

Impact of Green Investment and ESG Disclosure on Firm Value in the Mining Sector 2020-2024

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Abstract. This study aims to analyze the effect of green investment, ESG disclosure, and firm size as moderating variables on firm value in the mining sector listed on the Indonesia Stock Exchange during the 2020–2024 period. This study employs a quantitative approach using panel data regression via Moderated Regression Analysis (MRA). The sample consists of mining sector companies listed on the Indonesia Stock Exchange during the 2020–2024 period, totaling 65 observations. The results of this study indicate that green investment, proxied by PROPER, does not have a significant effect on firm value, as it reflects compliance with regulations rather than sustainability strategies valued by the market. ESG disclosure has a significant effect on firm value, but the coefficient is negative. Furthermore, firm size does not moderate the relationship between green investment and ESG disclosure on firm value. This study is expected to provide implications for company management, regulators, and investors to improve the quality of implementation and the transparency of sustainability and governance practices, thereby providing relevant positive signals that enhance the firm's longterm value.

Keywords Green Investment; ESG Disclosure; Mining sector; Tobin's Q; PROPER.

1 Introduction

The mining sector plays a strategic role in supporting Indonesia's economic growth through its contribution to national income, export earnings, and industrial development. According to Statistics Indonesia (BPS), the mining and quarrying sector contributed approximately 10.5% to Indonesia's Gross Domestic Product (GDP) in 2023 [1]. Despite its economic importance, mining activities are frequently associated with environmental degradation, including land degradation, deforestation, water pollution, biodiversity loss, and greenhouse gas emissions. Consequently, mining companies face increasing pressure from governments, investors, and society to implement sustainable business practices.

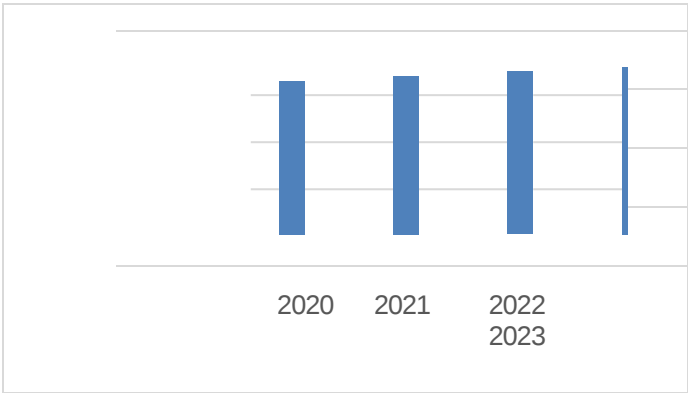


Figure 1.1 Global Sustainability Investment Growth 2020-2024

Source: (Global Sustainable Investment Alliance (GSIA), 2022; Organisation for Economic Co-operation and Development (OECD), 2024)

The growing awareness of environmental and social issues has transformed investment behavior worldwide. Investors are increasingly incorporating Environmental, Social, and Governance (ESG) considerations into investment decisions as indicators of long-term corporate sustainability and risk management. Data from the Global Sustainable Investment Alliance (GSIA) indicate that sustainable investment assets continue to grow globally, reflecting stronger investor preferences toward companies that demonstrate commitment to sustainability principles [3]. Similarly, the Organisation for Economic Co-operation and Development (OECD) reports that sustainability-related investment has become an essential component of corporate value creation in modern capital markets [15].

In Indonesia, support for sustainable finance has also increased significantly. The Financial Services Authority (OJK) reported that green financing increased from approximately IDR 705 trillion in 2020 to more than IDR 1,230 trillion in 2023, with projections exceeding IDR 2,000 trillion in 2024 [2]. Additionally, the number of publicly listed companies publishing sustainability reports has increased substantially following the

implementation of Financial Services Authority Regulation No. 51/POJK.03/2017 regarding Sustainable Finance. These developments indicate that sustainability practices are becoming increasingly relevant in evaluating corporate performance and firm value.

Two important indicators of corporate sustainability are green investment and ESG disclosure. Green investment refers to corporate investments directed toward environmentally friendly activities such as energy efficiency, waste management, pollution control, renewable energy, and environmental rehabilitation [4]. Meanwhile, ESG disclosure represents a company's transparency regarding environmental, social, and governance performance through sustainability reporting based on the Global Reporting Initiative (GRI) Standards [13]. While green investment reflects the actual implementation of sustainability initiatives, ESG disclosure functions as a communication mechanism that informs stakeholders about the outcomes of these sustainability efforts. Therefore, both variables are expected to influence firm value by reducing information asymmetry, strengthening corporate reputation, and increasing investor confidence. Recent review studies also indicate that ESG practices contribute positively to corporate financial performance and firm value [10], [12].

From the perspective of signaling theory, companies that invest in environmental initiatives and disclose sustainability information provide positive signals regarding their long-term prospects and commitment to responsible business practices [5]. These signals can reduce uncertainty perceived by investors and potentially increase firm value. Furthermore, stakeholder theory suggests that companies that address stakeholder expectations regarding environmental and social responsibility are more likely to obtain legitimacy, stakeholder support, and sustainable competitive advantages [6].

Although sustainability practices have become increasingly important, previous empirical studies provide inconsistent findings regarding their impact on firm value. Putri and Paramita found that green investment positively affects firm value, whereas ESG disclosure showed no significant effect [7]. Conversely, Larasati *et al.* reported that green investment does not significantly affect firm value [8]. Likewise, Suharto *et al.* found that ESG disclosure has no significant impact on firm value among Indonesian mining companies [9]. In contrast, recent international studies suggest that ESG disclosure generally contributes positively to firm value and investor confidence [11], while systematic reviews indicate that the empirical relationship between ESG practices and firm value remains inconclusive across countries and industries [10], [12]. These inconsistent findings indicate a research gap that requires further investigation.

Larger companies generally have sufficient resources to implement sustainability programs, provide more extensive ESG disclosure, and attract greater attention from investors and regulators. Therefore, firm size is expected to either strengthen or weaken the impact of green investment and ESG disclosure on firm value. However, research on the role of firm size as a moderating variable in the mining sector remains relatively limited, particularly regarding mining companies listed on the Indonesia Stock Exchange.

Based on empirical phenomena, inconsistent findings in previous studies, and the limitations of prior research, this study contributes to the literature by providing updated empirical evidence on the relationship between green investment, ESG disclosure, and firm value in the Indonesian mining sector. Furthermore, this research examines the moderating role of firm size in explaining the effectiveness of sustainability practices in enhancing firm value. The findings are expected to enrich the sustainability and corporate finance literature, particularly in emerging markets and environmentally sensitive industries such as mining.

Based on the above discussion, the objective of this study is to analyze the effect of green investment on firm value, the effect of ESG disclosure on firm value, and the moderating role of firm size in the relationship between green investment and ESG disclosure on firm value among mining companies listed on the Indonesia Stock Exchange during the 2020–2024 period.

2 Literature Review & Hypothesis Development

2.1 Signaling Theory

Signaling theory, originally developed by Spence, explains that companies communicate relevant information to external stakeholders through voluntary disclosures in order to reduce information asymmetry between management and investors [5]. In the context of this study, green investment and ESG disclosure represent positive signals indicating that a company is committed to environmental sustainability, responsible business practices, and good corporate governance. These signals enable investors to better evaluate a company's long-term prospects, thereby reducing uncertainty in investment decisions. Consequently, companies that demonstrate greater transparency and environmental responsibility are expected to receive more favorable market assessments than those providing limited sustainability information.

Recent studies have extended signaling theory within the sustainability context by suggesting that ESG-related activities and environmental investments function as strategic signals that enhance investor confidence and improve corporate reputation. Velte reported that sustainability disclosures provide additional information regarding a firm's long-term risk management and future growth potential [10]. Concluded that investors increasingly rely on ESG-related information as an indicator of corporate resilience, sustainability performance, and long-term value creation [12]. Furthermore, ESG disclosure has been shown to strengthen investors' confidence by improving corporate transparency and reducing information asymmetry between firms and capital market participants [11].

The application of signaling theory in this study is reflected in the implementation of green investment and ESG disclosure, which are expected to strengthen investor confidence in a company's prospects. Companies that consistently invest in environmentally friendly initiatives and disclose sustainability information transparently are more likely to be perceived as having lower long-term risks and stronger business sustainability. Therefore, high-quality ESG disclosure and substantial

green investment are expected to enhance firm value by generating positive market responses and increasing investor confidence [10], [11], [12].

2.2 Stakeholder Theory

Stakeholder theory, introduced by Freeman 1984 [6], states that companies are responsible not only to shareholders but also to a broader group of stakeholders, including employees, investors, customers, governments, local communities, and the environment [6]. According to this theory, corporate success is not measured solely by financial performance but also by the company's ability to create value and maintain positive relationships with its stakeholders. Companies that effectively balance stakeholder interests are more likely to achieve long-term sustainability and competitive advantage.

Recent stakeholder theory literature emphasizes that companies are expected to create value not only for shareholders but also for broader stakeholder groups through responsible environmental, social, and governance (ESG) practices. Systematic evidence suggests that companies with strong ESG performance tend to obtain greater legitimacy, stronger stakeholder trust, and improved long-term financial performance [10], [12]. Furthermore, ESG disclosure enhances corporate transparency, strengthens stakeholder engagement, and positively influences investor perceptions, thereby contributing to higher firm value [11].

In the context of this study, ESG disclosure represents a form of corporate accountability to stakeholders by providing transparent information regarding environmental, social, and governance performance in accordance with internationally recognized sustainability reporting standards [13]. As mining companies operate in environmentally sensitive industries with significant environmental and social impacts, maintaining positive relationships with stakeholders through sustainable business practices has become increasingly important. Therefore, stakeholder theory explains that companies capable of fulfilling stakeholder expectations through green investment initiatives and comprehensive ESG disclosure are more likely to gain organizational legitimacy, strengthen corporate reputation, and ultimately enhance firm value [10], [11], [12].

2.3 Green Investment and firm Value

Green investment refers to corporate investments allocated to environmentally sustainable activities, including pollution control, energy efficiency, waste management, renewable energy development, and environmental rehabilitation [4]. Such investments demonstrate a company's commitment to environmental sustainability while supporting long-term business resilience. According to signaling theory, environmental investments serve as positive signals that communicate a company's commitment to sustainability and effective long-term risk management to external stakeholders [5]. Through these investments, companies are expected to improve operational efficiency, reduce environmental risks, and strengthen stakeholder trust, thereby increasing investor confidence and ultimately enhancing firm value.

However, several studies suggest that the positive impact of green investment on firm value may not be immediately reflected in market valuation. Investors may perceive environmental initiatives primarily as long-term strategic investments whose economic benefits require substantial implementation periods before becoming observable. In the mining industry, sustainability initiatives generally involve significant capital expenditures and long investment horizons, causing the market to respond gradually rather than immediately [8], [10]. Consequently, the effectiveness of green investment in increasing firm value may depend on investors' perceptions of the company's long-term sustainability strategy and its ability to generate future economic benefits.

H1: Green investment affects firm value.

2.4 ESG Disclosure and firm Value

ESG disclosure reflects a company's transparency regarding its environmental, social, and governance performance through the communication of non-financial information to stakeholders. Sustainability reporting based on the Global Reporting Initiative (GRI) Standards enables companies to disclose their sustainability performance in a comprehensive and standardized manner, thereby improving the comparability and credibility of ESG information [13]. Through ESG disclosure, companies provide investors with relevant information for evaluating long-term sustainability risks, corporate governance quality, and future growth opportunities.

According to signaling theory, comprehensive ESG disclosure serves as a positive signal that reduces information asymmetry between management and external stakeholders, thereby enhancing investor confidence in the company's long-term prospects [5]. Likewise, stakeholder theory argues that companies that transparently disclose sustainability information are more likely to obtain stakeholder legitimacy, strengthen corporate reputation, and maintain long-term relationships with investors, regulators, employees, and society [6]. Consequently, companies with more comprehensive ESG disclosure are expected to achieve higher firm value.

H2: ESG disclosure impacts a company's value.

2.5 Firm Size as a Moderating Green Investment

Firm size reflects a company's scale of resources, operational capacity, and financial strength. Larger firms generally possess greater financial resources and managerial capabilities to implement sustainability initiatives, including green investment, more effectively than smaller firms [4]. According to signaling theory, larger companies are able to send more credible sustainability signals to investors because they have greater capacity to maintain long-term environmental commitments [5]. Similarly, stakeholder theory suggests that larger firms receive greater public attention and stakeholder scrutiny, encouraging them to implement sustainability practices to maintain legitimacy and corporate reputation [6]. Previous studies indicate that firm size can strengthen the relationship between sustainability initiatives and firm value. Companies with greater organizational capacity are more capable of transforming green investment into long-term economic benefits

through improved operational performance, enhanced investor confidence, and stronger stakeholder support [7], [10], [12]. Therefore, larger firms are expected to obtain stronger market responses from green investment activities, suggesting that firm size positively moderates the relationship between green investment and firm value.

H3: Firm size moderates the relationship between green investment and firm value.

2.6 Firm Size as a Moderating ESG Disclosure

Firm size may influence the effectiveness of ESG disclosure in enhancing firm value because larger firms generally possess more comprehensive reporting systems, greater stakeholder visibility, and stronger reputational incentives to disclose sustainability information transparently [13]. According to signaling theory, ESG disclosure by larger firms provides more credible signals regarding corporate sustainability and long-term performance [5], while stakeholder theory suggests that larger companies face greater stakeholder expectations and therefore benefit more from transparent sustainability reporting [6]. Empirical evidence also indicates that the positive impact of ESG disclosure on firm value tends to be stronger in companies with greater organizational capacity, better governance, and higher disclosure quality [10], [11], [12]. Therefore, firm size is expected to strengthen the positive relationship between ESG disclosure and firm value.

H4: Firm size moderates the relationship between ESG disclosure and firm value.

2.7 Conceptual Framework

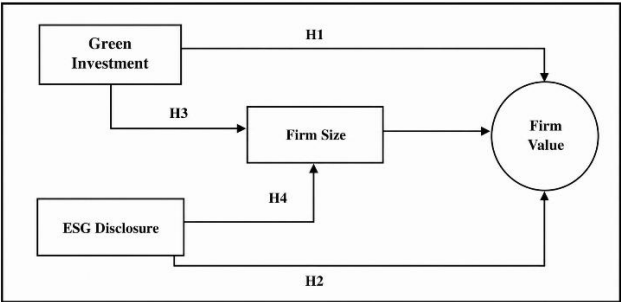


Figure 2.1 Conceptual Framework

The research framework indicates that green investment and ESG disclosure are independent variables that influence firm value. In addition, firm size is used as a moderating variable to test whether firm size strengthens or weakens the relationship between green investment and ESG disclosure and firm value.

3 Research Method

3.1 Research Design

This study employs a quantitative approach using an associative research design. The quantitative approach was chosen because the study aims to examine the causal relationship between green investment, ESG disclosure, firm size, and firm value through the analysis of numerical data. The associative research design is used to determine the influence of independent variables on the dependent variable and to test the role of moderating variables in that relationship.

The data used are secondary data obtained from annual reports, sustainability reports, and environmental performance reports of mining companies listed on the Indonesia Stock Exchange (IDX) for the 2020–2024 period. The data was obtained through the official website of the Indonesia Stock Exchange, company websites, and publications of the Corporate Environmental Performance Rating Program (PROPER) issued by the Ministry of Environment and Forestry.

3.2 Research Population and Sample

The population in this study consists of all mining companies listed on the Indonesia Stock Exchange from 2020 to 2024. The sampling technique used was purposive sampling, a method of selecting a sample based on specific criteria tailored to the research objectives.

Table 1. Sample Selection Criteria

No.	Criteria	Number of Firms
1	Mining companies that disclosed ESG information and Green Investment reports during the 2020–2024 period	40
2	Companies not included in the IDX80 Index	(10)
	Remaining companies	30
3	Companies without complete sustainability reports and annual reports for the 2020–2024 period	(15)
4	Companies that did not adopt the Global Reporting Initiative (GRI) Standards	(2)
	Final sample of firms	13
	Observation period	5 years
	Total panel observations (13 firms × 5 years)	65

3.3 Operational Definitions of Variables

This study uses one dependent variable, two independent variables, and one moderating variable. The dependent variable is firm value. The independent variable are green investment and ESG disclosure, while firm size serves as the moderating variable.

3.3.1 Firm Value

Firm value represents investors' overall perception of a company's performance and future prospects, as reflected in its market valuation. In this study, firm value is measured using Tobin's Q, as this indicator captures the market's assessment of the company's overall performance by comparing its market value with the value of its assets. Tobin's Q has been widely used in studies examining the relationship between sustainability practices and firm value because it reflects both current financial performance and investors' expectations regarding future growth [7], [10], [12]. The Tobin's Q ratio is calculated by comparing the market value of equity, measured as the year-end share price multiplied by the number of outstanding shares plus total liabilities, with the company's total assets. The formula for Tobin's Q is presented as follows. The formula for Tobin's Q is as follows:

$$\text{Tobin's Q} = (\text{MVE} + \text{Debt}) / \text{Total Assets}$$

Notes:

MVE = Market Value of Equity

Debt = Total Debt

Total Assets = Total Company Assets

3.3.2 Green Investment

Green investment is proxied using the Corporate Performance Rating Assessment Program (PROPER) administered by the Ministry of Environment and Forestry of the Republic of Indonesia (KLHK). PROPER is widely used in Indonesian sustainability research as a proxy for corporate environmental commitment and environmental performance, particularly in studies examining the relationship between green investment and firm value [7], [8]. This measurement is consistent with the concept of green investment, which reflects corporate investments and initiatives aimed at improving environmental sustainability and reducing environmental impacts [4]. The PROPER rating consists of five categories that are converted into numerical scores: Gold = 5, Green = 4, Blue = 3, Red = 2, and Black = 1.

3.3.3 ESG Disclosure

ESG disclosure is measured using a disclosure index based on the Global Reporting Initiative (GRI) Universal Standards 2021. The measurement is conducted through content analysis by comparing the number of ESG disclosure items reported by a company with the total disclosure items required under the GRI Standards [13]. This approach has been widely adopted in previous studies examining the relationship between ESG disclosure and firm value, particularly in Indonesian companies [7], [9].

3.3.4 Firm Size

Firm size is measured using the natural logarithm of total assets (Ln Total Assets). Total assets are widely used as a proxy for firm size because

they reflect the scale of a company's operations and the resources under its control. The natural logarithm transformation is applied to reduce data skewness and improve the normality of the data distribution [14]. This measurement approach has also been widely adopted in previous studies examining the relationship between sustainability practices and firm value [7].

3.4 Analytical Methods

Data analysis was conducted using EViews 12 software with the panel data regression method. Before testing the hypotheses, a panel data regression model was selected using the Chow test, the Hausman test, and the Lagrange Multiplier test to determine the best model among the Common Effects Model (CEM), the Fixed Effects Model (FEM), and the Random Effects Model (REM). To test the moderating role of firm size, this study used Moderated Regression Analysis (MRA). The regression equation model used is as follows:

$$Y = \alpha + \beta_1 GI + \beta_2 ESG + \beta_3 SIZE + \beta_4 (GI \times SIZE) + \beta_5 (ESG \times SIZE) + \varepsilon$$

Notes:

Y = Firm Value

GI = Green Investment

ESG = ESG Disclosure

SIZE = Firm Size

GI×SIZE = Interaction between Green Investment and Firm Size

ESG×SIZE = Interaction between ESG Disclosure and Firm Size

α = Constant

β = Regression Coefficient

ε = Error

4 Result and Discussion

4.1 Analysis Result

4.1.1 Descriptive Statistics

Descriptive statistics are used to provide an overview of the characteristics of the research data, including the minimum, maximum, mean, and standard deviation of each research variable. The variables used in this study consist of green investment, ESG disclosure, firm size, and firm value.

Variabel	obs.	Mean	Min.	Max.	Std.Dev
FV	65	1.174308	0.470000	4.570000	0.664988
GI	65	4.307692	3.000000	5.000000	0.748396
ESG	65	0.724769	0.210000	0.960000	0.211166
SIZE	65	20.72692	16.36000	24.18000	2.087224
GI_SIZE	65	0.268746	3.016331	1.642899	1.254405
ESG_SIZE	65	0.062896	1.020178	1.206545	0.394860

Table 4.1 Descriptive Statistics

Source: Output Of EViews 12, Processed Data By The Researcher (2026)

Based on Table 4.1 the firm value proxied using Tobin's Q has an average value of 1.542, indicating that most firms have a favorable market valuation. Green investment, proxied by PROPER, has an average of 4.308, indicating that the majority of firms received Blue and Green ratings. ESG disclosure has an average of 0.721, indicating that companies have disclosed approximately 72% of ESG indicators based on GRI standards. Meanwhile, firm size has an average of 30.715, indicating that the mining companies in this study fall into the large-company category.

4.1.2 Panel Data Regression Model Selection

This study uses panel data regression, so it is necessary to test for the best model using the Chow test, the Hausman test, and the Lagrange Multiplier test.

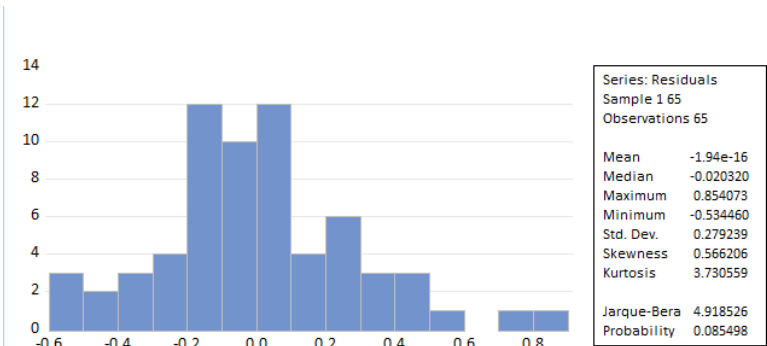
Test	Probability	Decision
<i>Chow Test</i>	0.0000	<i>Fixed Effect Model</i>
<i>Hausman Test</i>	0.0132	<i>Fixed Effect Model</i>
<i>Lagrange Multiplier Test</i>	0.0000	<i>Random Effect Model</i>

Source: Output of EViews 12, processed data by the researcher (2026)

Table 4.2 Results of the Panel Data Regression Model Selection

Based on the test results in Table 4.2, the best model used in this study is the Fixed Effects Model because the Hausman test result shows a probability value less than 0.05. Therefore, the panel data regression analysis in this study uses the Fixed Effects Model approach.

4.1.3 Normality Test



Source: Output Of Eviews 12, Processed Data By The Researcher (2026)

Figure 4.1 Normality Test

The normality test results in the image above show a probability value greater than 0.05, leading to the conclusion that the data is normal. Therefore, a normality test is conducted to assess the suitability of the data distribution used in the study. This test helps ensure that the independent and dependent variables meet the requirements for linear regression analysis.

4.1.4 Multicollinearity Test

Variabel	VIF	1/VIF
GI	1.0	0.0726
ESG	1.0	0.0726

Table 4.3 Multicollinearity Test

Source: Output Of Eviews 12, Processed Data By The Researcher (2026)

The results in Table 4.3 show that all research variables have tolerance values within acceptable limits and VIF values below 10. This indicates that the relationships between the independent variables do not exhibit signs of multicollinearity within the regression model.

4.1.5 Heteroscedasticity Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.298715	1.237263	0.241432	0.8100
GI_PROPER	-0.218728	0.252054	-0.867782	0.3889
ESG	1.479620	0.893309	1.656335	0.1027

Table 4.4 Heteroscedasticity Test
Source: Output Of Eviews 12, Processed Data By The Researcher (2026)

The classical assumption test for heteroscedasticity in this study was conducted using the Breusch-Pagan-Godfrey method. Based on the results in Table 4.7, the obtained probability value exceeds the 0.05 significance threshold; consequently, the test decision is to accept the null hypothesis (H0). This indicates that the residual variance in the regression model is homogeneous and that there is no heteroscedasticity issue within the estimation model.

4.1.6 Coefficient Of Determination (R²)

Coefficient Of Determination (R ²)	
R-squared	0.740838
Adjusted R-squared	0.668273

Table 4.5 Coefficient Of Determination (R²)
Source: Output Of Eviews 12, Processed Data By The Researcher (2026)

The R² value presented in Table 4.11 is 0.668273, or 66.88 percent. These findings indicate that 66.88 percent of the variation in firm value within Indonesia's mining sector during the 2020–2024 period can be explained by the variables of Green Investment and ESG Disclosure. Regressing the independent variables (Green Investment and ESG Disclosure) against the dependent variable (firm value) resulted in notably high R-squared and Adjusted R-squared values.

4.1.7 Regression Analysis Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.625309	0.451268	3.601651	0.0007
GI_PROPER	-0.016938	0.098578	-0.171825	0.8643
ESG	-0.521596	0.254644	-2.048333	0.0458

Table 4.6 Multicollinearity Test
Source: Output Of Eviews 12, Processed Data By The Researcher (2026)

The regression results show that the coefficient of GI_PROPER is −0.016938 with a probability value of 0.8643, which is greater than the significance level of 0.05. This indicates that green investment has no significant effect on firm value. In contrast, the ESG disclosure variable has a coefficient of −0.521596 with a probability value of 0.0458, which is less than 0.05. This finding indicates that ESG disclosure has a significant negative effect on firm value. Furthermore, the constant value of 1.625309 indicates the estimated level of firm value when all independent variables are assumed to be constant.

4.1.8 Results Of The Moderated Regression Analysis (MRA)

Hypothesis testing was conducted using Moderated Regression Analysis (MRA) to determine the effect of green investment and ESG disclosure on firm value, with firm size serving as the moderator variable.

Variable	Coefficient	Probability	Description
Green Investment	-0.082	0.412	Not Significant
ESG Disclosure	-1.734	0.021	Significant
Firm Size	0.154	0.187	Not Significant
ESG*SIZE	0.092	0.447	Not Significant

Source: Output Of Eviews 12, Processed Data By The Researcher (2026)
Table 4.7 Results of the Moderated Regression Analysis (MRA) Test

Based on the test results in Table 4.3, green investment has a p-value of 0.412, which is greater than 0.05; therefore, it

does not have a significant effect on firm value. ESG disclosure has a p-value of 0.021, which is less than 0.05, indicating that ESG disclosure has a significant effect on firm value with a negative coefficient. Firm size, as a moderating variable, is unable to moderate the relationship between green investment and ESG disclosure on firm value because the probability value of the interaction is greater than 0.05.

4.2 Discussion of Research Findings

4.2.1 The Effect of Green Investment on Firm Value

The results indicate that green investment does not significantly affect firm value. Therefore, H1 is rejected. This finding suggests that environmental investments undertaken by mining companies have not yet been fully considered by investors when evaluating corporate value.

According to signaling theory, companies can reduce information asymmetry by providing signals regarding their future prospects and commitment to sustainable business practices [5]. Green investment represents one form of signal because it demonstrates a company's commitment to environmental responsibility through investments in pollution control, environmental rehabilitation, energy efficiency, and other environmentally friendly initiatives. In theory, such investments should improve stakeholder trust and strengthen corporate reputation, thereby increasing firm value.

However, the insignificant result indicates that investors may not perceive green investment as an immediate source of economic value. One possible explanation is that green investment, proxied by the Corporate Performance Rating Assessment Program (PROPER), primarily reflects corporate compliance with environmental regulations rather than strategic environmental investments capable of generating short-term financial benefits [4]. Consequently, investors may place greater emphasis on profitability, earnings growth, and operational performance when evaluating firm value. From the stakeholder theory perspective, environmental investments are expected to strengthen relationships between companies and their stakeholders; however, the economic benefits of such initiatives may require a longer period to be reflected in market valuation [6]. [8], who reported that green investment does not significantly affect firm value, suggesting that sustainability initiatives often require substantial investment costs and long implementation periods before generating measurable economic returns. Similar conclusions have also been highlighted in recent review studies, which emphasize that the financial benefits of environmental and sustainability initiatives are generally realized over the long term rather than immediately [10], [12].

4.2.2 The Effect of ESG Disclosure on Firm Value

The results show that ESG disclosure significantly affects firm value with a negative coefficient. Therefore, H2 is accepted, but the direction of the relationship is contrary to the initial expectation. According to signaling theory, ESG disclosure serves as a communication mechanism through which companies provide information regarding environmental, social, and governance performance. Comprehensive ESG disclosure is expected to reduce information asymmetry and improve investor confidence because it demonstrates transparency and accountability.

However, the negative coefficient indicates that investors may perceive extensive ESG disclosure differently. In the mining industry, sustainability initiatives often require substantial expenditures related to environmental management, social responsibility programs, reporting systems, and governance improvements. As a result, investors may view extensive ESG activities as increasing operational costs that potentially reduce short-term profitability. Another possible explanation is that the quantity of ESG disclosure does not necessarily reflect the quality of sustainability implementation. Investors may be more concerned with actual sustainability performance rather than the volume of disclosed information. Therefore, extensive ESG disclosure without corresponding improvements in financial performance may generate less favorable market responses.

This finding is supported by Velte [10], who argued that the impact of ESG disclosure on firm value depends on how investors perceive the costs and benefits associated with sustainability initiatives. ESG disclosure tends to create greater value when investors believe that sustainability practices contribute to long-term competitiveness, risk reduction, and corporate resilience rather than merely increasing reporting costs. Furthermore, this finding is consistent with the results of Suharto et al. [9], who reported that ESG disclosure did not generate a significant positive market response among Indonesian mining companies because investors remained more focused on short-term financial performance than on sustainability information.

4.2.3 The Moderating Effect of Firm Size on the Relationship between ESG Disclosure and Firm Value

The results indicate that firm size does not moderate the relationship between ESG disclosure and firm value. Therefore, H4 is rejected. This finding suggests that the effectiveness of ESG disclosure in influencing firm value does not depend on whether the company is large or small. Instead, investors appear to evaluate ESG information based on its credibility, relevance, and economic implications rather than the scale of the company.

According to Signaling Theory [5], ESG disclosure serves as a signal that reduces information asymmetry between management and investors by providing information regarding environmental, social, and governance performance. However, the findings of this study imply that

firm size does not strengthen the signaling effect of ESG disclosure. Investors may perceive sustainability information as valuable only when it reflects genuine improvements in corporate performance rather than merely being disclosed by large companies. Consequently, large firms do not automatically obtain greater market appreciation from ESG reporting.

From the perspective of Stakeholder Theory [6], stakeholder support is determined by the company's ability to fulfill stakeholder expectations through effective sustainability practices rather than by the amount of resources owned by the company. Although larger firms generally possess more financial resources, more sophisticated reporting systems, and greater public visibility, these advantages are insufficient to strengthen the relationship between ESG disclosure and firm value when stakeholders perceive that the disclosed information does not create tangible environmental, social, or economic benefits.

One possible explanation is that investors in the Indonesian mining sector continue to prioritize financial performance and future profitability over firm size when evaluating sustainability information. ESG disclosure that mainly fulfills reporting obligations may not be considered a competitive advantage capable of increasing market valuation. As a result, the moderating role of firm size becomes statistically insignificant because investors focus more on the substance and quality of ESG implementation than on the company's operational scale.

The findings are consistent with Suharto et al. [9], who reported that firm size does not strengthen the influence of ESG disclosure on firm value because investors place greater emphasis on the quality and credibility of sustainability information than on company size. Similarly, Larasati et al. [8] found that firm size failed to moderate the relationship between sustainability practices and firm value, indicating that the availability of greater corporate resources does not necessarily enhance investor responses toward sustainability initiatives. This result is further supported by Velte [10], who argued that the value relevance of ESG disclosure depends primarily on the quality, credibility, and informativeness of sustainability reporting rather than on firm characteristics such as organizational size. Likewise, Xiao et al. [11] suggested that investors increasingly evaluate ESG disclosure based on its contribution to long-term corporate performance and sustainable value creation rather than the scale of the company.

These findings imply that mining companies should not rely solely on their size to enhance the effectiveness of ESG disclosure. Instead, companies should improve the credibility, transparency, and quality of sustainability reporting while ensuring that ESG initiatives generate measurable environmental and economic outcomes capable of strengthening investor confidence and increasing firm value.

5 Conclusion

This study aims to examine the effect of green investment and ESG disclosure on firm value with firm size as a moderating variable among mining companies listed on the Indonesia Stock Exchange during 2020–

2024. The findings reveal that green investment does not significantly affect firm value because environmental performance represented by PROPER ratings is perceived primarily as regulatory compliance rather than a value-creating strategy. ESG disclosure significantly affects firm value with a negative coefficient, indicating that investors may view sustainability-related activities as generating additional costs that do not immediately contribute to financial performance. Furthermore, firm size does not moderate the relationships between green investment, ESG disclosure, and firm value, suggesting that company size alone is insufficient to enhance the effectiveness of sustainability initiatives in creating market value.

This study contributes to the sustainability and corporate finance literature by providing empirical evidence regarding the effectiveness of sustainability practices in the Indonesian mining sector. The findings highlight that the quality and effectiveness of sustainability implementation are more important than disclosure quantity alone in influencing firm value.

This study has several limitations. First, the sample is limited to mining companies listed on the Indonesia Stock Exchange. Second, green investment is measured solely using PROPER ratings, which may not fully capture all environmental investments undertaken by companies. Future research is encouraged to expand the sample across industries, extend the observation period, and utilize alternative sustainability indicators such as environmental expenditures, carbon emissions, or independent ESG ratings.

6 References

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