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The impact of ESG disclosure and green mining on firm value: evidence from Indonesia

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ABSTRACT

This study examines the impact of Environmental, Social, and Governance (ESG) disclosures and the adoption of green mining practices on the value of mining companies in Indonesia. Using a quantitative research method, we analyze panel data from 20 mining companies listed on the Indonesia Stock Exchange (IDX) over the period from 2020 to 2022. The study estimates the relationships between ESG, green mining, and firm value through panel data regression, applying a fixed effects approach. The results show that neither ESG disclosures nor green mining significantly affects firm value, as measured by Tobin's Q. In contrast, firm size negatively impacts value, while ROA has a positive influence. These findings suggest that investors tend to prioritize traditional financial indicators over sustainability factors when evaluating mining companies. The theoretical implications of this study highlight that, although ESG and green mining are conceptually important, their current levels of implementation are insufficient to meaningfully affect market valuations. Practically, mining companies need to improve the transparency and effectiveness of their ESG reporting and strengthen their sustainability strategies to create additional value for investors and other stakeholders.

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1. INTRODUCTION

Disclosure of Environmental, Social, and Governance (ESG) factors has become a key focus in the mining industry in developing countries, demonstrating the firm's commitment to sustainable practices and transparency (Duho, 2023). These disclosures encompass reporting on environmental impacts, community engagement, governance standards, and initiatives to mitigate risks related to mining activities (Cranford, 2023). ESG disclosures give stakeholders insights into how mining companies address environmental challenges, contribute to community development, and maintain ethical governance (Fu et al., 2024).

With increasing focus on sustainability, green mining is gaining attention, aiming to apply environmentally responsible practices throughout the entire mining life cycle (Tang & Yang, 2024). According to Shang et al. (2015), the term "green mining" has been introduced and applied in several countries, including the European Union (EU, 2010), the United States (MIT, 2015), Canada (NRC, 2013), and Finland (Tekes, 2015). After the development of the era of sustainability, ecology and *high-tech* is increasingly massive, China (Bai et al., 2022; Qi et al., 2019; Shang et al., 2015; Shi, 2015; Zhou et al., 2020), India (Marimuthu et al., 2022), Australia and Russia (Srivani Maddala et al., 2021) made significant advancements in green mining technologies. Green mining seeks to enhance energy efficiency and reduce the environmental impact associated with the life cycle of mineral-based products. The objective of this approach is to recover all valuable minerals and by-products while minimizing waste. Currently, various solutions are being developed to decrease water and energy consumption (Saepudin et al., 2022). Therefore, the efficiency of fossil energy consumption, effective reclamation practices, proper training, the implementation of environmentally friendly technologies, the use of effective environmental management tools, and the establishment of sustainable partnerships are all essential factors for enhancing the performance of sustainable mining (Srivani Maddala et al., 2021).

However, the implementation of ESG and green mining faces significant challenges, one of which is the phenomenon of greenwashing, where companies only use ESG labels as a marketing strategy without real implementation, which can damage public trust (Santos et al., 2024). Detecting the greenwashing phenomenon is not an easy thing. According to Ghitti et al. (2024) greenwashing can reduce the value of the firm. Li et al. (2023) found that greenwashing had a significant positive effect on corporate financial performance (CFP). The high cost of implementing environmentally friendly technologies and meeting ESG standards is also an obstacle, especially for companies with limited resources (Parameswar et al., 2023). Moreover, the inconsistent application of ESG principles among companies, coupled with regulatory and supervisory weaknesses in Indonesia, often diminishes the effectiveness of green mining practices (Saepudin et al., 2022). One strategy to overcome this is to look at the assessments of investors and other stakeholders regarding the financial performance and value of these mining companies (Ghitti et al., 2024; Li et al., 2023).

Indonesia has implemented various policies to enhance sustainability and transparency in the mining sector. Yaya et al. (2018) examined the impact of Government Regulation No. 47/2012 on environmental disclosure practices, which required companies to report their social and environmental activities in annual reports. The study found a significant increase in GRI index-based information and the number of words used to discuss environmental and carbon emission aspects after the policy's implementation. Interestingly, this increase was more pronounced among companies with moderate or low carbon emissions, suggesting that the regulation had a greater impact on companies seeking to enhance their legitimacy, rather than those already facing major environmental challenges. In addition, the impact of mining regulations in Indonesia on the protection of indigenous communities remains a primary concern. According to Jamin et al. (2023) although the government has implemented various policies, their effectiveness in ensuring benefits, justice, and balance for indigenous communities is still limited. The government still needs to improve laws and management systems, particularly in relation to post-mining reclamation and the standardization of waste handling practices. Based on these two studies, the current discourse on green mining in Indonesia remains focused on legal aspects. However, there is a notable gap in research examining the broader impact of carbon emissions on the overall value of companies.

Given the gaps in research and the challenges in implementing ESG and green mining practices, studying their impact on the financial performance of mining

companies in Indonesia is crucial. Despite improvements in legal frameworks and protections for indigenous communities, the broader effect of these initiatives on company value remains underexplored. As the mining sector is vital to Indonesia's economy, understanding how ESG and green mining practices influence financial performance will support better corporate decisions and more effective government policies. This research is also valuable for investors, enabling them to incorporate sustainability into their investment strategies and contribute to the sector's long-term sustainability.

2. RESEARCH METHOD

This study uses a quantitative approach with a panel data regression model, which focuses on mining companies listed on the Indonesia Stock Exchange (IDX) during the period 2020 to 2022. The research design used is causal-explanatory, which aims to analyze the relationship between ESG disclosure, green mining practices, and company value, taking into account control variables related to financial conditions and company characteristics.

The selection of the sample was carried out by the purposive sampling method, which establishes certain criteria so that only companies that meet the requirements can be included in the study. These criteria include (1) consistency in disclosing Environmental, Social, and Governance (ESG) factors, including carbon emission data, and (2) publication of financial statements that have been routinely audited during the observation period. Based on this criterion, as many as 20 companies are eligible for analysis. The data in this study was obtained from two main sources, namely ESG disclosure and carbon emissions obtained from ESG Intelligence, a database published by Airlangga University Surabaya, and financial performance data sourced from the audited financial statements of each company. The integration of data from these various sources ensures a strong and credible analytical basis for examining the relationship between ESG disclosures, carbon emissions, and corporate financial performance.

The dependent variable in this study is the value of the firm, which is measured using TOBIN'S Q. This measure is one of the indicators that is widely used in accounting, finance, and business literature to proxy the valuation of the firm (Benjamin & Biswas, 2022; Buchanan et al., 2018; Sanga et al., 2024; Servaes & Tamayo, 2017). The independent variables consist of ESG and Green Mining (GMIN) disclosures which are measured using the firm's carbon emission disclosures. Some of the control variables used in this study include: firm size (SIZE) calculated by natural logarithm of total assets; financial performance (ROA) is calculated as net profit divided by total assets (Sanga et al., 2025); capital expenditure (CAPEX) is calculated as the ratio of fixed assets of the current year minus the previous year to total assets; leverage (LEVERAGE) total debt against total assets – debt used is long-term debt that generates interest such as loan, lenders and bond (Jankalová & Kurotová, 2020; Sanga, 2024); firm cash (CASH) is calculated as firm cash and short-term investments divided by total assets; fixed assets (PPE) as Net property, plant, and equipment plus mining property assets divided by total assets; sales growth (GROWTH) where current year sales divided by sales in the previous year minus one (Benjamin & Biswas, 2022).

To estimate the influence of ESG and Green Mining on firm value, the following research model is used:

$$TOBIN'SQ = a + \beta_1 ESG + \beta_2 GMIN + \beta_3 SIZE + \beta_4 ROA + \beta_5 CAPEX + \beta_6 LEVERAGE + \beta_7 \text{CASH} + \beta_8 PPE + \beta_9 GROWTH$$

The panel data approach used in this study allows the analysis of variable changes in a certain time range as well as identifying differences between observation units. To obtain the most suitable regression model, this study tested three estimation methods, namely Pooled Ordinary Least Squares (OLS), Fixed Effects Model (FEM), and Random Effects

Model (REM). In addition, the Hausman test is used to determine the best model to use in regression analysis. The study also conducted a series of diagnostic tests, including multicollinearity, heteroscedasticity, and autocorrelation tests, to ensure the reliability of regression results.

The entire data processing and statistical analysis process in this study was carried out using STATA 17, which is a data analysis software widely used in economic and financial research. With this comprehensive methodological approach, the research is expected to provide strong empirical findings regarding the role of ESG disclosure and green mining practices on company value.

3. RESULTS AND DISCUSSIONS

3.1 Results

Table 1 displays the descriptive statistics of this study which provides an overview of the characteristics of the variables used. For example, TOBIN'S Q has an average value of 0.945 with a standard deviation of 0.806, which indicates significant variation between companies. A minimum value of 0.128 indicates a firm with a much lower market value than total assets, while a maximum value of 4.857 indicates a firm with a very high market value. Meanwhile, ESG disclosures have an average value of 44 with a standard deviation of 22, which indicates varying levels of ESG disclosures, ranging from 0 (no disclosure) to 86 (high disclosure). Green Mining (GMIN) has an average of 4 with a standard deviation of 2, which indicates the firm's relatively low carbon emission disclosure level, with a minimum value of 0 and a maximum of 7.

Table 1. Descriptive Statistics

Variables	N	Mean	SD	Min.	Median	Max.
TOBIN'S Q	60	0.945	0.806	0.128	0.688	4.857
ESG	60	44	22	0	42	86
GMIN	60	4	2	0	3	7
SIZE	60	13.394	0.427	12.412	13.387	14.229
ROA	60	0.084	0.122	-0.098	0.054	0.585
CAPEX	60	0.401	0.316	-0.007	0.352	1.358
LEVERAGE	60	0.163	0.162	0.000	0.100	0.495
CASH	60	0.175	0.140	0.004	0.155	0.676
PPE	60	0.328	0.169	0.054	0.349	0.639
GROWTH	60	0.294	0.482	-0.359	0.259	2.018

Source: Data processed, 2025

The analysis revealed strong positive autocorrelation in the model (DW = 0.713), prompting the use of the Fixed Effects Model (FEM). FEM was selected based on Hausman's test, which showed it was more appropriate than the Random Effects Model (REM). FEM accounts for firm-specific characteristics that remain constant over time and may affect firm value, making it suitable for mining firms with unique traits like ownership structures and regulatory environments. To address correlation issues between variables, the Spearman's rho correlation test was used, as it is better suited for non-linear relationships and non-normally distributed data. The results of the Spearman's rho test are shown in Table 2.

Table 2. Correlations Spearman's rho

	TOBIN'S Q	ESG	GMIN	SIZE	ROA	CAPEX	LEVERAGE	CASH	PPE
ESG	0.082								
	0.535								
GMIN	0.032	0.805**							
	0.807	0.000							
SIZE	0.064	0.331**	0.378**						
	0.627	0.01	0.003						
ROA	0.326*	0.374**	0.370**	0.05					

	0.011	0.003	0.004	0.703					
CAPEX	-0.177	0.182	0.15	-.258*	-0.102				
	0.175	0.164	0.252	0.046	0.44				
LEVERAGE	-0.206	-0.095	-0.126	.306*	-.357**	-0.207			
	0.114	0.471	0.339	0.018	0.005	0.113			
CASH	0.15	0.107	0.13	0.13	0.470**	0.125	-0.22		
	0.251	0.414	0.321	0.323	0.000	0.341	0.091		
PPETA	0.095	0.152	0.209	0.136	-0.244	0.561**	-0.061	-0.118	
	0.469	0.246	0.109	0.299	0.06	0	0.645	0.371	
GROWTH	0.012	0.358**	0.421**	0.237	.534**	-0.097	-0.183	0.159	-0.147
	0.928	0.005	0.001	0.068	0.000	0.462	0.163	0.224	0.263

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
Source: Data processed, 2025

Based on Table 2, ROA is the only variable with a significant positive relationship with TOBIN'S Q. That is, the better the firm's financial performance (measured through return on assets), the higher the firm's value. Meanwhile, ESG, GMIN, and SIZE did not show a significant relationship with TOBIN'S Q. On the other hand, ESG and GMIN had a positive and significant relationship. This means that companies that have high ESG disclosures also tend to have a high level of Green Mining disclosure. This reflects that companies that care about the environment in general show good performance in these two dimensions. ESG and SIZE have a significant positive relationship. Larger companies tend to have better ESG disclosures, as they have more resources or external pressure (e.g., regulation or investors) to comply with ESG standards. GMIN and GROWTH have a significant positive relationship. Companies with high sales growth tend to do better in Green Mining disclosures. This shows that growing companies have more ability to report on environmental initiatives in mining activities.

Table 3. Regression Test Results

Variables	TOBIN's Q
ESG	0.007
	(1.32)
GMIN	-0.068
	(-1.39)
SIZE	-1.384**
	(-2.06)
ROA	2.527**
	(2.21)
CAPEX	-0.393
	(-0.61)
LEVERAGE	0.128
	(0.16)
CASH	-0.593
	(-0.49)
GROWTH	-0.205
	(-1.15)
Constant	19.517**
	(2.21)
Obs.	60
Number of Firm	20
F-test	2.06
R^2	25.7

** p>0.05
Source: Data Processed, 2025

The regression results show that the ESG (Environmental, Social, and Governance) and green mining (GMIN) variables do not have a significant influence on the firm's value as measured by Tobin's Q (table 3). An ESG coefficient of 0.007 with

insignificant t-statistics proves that the sustainability and social responsibility aspects do not affect investors' assessment of mining companies. This is due to a lack of transparency in ESG disclosures, a firm's short-term focus on profitability, and variations in ESG assessment methods that are not yet standardized. Meanwhile, the green mining variable which has a coefficient of -0.068 also does not show a significant influence due to the limited adoption of green mining practices, high implementation costs, and the lack of incentives or government policies that encourage sustainable practices in this industry. In contrast to ESG and GMIN, the SIZE and ROA variables have a significant effect on the firm's value. The firm size has a negative coefficient of -1,384 at a significance level of 5%, which proves that the larger the firm, the lower the value the market appreciates due to managerial complexity and lack of flexibility in dealing with market changes. In contrast, a significant profitability (ROA) of 2,527 at a rate of 5% indicates that the higher the profitability, the higher the firm's value, in line with the expectations of investors who value strong financial performance. However, this regression model has limitations in explaining the variation in firm values, as shown by the F-test value of 2.06 and the coefficient of determination (R^2) of 25.7%.

3.2. Discussions

ESG and Green Mining (GMIN) do not have a significant effect on a firm's value, which can indicate that sustainability factors and green mining practices are not yet a top priority in investors' assessment of mining companies. This aligns with the study conducted by De Vegvar, (2024) which found that the implementation of ESG has not been able to affect the financial performance of the ROA and ROE of the energy and mining sector in the United States both before and after the COVID-19 period. Meanwhile, profitability (ROA) has a significant influence on a firm's value. This indicates that investors tend to value companies with good financial performance. In addition, firm size (SIZE) has a significant negative influence on the value of the firm, which shows that the larger the firm, the more complex its management is, which can reduce efficiency and flexibility in responding to market changes. Leverage also has a significant effect on a firm's value, suggesting that high levels of debt can negatively impact investors' perception of a firm's value.

The results of this study confirm that profitability is a major factor in the valuation of a firm's value by investors, in line with signaling theory and performance-based financial theory (Situmorang & Sanga, 2023). However, these findings also challenge the view that ESG factors and sustainability practices directly increase the value of companies, especially mining companies. During the COVID-19 pandemic, the sustainability aspect of the mining sector is still considered an additional cost that does not directly contribute to the increase in firm value in the short term. Investors tend to see that operational risk and commodity price volatility have a greater effect on a firm's value than ESG factors and green mining practices. Therefore, to increase the relevance of ESG in investor assessment, efforts are needed to improve transparency, reporting consistency, and the development of policies that link sustainability practices to improved long-term financial performance. In terms of practice, these results provide insight for mining firm management that increasing profitability is more important in attracting investors' attention than increasing ESG disclosure (Sanga et al., 2024) or green mining practices. Firm management must also be more careful in managing the capital structure to avoid the negative impact of high leverage levels.

This research has several limitations that need to be considered. *First*, the dynamics of the mining industry which is greatly influenced by fluctuations in global commodity prices (Boako et al., 2020). Unexpected price changes can significantly impact a firm's financial performance and market value, making it difficult to assess the ESG impact and green mining practices consistently. *Second*, differences in the use of

measurement indicators between studies can lead to variations in the interpretation of results, potentially leading to less accurate conclusions. Therefore, future research is recommended to consider a wider range of macroeconomic variables and develop more uniform measurement standards to improve the validity and reliability of findings related to the relationship between ESG, green mining, and corporate value. One measure that can be used is to calculate the value of a firm by combining ESG and EVA methodologies (Sanga & Situmorang, 2024).

Companies that increase transparency and accountability in ESG disclosures can contribute to sustainable development and increase public trust in the mining industry (Husnah & Fahlevi, 2023). However, the lack of uniform standards in ESG reporting can pose a risk of greenwashing, where companies tend to overestimate their sustainability performance to improve public image. Therefore, stricter regulation and the use of digital technology are needed to improve the accuracy and transparency of ESG reporting. In addition, wise leverage management can preserve the firm's value in the eyes of investors and other stakeholders.

4. CONCLUSION

The study highlights the factors that affect a firm's value, with a focus on ESG disclosure, green mining practices, as well as control variables such as firm size and profitability. The results of the analysis show that ESG and green mining (GMIN) do not have a significant influence on the value of companies measured using Tobin's Q. This reflects that during the COVID-19 pandemic, sustainability factors and green mining practices have not been prioritized enough by investors in firm valuations. In contrast, profitability (ROA) has a significant influence on a firm's value, indicating that investors pay more attention to strong financial performance as a key indicator in determining a firm's market value. Firm size (SIZE) shows a negative influence on the value of the firm, which reflects that the larger the firm, the more complex its management, so that it can reduce flexibility and efficiency in responding to market dynamics.

This finding suggests that investors, particularly during times of economic uncertainty, tend to prioritize short-term financial stability over long-term sustainability initiatives. The lack of significance in ESG and green mining variables may also indicate that regulatory pressures and incentives for sustainable practices in the mining sector were not strong enough to influence investor behavior. Additionally, this result aligns with previous studies that argue ESG disclosures and sustainability efforts often require a longer time horizon before their impact on firm value becomes evident. Future research should consider incorporating a broader set of macroeconomic variables, such as exchange rates, inflation, and interest rates, to better capture the external factors affecting the mining industry. Additionally, standardizing ESG and green mining measurement frameworks across studies could enhance comparability and consistency in findings. Integrating alternative valuation methods, such as combining ESG and Economic Value Added (EVA) methodologies, may provide a more comprehensive assessment of a firm's sustainability and financial performance. Moreover, longitudinal studies covering a more extended period could help account for fluctuations in commodity prices and provide deeper insights into the long-term impact of ESG and green mining practices on corporate value.

Based on the results of this study, there are several recommendations for various stakeholders: First, mining companies in Indonesia need to improve the transparency and quality of ESG disclosures and green mining practices to be more credible and reliable for investors. The use of global reporting standards such as the Global Reporting Initiative (GRI) or the Sustainability Accounting Standards Board (SASB) will ensure that the disclosures are not only symbolic but also provide a tangible picture of the firm's sustainability performance. Thus, investors can more easily assess the impact of ESG on

the firm's value objectively. Second, the government must strengthen regulations and provide incentives for companies that implement sustainable mining practices. More favorable tax policies, subsidies for environmentally friendly technologies, and reward mechanisms for companies with the best ESG performance can be strategic steps to increase the adoption of green mining in Indonesia's mining industry. In addition, stricter supervision is needed to avoid greenwashing practices that could damage market confidence. Third, investors and stakeholders must start considering ESG and green mining aspects as part of their long-term investment strategy. With increasing awareness of sustainability issues, investors need to integrate ESG factors in their risk analysis and investment decision-making. Additionally, more research is needed to explore the long-term relationship between ESG, green mining, and corporate value, as well as how external factors such as commodity price volatility and government policies can moderate those relationships.

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