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ENHANCING SUSTAINABILITY AND COMPETITIVENESS IN INDONESIA'S MINING SECTOR: A SYSTEMATIC LITERATURE REVIEW OF ESG IMPLEMENTATION

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ABSTRACT
The mining sector plays a pivotal role in Indonesia's economic development, yet it also faces increasing scrutiny regarding its environmental, social, and governance (ESG) performance. Integrating ESG principles into mining practices, particularly within downstream policies, is essential to ensure both sustainability and global competitiveness. This study aims to (i) assess the importance of ESG implementation within Indonesia's downstream mining policy, (ii) evaluate the current level of ESG adoption in industrial practices, and (iii) formulate strategies to enhance sustainability and competitiveness based on ESG principles. To achieve these objectives, a Systematic Literature Review (SLR) was employed, synthesizing evidence from academic research, policy documents, and industry reports. The review was conducted in three stages: five articles were analyzed to assess the policy importance of ESG, another five to evaluate adoption in industrial practices, and ten to generate strategic recommendations. Artificial intelligence tools were used to support the review process, ensuring transparency, rigor, and efficiency in screening and synthesizing literature. The findings highlight that while ESG has gained recognition in Indonesia's mining sector, challenges remain in consistent adoption, stakeholder engagement, and disclosure quality. The study proposes context-specific strategies such as strengthening governance frameworks, improving community participation, and integrating ESG into enterprise risk management. These insights contribute to advancing sustainable mining practices and provide strategic directions for policymakers, industry leaders, and stakeholders seeking to align Indonesia's mining sector with global ESG standards.

Keywords: ESG, mining sector, downstream policy, Indonesia, Systematic Literature Review (SLR

INTRODUCTION

In an era of global competition, every company has the right and opportunity to grow through innovation and increased competitiveness. However, along the way, companies face various challenges, not only financial but also environmental and social. Therefore, corporate goals are no longer solely short-term but encompass long-term sustainability. A commitment to social responsibility is key, not only to maintaining a reputation but also to gaining investor confidence.

One strategic approach that is increasingly being implemented is the Environmental, Social, and Governance (ESG) principle (Aristiningtyas & Fidiana, 2023). ESG implementation has become a crucial indicator in assessing a company's performance holistically, as it aligns sustainability aspects with good governance. Investors are now more carefully assessing risks, including a company's ability to address climate, social, and economic crises. Therefore, ESG integration not only supports business continuity but also becomes a major attraction for investors and other stakeholders. With ESG disclosure and a clear commitment to sustainability, companies can strengthen their competitive position in a market increasingly aware of social and environmental responsibility (Andespa, 2022).

In Indonesia, the mining sector has a significant impact on the country's economy and sustainable development, with the mining sector peaking with a cumulative growth of 259.47%. In 2022, the realization of PNBP (Natural Revenue) from Natural Resources reached IDR 74.44 trillion, representing a 122.42% increase (*ApbnKita*, 2022). This significant increase in natural resources was driven by rising prices for minerals and other

commodities, as well as government support for downstream. The mining sector is a strategic sector supporting Indonesia's economic growth. This is further supported by the government's increased priority on downstream. This means exporting not only raw materials but also processing them into value-added products such as nickel, ferronickel, and other mineral products. Indonesia itself has the world's largest nickel reserves, at approximately 21 million tons, or 22% of global reserves (Statistics, 2022).

Coal reserves are among the top five global coal exporters, with reserves reaching 38.8 billion tons. The gold and copper potential at PT Freeport Indonesia, one of the world's largest gold and copper mines, is estimated at around 7.8 million tons of copper and 921 tons of gold (The Global Economy, 2023). However, the complexity of operations and the massive scale of investment make this sector unique and challenging. In this context, the value chain concept becomes a highly relevant framework.

Fundamentally, the mining value chain describes the entire spectrum of activities that minerals undergo, from their discovery underground to their production as products ready for use by other industries or end consumers (Görner et al., 2020) (a more detailed chain cycle is presented in Figure 1). Massive mining activities such as drilling, blasting, transporting, and processing minerals produce greenhouse gas emissions and air pollutants, such as carbon dioxide (CO2), sulfur dioxide (SO2), and nitrogen oxides (NOx), which have significant impacts on the environment and health. Data from the Indonesian Central Bureau of Statistics (BPS) demonstrates the seriousness of this problem. In 2023, total emissions from the mining and quarrying sector in Indonesia reached 40.619 tons. This figure is significant and serves as a reminder that while mining is essential for the economy, its impact on the air is substantial (Statistics, 2022) .

Not only the air, but also the marine ecology is affected by massive port activities from large ships. A marine biologist from IPB University, Mohammad Mukhlis Kamal, highlighted the importance of protecting the Napoleon wrasse (*Cheilinus undulatus)*. This fish is increasingly threatened with extinction due to mining activities. This incident is clear evidence that mining activities not only impact land but can also damage fragile marine ecosystems (Hasyim, 2025).

Furthermore, the most severe impact occurs in the mining phase. These, namely, mineral reserve exploration activities must sacrifice forests by clearing land for open-pit mining, followed by the development of mining roads, worker and processing facilities, and waste disposal sites, the scale of which reaches thousands of hectares. According to Giljum et al. (2022), from 2000 to 2019, 3.264 km² of forest were lost directly due to mining, with 80% occurring in just four countries: Indonesia, Brazil, Ghana, and Suriname.

Mining activities in Indonesia have caused significant environmental damage, including the loss of 1.901 km² of forest, which has serious consequences, including investment risks. Despite promising commodity prices for nickel, modern investors highly value sustainability as a key factor. For example, Paris-based investor Hedonova sold 76% of its shares due to disappointment with the waste management of mining companies in Indonesia (Teja, 2023). This demonstrates that unsustainable practices can reduce investment attractiveness. Therefore, implementing ESG principles is key to creating responsible and sustainable mining by encouraging companies to focus not only on profits but also on social and environmental responsibility.

The mining sector in Indonesia plays a crucial role in supporting the national downstream policy; however, it faces mounting challenges related to environmental degradation, social conflict, and governance issues that threaten its long-term sustainability and investment attractiveness. These challenges highlight the urgent need to implement Environmental, Social, and Governance (ESG) principles as a framework for improving transparency, accountability, and stakeholder trust in the industry. Therefore, this study

aims to (i) assess the importance of ESG implementation within the downstream policy of the mining sector in Indonesia, (ii) evaluate the current level of ESG adoption in industrial practices, and (iii) formulate strategies to enhance sustainability and competitiveness based on ESG principles. To achieve these objectives, a **Systematic Literature Review (SLR)** was employed by synthesizing academic research, policy documents, and industry reports to provide comprehensive insights and strategic recommendations for strengthening ESG integration in Indonesia's mining sector.

LITERATURE REVIEW

Stakeholder *Theory*

Stakeholder theory ESG is a managerial concept useful for examining how effectively a company manages long-term benefits for all parties, such as investors, government, communities, employees, and the environment (Donaldson & Preston, 1995). Therefore, an understanding of the supply chain is needed, *focusing* on logistics and production efficiency, and needs to be complemented by a value chain *that* considers how each activity creates added value, both economically and socio-environmentally (Görner et al., 2020). In this case, the application of ESG principles is imperative because it can encourage companies to carry out environmentally responsible practices, respect social rights, and implement good environmental governance (Zhang et al., 2024).

Table 1. Relationship Between ESG and Stakeholders

ESG Concept	Stakeholders	Linkage of ESG with Stakeholders
Environmental (E): Reducing pollution, efficient use of natural resources, biodiversity protection, energy transition.	Government, community, NGOs, environmental agencies.	The government sets regulations, communities demand a clean environment, NGOs monitor, and agencies enforce compliance.
Social (S): Labor rights, occupational safety, community development, social responsibility.	Employees, labor unions, local communities, consumers.	Employees and unions expect fair treatment and safety, communities expect benefits and support, and consumers demand responsible products.
Governance (G): Transparency, anti-corruption, compliance, board independence, shareholder protection.	Investors, regulators, shareholders, financial institutions.	Investors and shareholders expect transparency and accountability, regulators enforce governance rules, and financial institutions require compliance for funding.

Source: Processed Data (2025)

Table 1 presents the ESG framework and its relationship with various stakeholders. ESG outlines corporate responsibilities in three main areas: environmental, social, and governance. Stakeholders such as communities, investors, governments, employees, and business partners have different roles and interests in each aspect of ESG.

Environmental aspects relate to the impact of a company's operations on the surrounding community, while investors will focus on the reputational and financial risks resulting from poor environmental practices. Social aspects include the company's relationship with the community, working conditions, and ethical supply chain practices. Finally, corporate governance focuses on transparency, accountability, and the board structure to protect shareholder rights and ensure ethical and transparent decision-making.

Environmental, Social, and Governance (ESG) Principles

Amidst growing awareness of environmental and social issues, the concept of ESG has transformed from a mere trend into a fundamental framework for corporate sustainability. The environmental aspects of ESG directly relate to society and government as primary stakeholders. Likewise, the social elements emphasize the company's role as a vital part of the ecosystem. This ensures safe and fair working conditions and the absence of human rights violations in the supply chain. Furthermore, governance serves as the backbone for guaranteeing effective ESG implementation.

From BPS data, the provision of physical use for Indonesia's GHG emissions in thousands of tons in 2023, explains that the total use of emissions created from mining activities during one calendar year, based on material elements such as CO2, reached 787,428 (Statistics, 2022). This indicates that total emissions have improved. In accordance with the government's efforts to commit to reducing GHG emissions in accordance with the target stated in *the National Determined Contribution* (NDC), which is 29% of 2,919 million tons of CO2 a for all sectors (Agus et al., 2017) and this is in accordance with the GRI 305-1 disclosure regulation regarding GHG Emissions 2016 (scope 1) (GRI 305, 2016) .

Research Related to ESG and Mining

As the mining industry transforms through downstream and sustainability initiatives, ESG implementation studies are becoming increasingly important. Previous studies have explored various approaches to ESG integration, including regulatory, technological, and stakeholder perceptions. Therefore, reviewing previous research aims to highlight areas that are still relevant and/or irrelevant to the current situation.

A case study conducted by Vera-Burau et al. (2025) at a mine in Cataluna, Spain, demonstrated the importance of integrating ESG into mine operational planning and decision-making. By modifying a block model commonly used in mineral revenue planning, the study addressed variables such as emissions, waste, and social impacts. The results demonstrated a positive link between operational efficiency and sustainability, where strategies that reduce costs also have positive impacts on environmental sustainability and social outcomes.

In another case study related to Peru's national copper reserves, conducted by Valer Dávila et al. (2024), the study developed a comprehensive stochastic model to evaluate extraction policies, fiscal impacts, social impacts, and environmental costs in mining projects. This approach uses methods such as Markov Chain Monte Carlo (MCMC), dynamic programming, and Monte Carlo simulations to generate optimal extraction strategies amidst uncertainty about prices, environmental costs, and fiscal policy. The study shows that copper prices and environmental costs are the main factors in determining the social and private value of a project, greater than fiscal factors such as taxes. Therefore, this study is relevant to ESG principles because it directly integrates external environmental and social costs into the project assessment process.

In addition, the latest research using bibliometric methods and content analysis of ESG literature from 1991 to 2023 was conducted by Zhang et al. (2024) study states that ESG studies have grown rapidly, primarily driven by global attention to climate change and sustainable development goals. The results indicate that the primary focus of ESG studies has shifted from corporate social responsibility (CSR) issues to more specific areas, such as responsible investment, ESG disclosure, and investment efficiency. The dominant topics relate to ESG and financial performance, transparency, green innovation, and the role of ESG in promoting sustainability. This provides a comprehensive view of the direction and focus of global ESG research. Therefore, ESG disclosure and stakeholder engagement are crucial in promoting more transparent corporate governance.

METHODS

The current study utilized SLR to achieve an objective study (Mukhtar et al., 2025; Savio et al., 2023). The systematic approach emphasizes transparency, thoroughness, and reproducibility, contrasting with traditional narrative reviews that may lack these qualities (Tranfield et al., 2003). This process aims to reduce biases and improve the reliability of the conclusions drawn (Tranfield et al., 2003).

According to the paper of Tranfield et al. (2003), conducting an SLR involves several key stages: (1) **Planning the Review (Plan):** Forming a review panel with experts and defining the scope, objectives, and criteria for including or excluding studies. This stage may involve iterative refinement and scoping studies to assess the literature's relevance and volume, (2) **Conducting the Search (Search):** Performing an exhaustive search of published and unpublished sources — including bibliographic databases, conference proceedings, industry reports, Internet sources, and personal contacts — using well-defined keywords and search strings. The process must be documented thoroughly to ensure reproducibility. Only studies meeting pre-set inclusion criteria are incorporated, (3) **Selection and Evaluation (Select):** Screening the identified studies against inclusion/exclusion criteria, assessing their quality, and selecting core contributions for synthesis. This step ensures the review is based on credible and relevant evidence, (4) **Synthesis and Reporting (Synthesis):** Systematically synthesizing the data, often quantitatively (meta-analysis) or qualitatively, and transparently reporting the methodology and findings to enable replication and critical appraisal.

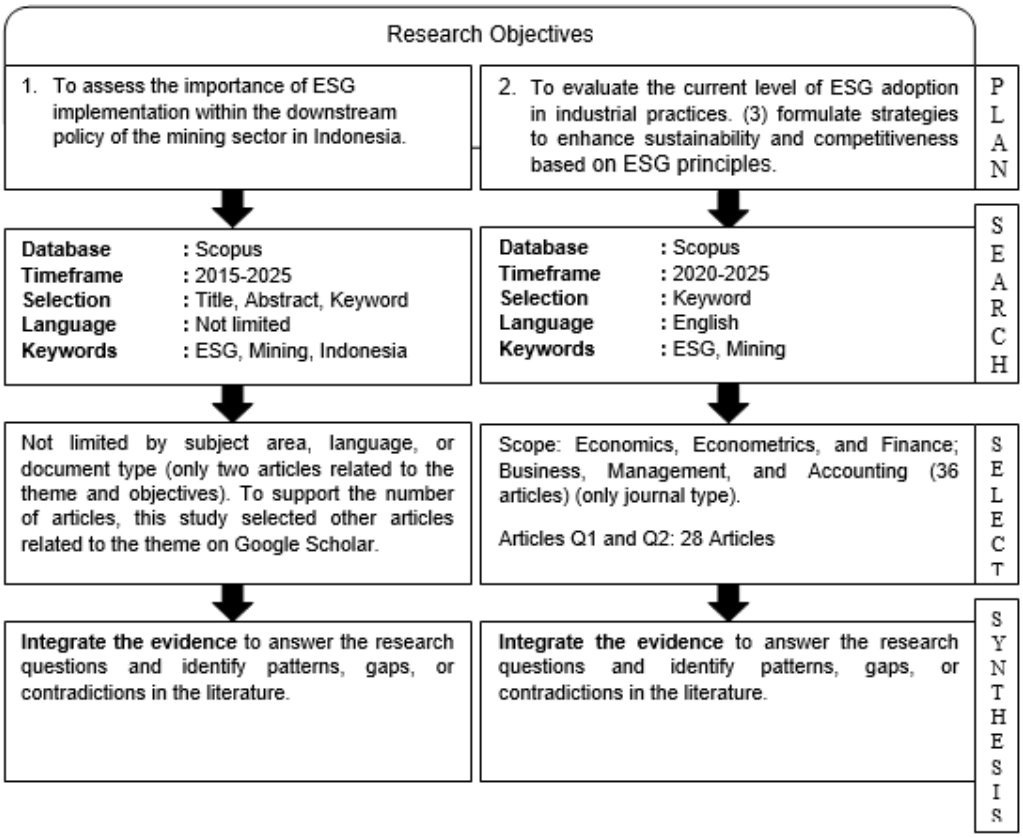

Figure 1 Methodology SLR
Source: Authors' own work (2025)

Figure 1 illustrates the SLR methodology applied in this study. Three main objectives guide the research, each addressed through distinct approaches. The review process follows the stages proposed by Tranfield et al. (2003), namely planning the review, conducting the search, selecting and evaluating the studies, and synthesizing and reporting the findings.

RESULTS

To address the research objectives, this study employed a Systematic Literature Review (SLR) approach, following the structured stages outlined by Tranfield et al. (2003). The SLR enabled a comprehensive and replicable synthesis of existing knowledge by integrating evidence from academic research, policy documents, and industry reports related to ESG in the mining sector. Specifically, for Objective (i), five peer-reviewed articles focusing on ESG implementation within the downstream mining policy context in Indonesia were analyzed to assess its importance. For Objective (ii), another five articles were systematically examined to evaluate the current level of ESG adoption in industrial practices. Finally, for Objective (iii), ten articles were reviewed and synthesized to formulate strategic recommendations aimed at enhancing sustainability and competitiveness through ESG principles. Importantly, the entire analysis process was supported by artificial intelligence tools, which assisted in screening, evaluating, and synthesizing the literature in a systematic and efficient manner, ensuring transparency, objectivity, and rigor in the review process.

ESG implementation within the downstream policy of the mining sector in Indonesia

The main challenges faced in implementing green mining in Indonesia include Technical and financial hurdles such as the difficulty in producing and utilizing renewable energy in mining operations, as well as high costs associated with renewable energy sources, which make it challenging to attract investors and prioritize renewable energy as the main energy source. Additionally, Indonesia's extensive deforestation caused by large-scale mining activities presents significant environmental and operational challenges that hinder the transition to environmentally sustainable mining practices. The need for technological adaptation and the high costs of cleaner energy further complicate the adoption of green mining methods, requiring substantial efforts and investments from stakeholders (Saepudin et al., 2022).

The study on board attributes and corporate sustainability disclosure in Indonesia's mining sector strengthens the first objective of this research by showing that ESG implementation is closely tied to governance quality. The findings reveal that board independence and gender diversity significantly enhance sustainability disclosure, while board size has little impact, indicating that effective ESG adoption relies more on the composition of the board than its scale. This is directly relevant to downstream policy, as greater transparency and accountability are crucial for attracting investment, gaining social trust, and ensuring long-term sustainability in the mining industry (Perdana et al., 2024). By recommending that regulators strengthen rules on independent and female directors, the study underscores the importance of embedding ESG principles into Indonesia's downstream agenda, highlighting that policy success depends not only on economic objectives but also on governance reforms that integrate ESG into mining practices.

Putriningtyas et al. (2024) highlight that ESG disclosure in Indonesian mining companies remains limited and largely driven by external pressure from investors rather than genuine internal commitment. The reporting practices are often fragmented and lack standardized frameworks, making ESG appear more as a compliance exercise than a strategic approach to sustainability. This shows that while ESG is recognized in discourse, its integration into the operational and policy dimensions of mining is still

underdeveloped. Such findings suggest that unless ESG becomes a core element of industry practices, mining companies may struggle to align with global sustainability expectations.

Table 2 Link Between Previous Study and Objective Study

Previous Research	Key Findings	Link to Objective One (Importance of ESG in Downstream Policy)
(Darsono et al., 2024)	ESG improves environmental performance both directly and through green accounting and CSR disclosure.	Shows that ESG is essential for sustainability in resource industries, supporting the need for ESG integration in Indonesia's downstream policy.
(Perdana et al., 2024)	Governance factors (board independence, gender diversity) enhance sustainability disclosure, but reporting is often treated as compliance only.	Highlights weak ESG integration in Indonesia's mining governance, stressing the importance of embedding ESG into downstream as a strategic, not bureaucratic, requirement.
(Putriningtyas et al., 2024)	ESG adoption in Indonesian mining is limited and often externally driven by investors.	Indicates a gap: ESG is not internally embedded in policy or practice, making it critical to assess its role in the downstream.
(Saepudin et al., 2022)	Developing economies face regulatory challenges and lack of standard ESG standards.	Reinforces that Indonesia's downstream risks failure without stronger ESG policy integration.
(Kholis et al., 2020)	Focus mainly on economic aspects of downstream, neglecting ESG.	Shows the policy gap: ESG is not yet central to downstream discussions, making assessment necessary.

Source: Processed Data (2025)

Evaluate the current level of ESG adoption in industrial practices

Recent studies highlight that ESG adoption has grown globally but remains inconsistent in emerging economies. Evidence shows that in many developing contexts, disclosure is largely compliance-driven and symbolic, reflecting external investor or regulatory pressures rather than genuine strategic integration (Vera-Burau et al., 2025). In resource-based sectors, companies that adopt ESG more comprehensively benefit from greater resilience, reputation, and financial performance, but the level of adoption varies, with many firms limiting efforts to basic reporting rather than embedding ESG into strategy (Cai et al., 2024). A bibliometric analysis further confirms that while ESG has become a mainstream corporate agenda globally, extractive industries such as mining continue to show uneven and partial implementation, especially in regions where regulatory enforcement is weak (Valer Dávila et al., 2024).

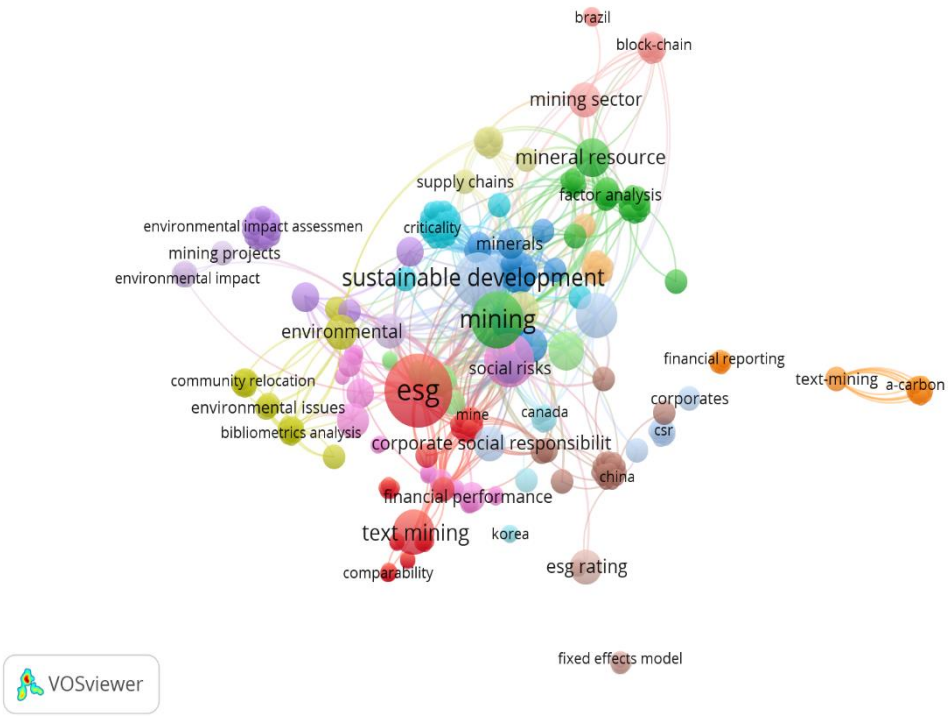

Figure 2 Keywords of 36 Previous Study Relate to ESG and Mining
Source: Processed Data supported by Artificial Intelligence (2025)

Figure 2 supports objective 2 (Evaluate the current level of ESG adoption in industrial practices) by showing how ESG is strongly clustered with sustainable development, mining, CSR, and financial performance, reflecting that ESG adoption is widely studied in connection with both environmental and corporate strategies. The spread to related nodes such as environmental impact assessment, supply chains, financial reporting, and ESG rating indicates that research has already begun to operationalize ESG in industrial practices, but the fragmented clusters (e.g., text mining, fixed effects model, blockchain) highlight that adoption is uneven and context-specific across industries.

Governance structures are also shown to play a critical role in the quality of ESG adoption. Strong boards with independence and gender diversity enhance credibility and depth of ESG practices, while weak governance leads to superficial “window-dressing” disclosures (Fikru et al., 2024). Furthermore, research emphasizes that ESG adoption is much higher in countries with mandatory standards and strong regulation, while economies with voluntary frameworks, such as Indonesia, experience fragmented and inconsistent practices (Zhang et al., 2024). Together, these insights indicate that the current level of ESG adoption in Indonesia’s mining industry is low to medium, with disclosure occurring, but integration into long-term strategy and operations remaining limited. This directly supports Objective Two by providing both global benchmarks and industry-specific evidence to critically assess Indonesia’s mining sector practices.

Formulate strategies to enhance sustainability and competitiveness based on ESG principles

Sustainability and competitiveness in the mining and resource sectors increasingly depend on the ability to anticipate, manage, and communicate environmental, social, and governance (ESG) risks effectively. One important approach is to build a dynamic risk-foreseeability program that categorizes ESG incidents into high-visibility risks, stakeholder red flags, corporate foresight risks, and black swans, ensuring that strategies

are tailored for each type of risk (Bester & Groenewald, 2021; Savinova et al., 2023). Evidence shows that stakeholders are often better positioned to foresee potential ESG challenges than companies themselves, which highlights the importance of strengthening community participation in impact assessments and public consultations to secure legitimacy and reduce costly conflicts (Lèbre et al., 2022; Woźniak, 2022).

In addition, research emphasizes that social and environmental factors should be integrated into early exploration and project screening, not treated as secondary to geological and financial considerations, as delays and resistance often stem from neglecting these dimensions (Aaen & Hansen, 2023; Bester & Groenewald, 2021). This also reflects the capability gap between junior and senior mining firms, with juniors underperforming in ESG integration, suggesting the need for shared services, governance frameworks, and ESG knowledge transfer mechanisms (Bester & Groenewald, 2021).

From a broader perspective, supply chain analysis and material flow assessments reveal that ESG-related risks extend beyond company boundaries, requiring firms to monitor upstream and downstream impacts, prioritize supplier due diligence, and anticipate trade-linked risks (Heichl & Hirsch, 2023). High-visibility risks such as tailings dam failures, spills, and blasting incidents should be addressed through robust design standards, transparent communication of safety thresholds, and scenario-specific emergency drills (Sahin et al., 2023). Equally, climate-driven black swan events, such as extreme weather or geotechnical failures, must be integrated into long-term planning through advanced forecasting and scenario modeling (Woźniak, 2022). Corporate Social Responsibility (CSR) emerges as a vital driver of competitiveness, since meaningful engagement with stakeholders and communities helps maintain the social licence to operate (SLO) while reducing operational disruptions (Lèbre et al., 2022).

On the governance side, studies show that corporate ESG disclosures often rely on impression management, which undermines credibility and risks accusations of greenwashing. Thus, companies should adopt balanced reporting, third-party assurance, and stakeholder-tested materiality assessments to strengthen transparency (Gervais et al., 2023; Sahin et al., 2023). Integrating ESG considerations into enterprise risk management (ERM) frameworks further enhances organizational resilience, as ESG performance is linked to reduced financial risk (Woźniak, 2022). However, overreliance on external ESG ratings is problematic given their variability, so companies are encouraged to develop internal, context-specific metrics, particularly in areas such as water, biodiversity, and safety, to guide decision-making (Gervais et al., 2023; Savinova et al., 2023). Finally, ESG strategies are not only risk mitigators but also drivers of capital access and competitiveness, since strong ESG performance improves financing opportunities, investor confidence, and long-term market positioning (Woźniak, 2022).

The downstream mining sector strategy highlights the importance of mapping the value chain, from exploration to distribution, to understand where ESG principles can be embedded. As Brown and Hillegeist (2007) explain, integrating ESG into each stage of the value chain ensures that downstream processes generate not only economic but also environmental and social value. For instance, adopting low-emission technologies and sensor-based monitoring during extraction enhances environmental stewardship while improving social legitimacy and attracting sustainability-focused investors. This reflects that current ESG adoption in industrial practices is moving toward operational integration, showing companies are increasingly pressured to balance value creation with sustainable development goals.

However, despite the mainstreaming of green mining frameworks, ESG adoption in practice still faces the challenge of greenwashing, where companies exaggerate their environmental and social responsibility claims (Nyilasy et al., 2014). This creates

information asymmetry between firms and investors, as companies may disclose extensive ESG data to obscure weak actual performance (Bergh et al., 2019)(Bergh et al., 2019). To strengthen genuine ESG adoption and reduce greenwashing risks, ESG labeling monitored by regulators could serve as an innovative mechanism, ensuring that disclosed practices align with actual operational sustainability. This demonstrates that while ESG frameworks are increasingly present in industrial practices, objective 3 requires evaluating both the quality of ESG adoption and the credibility of disclosures to ensure meaningful alignment with sustainability.

CONCLUSIONS

This study concludes that the integration of Environmental, Social, and Governance (ESG) principles into Indonesia's mining downstream policy is essential for ensuring sustainability, competitiveness, and long-term investment attractiveness. While ESG adoption has gained recognition globally, in Indonesia it remains fragmented, often driven by external investor or regulatory pressure rather than genuine internal commitment. The findings highlight that the mining sector faces complex challenges, including environmental degradation, governance gaps, and greenwashing risks, which limit the credibility of current practices. Therefore, ESG implementation should not merely be a compliance requirement but must be embedded as a strategic approach in the entire mining value chain to secure both economic and socio-environmental benefits.

Contributions

Academically, this study contributes by synthesizing recent ESG-mining literature through a Systematic Literature Review (SLR), offering a structured understanding of how ESG adoption interacts with stakeholder theory and the mining value chain framework. Theoretically, it expands ESG discourse by linking governance attributes, disclosure practices, and sustainability performance in resource-based industries. Practically, the study provides insights for mining companies on strengthening transparency, community engagement, and green innovation, while for regulators it emphasizes the need for standardized ESG frameworks and stronger enforcement mechanisms to reduce symbolic disclosure. In this way, the study bridges academic, theoretical, and practical perspectives to support responsible mining development in Indonesia.

Limitations and Recommendations

This study is limited by its reliance on secondary data from published academic articles, policy documents, and industry reports, which may not fully capture the latest firm-level practices or informal governance arrangements in the field. Additionally, the scope is restricted to literature between 2015-2025, potentially overlooking earlier but still relevant insights. Future research should employ mixed methods, combining quantitative bibliometric analysis with qualitative case studies and stakeholder interviews, to provide deeper contextual understanding of ESG integration in mining. Longitudinal studies could also explore the evolution of ESG practices over time, while comparative cross-country analyses may highlight best practices that Indonesia can adopt.

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