third-party oversight. A diversified financing model involving the government, polluting enterprises, and social capital is urgently needed. Establishing a dedicated fund committee and implementing independent accounting will expand financing channels, enhance fund management, and ensure efficient and secure fund utilization.

(2) A systematic accounting framework for the mine ecological restoration fund is urgently needed to ensure transparency and joint supervision by stakeholders. Unlike mature systems in the U.S. and Canada, China's fund system requires improvement, especially in accounting. Current practices rely on the guarantee deposit model, but with diversified financing and advancing restoration technologies, management demands have increased. A comprehensive accounting system with strong oversight will enhance fund management and ensure secure fund flow.

(3) The TJS Coal Mine District restoration project validates the feasibility of the proposed accounting system for the mine ecological restoration fund. By applying a multi-source financing model, this study provides accounting references for restoration projects, clarifies fund flows among stakeholders, enhances supervision, and ensures efficient and orderly restoration activities.

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