

Bridging the gap: evaluating the impact of mining regulations on community empowerment in post-mining transition – a case study of underground gold mining in Indonesia

Rini Ismiati ^{a,b,*}, Raldi Hendrotoro Seputro Koestoer ^a, Teuku Yuri Zagloel ^c, Sri Setiawati Tumuyu ^a

^a School of Sustainable Development, University of Indonesia, Indonesia

^b Center of National Development and Knowledge, Indonesia

^c Department of Industrial Engineering, University of Indonesia, Indonesia

Abstract

Mine closure planning should be initiated at the earliest stages of mine development and systematically integrated throughout the mine life cycle. Such an approach helps ensure that long-term environmental, social, cultural, and economic impacts are effectively anticipated, managed, and mitigated. While Indonesia's mining legislation requires mining companies to prepare mine closure plans and implement community development and empowerment (Pengembangan dan Pemberdayaan Masyarakat – PPM) programs, the existing regulatory framework primarily focuses on mine closure obligations and does not explicitly establish a post-mining transition phase. This regulatory gap limits the capacity of affected communities to achieve sustainable livelihoods beyond mine closure. This study evaluates the effectiveness of Indonesia's mining regulations in supporting community empowerment during the post-mining transition through a qualitative legal-empirical approach. The study combines a normative analysis of Indonesia's mining legislation with an empirical case study of underground gold mining. Survey data were collected from 416 respondents across 5 villages directly affected by mining activities to assess community awareness, participation, preparedness, and understanding of the regulatory framework governing mine closure and post-mining transition. The findings reveal low levels of community awareness of mine closure planning, limited access to regulatory information, and weak understanding of stakeholder roles and responsibilities. These conditions indicate inadequate community preparedness, particularly among households whose livelihoods depend on mining activities. The study identifies a significant governance gap arising from the absence of a clearly defined post-mining transition phase within the current regulatory framework. Based on these findings, the study proposes a post-mining transition framework that integrates environmental restoration, socio-economic transformation, institutional coordination, and community empowerment. Strengthening regulatory integration, improving information dissemination, and enhancing participatory governance are essential to support sustainable post-mining outcomes and long-term community resilience in Indonesia.

Keywords: community empowerment, governance, mining legislation, post-mining transition, sustainability

1 Introduction

Mining contributes significantly to economic development but generates long-term environmental and socio-economic risks, particularly at closure. Communities often face declining employment opportunities, environmental degradation, and uncertainty regarding future livelihoods. The Gunung Pongkor gold mine, located in Bogor Regency, West Java Province, is one of many gold mining sites in Indonesia that uses underground mining methods. Currently, average gold production at Pongkor stands at 1.2 tonnes per year (Mining Industry Indonesia [MIND ID] 2023). Mining operations, which have been underway for the past 3

* Corresponding author. Email address: rini.ismiati31@ui.ac.id

decades, provide the benefits of gold deposits and have an impact on the local community. However, the various impacts of mining activities can be minimised through the implementation of green mining and sustainable mining practices, extending all the way through the post-mining phase.

In principle, green mining and sustainable mining have similarities, but there are differences in certain aspects, primarily because green mining encompasses sustainable post-mining land use (Jafarpour & Khatami 2021; Li et al. 2022; Nurmi 2017), while sustainable mining accommodates community participation – not merely minimising impacts (Allan 1995; Laurence 2011). Both aspects are crucial, as after a mine ceases operations, local communities will face a livelihood transition – one that is not necessarily sustainable.

In Indonesia, existing laws and regulations have established guidelines for good mining governance. The relevant regulatory provisions explicitly state the obligation to apply the principles of green mining and sustainable mining. Various post-mining policies are outlined in the laws governing mining in Indonesia, namely the Mineral and Coal Law (Indonesian: UU Minerba): Law Number 4 of 2009 juncto. Law Number 3 of 2020 juncto. Law Number 2 of 2025. under the Government of Indonesia 2025 regulates mineral and coal mining through the *Law Number 2 of 2025 concerning the Fourth Amendment to Law Number 4 of 2009 on Mineral and Coal Mining*.

However, these frameworks remain largely compliance-driven and do not adequately address long-term transition outcomes, such as sustainable economic development and environmental restoration for affected communities. The absence of a defined post-mining transition phase creates a gap between regulatory intent and community readiness, which hinders the ability of communities to effectively adapt to the changes and challenges that arise after mining activities cease. This study examines regulatory effectiveness and identifies structural gaps in supporting community empowerment.

2 Regulatory framework

2.1 National mining law

The starting point for policies related to post-mining activities in Indonesia is outlined in Article 74 of Law Number 40 of 2007 on limited liability companies, which states that companies engaged in business activities related to natural resources are required to fulfil their social and environmental responsibilities (Pagouni et al. 2024). Furthermore, Law No. 4 of 2009 on Mineral and Coal Mining explicitly regulates post-mining obligations – such as the establishment of reclamation and post-mining guarantee funds from the outset of operations – along with their legal consequences.

Subsequently, Law Number 4 of 2009 was amended by Law Number 3 of 2020, which imposed stricter penalties on permit holders who fail to carry out reclamation or post-mining activities. Then, nearly 15 years after the last amendment, Law Number 4 of 2009 was amended again by Law Number 2 of 2025. This law marks a shift in policy direction from bureaucratic centralisation toward ecosystem digitalisation and environment, social, and governance (ESG) compliance.

Although in practice the primary regulations currently in effect still refer to Law Number 3 of 2020, several new provisions are established in Law Number 2 of 2025. Regarding post-mining activities, this law links them to national emission targets and the green economy. Post-mining land must not only be restored to green conditions but also be prioritised for conversion into carbon sink areas or energy infrastructure.

Regarding social aspects, while Law Number 3 of 2020 focused on community development and empowerment, Law Number 2 of 2025 places greater emphasis on integrated obligations. These obligations relate to post-mining self-reliance, where social aspects must be linked to economic sustainability. Companies are required to ensure that local communities have self-sustaining business models when the mine closes or stops operating.

Regulations at the level of law – ranging from the *Limited Liability Companies Act* to the *Mineral and Coal Mining Act* – only address social responsibility and the empowerment of communities surrounding mining areas during the planning, exploration, production and post-mining phases. However, there is another

equally important phase: the transition to the post-mining phase, during which it is essential to strengthen community empowerment. This strengthening aims to bridge the gap in community readiness – particularly among affected communities – for economic self-reliance once mining operations end.

Additionally, during the transition to the post-mining phase, communities should already be aware of both the regulations and the company's programs and activities aimed at achieving sustainable post-mining outcomes. Having this knowledge, communities should also be involved in preparing these programs and activities alongside relevant stakeholders. However, the regulation does not explicitly define the transition phase between mine closure and post-mining conditions, limiting policy coherence and implementation effectiveness.

2.2 Community development and empowerment

Community development and empowerment programs are regulated under the Decree of the Minister of Energy and Mineral Resources Number 1824 K/30/MEM/2018 (Ministry of Energy and Mineral Resources 2018). These programs are designed to be participatory, transparent and sustainable. Despite covering key sectors such as education, health and economic development, implementation often remains short-term and program based, with limited focus on long-term economic independence, which hinders the ability of communities to sustain growth and improve their overall quality of life. Under this decision, companies are required to have a PPM master plan and annual plans in consultation with local governments and communities, with programs tailored to local needs and potential. Program implementation and reporting must be carried out in accordance with the approved plans, and PPM implementation reports must be submitted periodically to the government. This is intended to ensure the effectiveness and sustainability of the programs.

The community development and empowerment programs stipulated in the Decree of the Minister of Energy and Mineral Resources Number 1824 K/30/MEM/2018 are broadly consistent with the provisions of Law Number 3 of 2020, which strengthens the implementation of community development and empowerment as an integral component of mining activities. These provisions are further reinforced under Law Number 2 of 2025 concerning the Fourth Amendment to Law Number 4 of 2009 on Mineral and Coal Mining, which adopts a more integrated approach to post-mining responsibilities, including the promotion of community self-reliance beyond mine closure.

The legislative development reflects a gradual shift from compliance-based community programmes towards a more sustainable post-mining perspective. In this context, community empowerment extends beyond social assistance to encompass long-term economic sustainability. Mining companies are therefore expected to facilitate the development of sustainable livelihoods and resilient local economies, enabling affected communities to maintain independent economic activities following mine closure. Nevertheless, while the regulatory framework increasingly recognises the importance of community empowerment, it does not yet establish a comprehensive governance framework that explicitly links mine closure planning with a structured post-mining transition process.

2.3 Green mining, sustainable mining and post-mining transition

Green mining and sustainable mining integrate environmental management, reclamation, and post-mining obligations (Decree of the Minister of Energy and Mineral Resources Number 1824 K/30/MEM/2018). While technically comprehensive, these provisions are primarily compliance oriented and do not provide a structured framework for socio-economic transition, which is essential for ensuring that local communities can adapt and thrive after mining activities cease. In the phase between mine closure and post-mining, there is a categorisation of transition options following the cessation of mining activities and the closure of the mine site. A commonly used categorisation is that proposed by the Society for Ecological Restoration International (2004), namely the 4R framework, which consists of restoration, remediation, reclamation and rehabilitation.

Regardless of the transition option chosen, mine closure and the transition to the post-mining phase must be prepared well in advance of the commencement of both phases. This preparation must be carried out gradually and systematically, as its consequences span multiple generations (Aristizabal-Hernández et al. 2023). It must also be holistic: through underground risk mitigation (geoecology and hydrogeology), evaluation and protection of the land surface (geomonitoring), preservation of industrial heritage for the re-use of mine land, and economic transformation toward a sustainable future (Kretschmann 2020), so it is also important to include spatial analysis of contextual factors, such as regulatory, environmental/technical, and socio-economic factors (Worden et al. 2024). The calculations should include the potential benefits of land closure (Kodir et al. 2017), the impacts on ecosystem services (von Döhren & Haase 2023), and stakeholder engagement, along with approaches that remain viable even with low participation (Samadi et al. 2023). To that end, there are several criteria and attributes that can serve as guidelines in determining post-mining land transition and utilisation options.

3 Method

This study uses a qualitative-empirical approach combining normative legal analysis and a case study of underground gold mining. Survey data from five affected villages were analysed to assess community awareness, participation, and preparedness. The analysis focuses on institutional capacity, specifically the access to information and understanding of regulatory frameworks that promote community empowerment.

This study adopts a qualitative legal-empirical approach to evaluate the impact of Indonesia's mining regulations on community empowerment during the post-mining transition. The research combines normative legal analysis with an empirical case study of an underground gold mining area to examine the extent to which the regulatory framework supports sustainable community development after mining operations.

The normative analysis was conducted through a systematic review of Indonesia's mining legislation, including Law Number 4 of 2009 on Mineral and Coal Mining, as amended by Law Number 3 of 2020 and Law Number 2 of 2025, together with relevant implementing regulations. The review focused on regulatory provisions concerning reclamation, mine closure, community participation, institutional responsibilities, access to information, and community empowerment. A comparative analysis was undertaken to identify regulatory developments, implementation challenges and gaps affecting post-mining transition.

The empirical component consisted of a case study of underground gold mining in Indonesia. Survey data collected from 5 affected villages, involving 416 respondents, were analysed using thematic analysis to assess community awareness, participation, preparedness, and access to information regarding post-mining transition policies. The legal and empirical findings were interpreted through the perspectives of environmental governance, institutional capacity, and community empowerment to evaluate whether the existing regulatory framework effectively facilitates a just and sustainable post-mining transition.

4 Results and discussion

4.1 Awareness of mine closure

Most respondents lacked knowledge of mine closure timelines. Out of 416 respondents, 339 were unaware of when mining activities would end. This indicates weak information dissemination and limited stakeholder engagement.

4.2 Regulatory literacy

Approximately 79% of respondents had no knowledge of mining regulations. This finding highlights low regulatory literacy among affected communities, limiting their ability to participate in decision-making processes (Decree of the Minister of Energy and Mineral Resources Number 1824 K/30/MEM/2018).

4.3 Information inconsistency

Among respondents with some awareness, closure timelines varied widely (2018–2035), with an average estimate of 2028. This reflects fragmented communication and a lack of coordinated information dissemination.

4.4 Governance gap

Existing regulations address reclamation, financial guarantees, and community programs (Indonesia's mining legislation, including Law Number 4 of 2009 on Mineral and Coal Mining, as amended by Law Number 3 of 2020 and Law Number 2 of 2025, together with the Decree of the Minister of Energy and Mineral Resources Number 1824 K/30/MEM/2018). However, they do not define a structured post-mining transition phase. As a result, community empowerment initiatives remain fragmented and have not yet had a significant impact on the entire local community, leading to ongoing challenges in achieving sustainable development and effective rehabilitation of the affected areas.

Figure 1 illustrates the distribution of community awareness regarding mine closure timelines, regulatory literacy among affected communities, information dissemination, and governance implications related to mine closure and the post-mining transition.

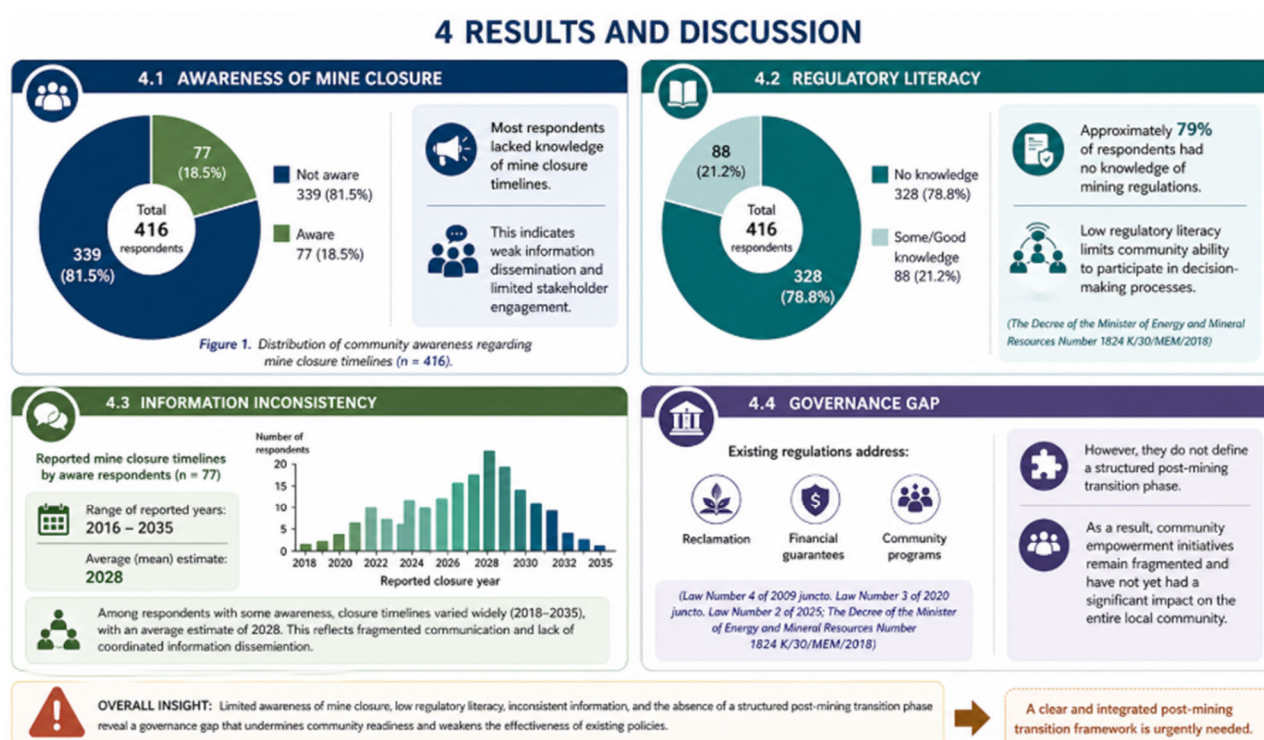


Figure 1 Summary of the distribution of community awareness regarding mine closure timelines, regulatory literacy among affected communities, information dissemination, and governance implications

5 Post-mining transition framework

A key finding of this study is the absence of post-mining transition as a distinct regulatory phase within Indonesian mining law. Post-mining transition is defined as a structured process linking mine closure to sustainable post-mining conditions through integrated environmental, social, and economic strategies. Key components include:

- Economic diversification
- Skills development

- Productive land use
- Stakeholder coordination.

This framework complements existing regulatory obligations while addressing current gaps in implementation, such as the need for better stakeholder engagement and more effective monitoring of post-mining land use practices.

The findings demonstrate that Indonesia's mining regulatory framework provides comprehensive provisions for reclamation, mine closure, financial guarantees, and community development. However, these regulatory instruments remain primarily focused on compliance with environmental and administrative obligations and do not establish a clearly defined post-mining transition phase. Consequently, community empowerment initiatives are implemented in isolation, with limited integration into broader regional development objectives. This fragmented governance approach contributes to inconsistent implementation and reduces the long-term effectiveness of post-mining programs.

Based on these findings, this study concludes that a post-mining transition framework is required to bridge the gap between regulatory compliance and sustainable community development. The proposed framework extends beyond conventional mine closure by integrating environmental restoration with socio-economic transformation, institutional coordination, and community empowerment. It positions post-mining transition as a continuous governance process rather than the final stage of mining operations, ensuring that environmental rehabilitation is accompanied by sustainable livelihood opportunities, inclusive decision-making, and long-term regional resilience.

The development of this framework should adopt an integrated governance approach encompassing 5 key elements:

- incorporation of a legally recognised post-mining transition phase within mining legislation and implementing regulations
- strengthened institutional coordination among government agencies, mining companies, and local communities through clearly defined roles and responsibilities
- enhanced community empowerment through participatory planning, improved access to information, capacity building, and support for sustainable alternative livelihoods
- integration of post-mining transition objectives into regional and local development planning
- establishment of monitoring and evaluation mechanisms incorporating environmental, social, economic and institutional indicators to assess transition outcomes and inform future policy development.

Collectively, these elements provide a foundation for strengthening regulatory effectiveness and promoting a more inclusive and sustainable post-mining transition in Indonesia.

6 Conclusion

This study demonstrates that, despite recent improvements to Indonesia's mining legislation, the existing regulatory framework remains primarily focused on mine closure obligations rather than on managing the broader post-mining transition. Evidence from 416 respondents across 5 villages affected by underground gold mining indicates that limited regulatory guidance, inadequate access to information, and insufficient community participation constrain the effectiveness of community empowerment programs and reduce local preparedness for post-mining conditions.

The findings highlight the need to move beyond compliance-oriented mine closure towards a structured post-mining transition framework that integrates environmental restoration, socio-economic transformation, institutional coordination, and community empowerment. Strengthening regulatory integration, improving

information dissemination and enhancing participatory governance are essential to support sustainable post-mining outcomes and long-term community resilience in Indonesia.

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