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ROE as A Moderating Influence of ESG, Green Innovation and Carbon Emission Disclosure on Firm Value

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ABSTRACT

This study evaluates the impact of Environmental, Social, and Governance (ESG), Green Innovation, and Carbon Emission Disclosure on Firm Value, with Return on Equity (ROE) as a moderating variable. In a business environment increasingly emphasising sustainability and complexity, this study uses secondary data from financial statements from mining sector companies listed on the Indonesia Stock Exchange (IDX) from 2020 to 2022. The independent variables in this study include ESG, environmentally friendly innovation, and carbon emission disclosure, while the company value serves as the dependent variable and ROE as the moderator. Multiple regression and Moderated Regression Analysis (MRA) methods were used to analyse the direct relationship and moderation effects. The research findings indicate that the three independent variables positively and significantly impact the company's value. In addition, ROE has been proven to strengthen the influence of ESG, green innovation, and emission disclosure on company value. Companies with higher ROE tend to correlate more strongly with sustainability practices and increased company value.

INTRODUCTION

In an increasingly complex and global business era, sustainability is one of the main issues faced by business people. Investors, customers and other stakeholders are increasingly demanding transparency and accountability in business practices, especially in relation to corporate environmental and social responsibility. Nestlé is one of the companies in Indonesia that has implemented various programs to support the achievement of global sustainability targets. Some of the main sustainability targets that Nestlé Indonesia focuses on include reducing carbon emissions, increasing the use of regenerative raw materials, reducing the use of virgin plastics and implementing the circular economy, to increasing access to quality nutrition. (https://www.medcom.id/).

However, there are several other things that can be done by business people to overcome sustainability issues , including by implementing ESG (Environment, Social and Governance), Green Innovation and Carbon Emission Disclosure practices as part

of their business strategy. ESG itself includes the criteria used to measure the sustainability and social impact of a company. It is important for business people to be committed to the implementation of ESG (Environmental, Social and Governance) standards, this is done so that companies not only focus on achieving business profit targets but also pay attention to environmental sustainability by conducting business operations responsibly, (https://jurnalpost.com/). In addition, ESG itself includes three main dimensions, namely Environment: Practices related to environmental impacts, such as waste management, use of renewable energy and protection of biodiversity. Social: Social aspects that include human rights, working conditions, contributions to the community and relationships with stakeholders. Governance: Aspects of corporate governance which include transparency, business ethics, management structure and anti-corruption policies. Meanwhile, green technology / Green Innovation is an innovation in environmentally friendly technology, such as electric vehicles, energy efficiency technology and sustainable mining practices. One of the ways the company discloses its environmental activities is through the Carbon Emission Disclosure.

Currently, environmental damage is expected to have a significant impact on human life. An increase in greenhouse gas emissions (carbon emissions) and other emissions that continue to occur can cause the earth's temperature to rise even more. This, if left unchecked, can affect environmental conditions broadly, ranging from climate change that includes extreme weather, such as rising sea levels, declining biodiversity, increasing disease risk, to significantly weakening the economy.

Environmental impact phenomena include various interrelated aspects ranging from climate change, depletion of natural resources, soil pollution to pollution and loss of biodiversity. Effective mitigation efforts require global cooperation, green technology innovation, strong policies and increased public awareness. With the right actions, we can reduce the negative impact on the environment and maintain the balance of the ecosystem for future generations. Some of the main environmental impact phenomena that are currently of global concern include challenges related to water resources in Indonesia, this problem includes the unevenness of water availability in Indonesian territory. The degradation condition of water quality and quantity in Indonesia is also a concern as stated in Government Regulation No. 19 of 2020 concerning the 2020-2024 RPJMN. Based on these regulations, Water availability is already categorized as scarce to critical in the majority of Java and Bali. According to estimates, the size of important water areas—which include southern Sumatra, western Nusa Tenggara, and southern Sulawesi—will rise from 6% in 2000 to 9.6% in 2045 (https://www.menlhk.go.id/).

Another phenomenon is related to air pollution, where in mid-2023 the air quality in the capital is getting worse to exceed the limits set by the WHO and the Indonesian government (Lestari, 2023; Prima, 2023). According to the Ministry of

Environment and Forestry (MoEF), industrial activities are the second highest cause of the increase in air pollution in Jakarta with a contribution of 41%, while motor vehicles are ranked first at 44% . The impact of high air pollution is also felt in the economic aspect, as conveyed by the Center of Economic and Law Studies (Celios), that investment interest has decreased as a result of high levels of air pollution in Jakarta (Intan, 2023). This condition, if left unchecked, will have a bad impact on the company's sustainability, so it requires effective solutions to overcome it.

This research provides a new contribution by integrating three sustainability factors—ESG (Environmental, Social, Governance), Green Innovation, and Carbon Emission Disclosure—while also testing Return on Equity (ROE) as a moderating variable in influencing Firm Value. Most previous studies examined the direct relationship between ESG or Carbon Emission Disclosure and Firm Value without considering the moderating role of profitability indicators such as ROE (Agustia et al., 2019)

However, this article does not provide clear theoretical or empirical reasons for choosing ROE as a moderating variable. ROE should be explained as a profitability indicator that can change the direction or strength of the relationship between sustainability activities and company value. Based on signaling theory, ROE can be an important signal for investors about how effectively the company manages its resources in the context of sustainability .

These occurrences demonstrate how industry's effects on the environment can reduce a company's value. Many businesses frequently overlook environmental issues because they are so preoccupied with making money. Effective solutions are required to tackle it because, in reality, if left unchecked, it would negatively affect the sustainability of the organization. Information indicates that 2023 will be a difficult year for some issuers in Indonesia's mining and oil industries, which have seen a downturn. The URL is https://industri.kontan.co.id. Thus, the purpose of this study is to investigate how Carbon Emission Disclosure, Green Innovation, and Environmental Social Governance (ESG) affect firm value. It is anticipated that the findings of this study will also motivate businesspeople to raise their operational and environmental awareness.

LITERATURE REVIEW

Stakeholder Theory

Freeman (1998) posits that stakeholders include groups or individuals who can influence or be influenced by the achievement of corporate goals. This is in line with the view of Beckman et al. (2016) who emphasized that stakeholder theory involves various constituents that have a significant impact on the company. (Sadiq et al., 2023)added that to achieve sustainability, managers need to explain environmental performance through disclosure of information to stakeholders. This shows that stakeholder theory plays an important role in assisting management decisions regarding

the disclosure of the performance of the carbon emissions produced (Adhi & Cahyonowati, 2023). In addition, (Ramadhany et al., 2021) emphasized the importance of the role of stakeholders in green innovations that aim to reduce negative impacts on the environment. (Agustia et al., 2019) also revealed that the application of stakeholder theory can support the implementation of green strategies in companies, so that later it can increase firm value by attracting investors to invest in companies that show good environmental performance. In addition, regulators have a crucial role in determining the tolerance level of carbon emissions and ensuring compliance with environmental regulations. Thus, stakeholder theory not only provides a framework for understanding the interaction between companies and various related parties, but also becomes a strategic tool for management in formulating sustainable and socially responsible policies.

Legitimacy Theory

The theory of legitimacy expressed by Suchman (1995) emphasizes that the actions of an entity are expected to be in line with the norms, values and beliefs that exist in society. In this context, Mousa et al. (2015) state that legitimacy theory describes the existence of a reciprocal interaction or two-way relationship between a company and its surrounding environment. This theory encourages the efforts of entities to report or present information related to relevant social and environmental issues (Zuhrufiyah & Anggraeni, 2019). As part of efforts to gain legitimacy in its operations, information disclosure is considered an effective method of communicating the company's activities and management from the perspective of environmental, social and other issues related to business. One example is how companies manage, describe and measure the greenhouse gas emissions they produce (Husnaini & Tjahjadi, 2021a)

Firm Value

In a study conducted by (Pasaribu et al., 2019), firm value shows investor perception of the success of a business entity. This value is usually associated with the price of the shares owned by the company. A public company seeks to maintain or increase such value as a reflection of performance that can affect the perception of stakeholders, especially investors. *Price Book Value* (PBV), which is a comparison between the current stock price and the book value per share, can be used to project the value of a company. Various factors of corporate sustainability such as ESG performance, green innovation, and environmental effectiveness are now important considerations for investors in assessing a company (Adhi & Cahyonowati, 2023). The importance of the investor's perspective in determining the value of the company is undeniable, but the public also has a role in the assessment. Lonkani (2018) shows that there is a shift in view that the value of a company is not only determined by investors

(Shareholders), but also by *Stakeholders (Stakeholders).* Therefore, stakeholder theory and legitimacy can help companies realize high corporate value through ESG, *Green Innovation and Carbon Emission Disclosure performance.*

Environmental, Social and Governance (ESG) Performance

The importance of reporting ESG performance to the public is increasingly recognized by companies. In Indonesia, sustainability reports are used by companies to communicate with stakeholders regarding their efforts in managing ESG. Environmental, social and governance (ESG) standards are designed to evaluate and regulate a company's performance in environmental, social and governance aspects (Sadiq et al., 2023). Harahap (2023) states that investors are currently considering ESG performance in investment decision-making, so companies need to respond to environmental and social issues that have increased in recent years. Companies require external verification through their sustainability reports to increase their credibility and maintain their existence. Companies that are able to manage all three aspects of ESG well tend to have better long-term performance and can provide added value for all stakeholders. Therefore, companies should not only focus on profitability, but also consider the environmental impact of their business activities. To measure performance in ESG implementation, Bloomberg and ESGI data provide ESG *scores* as indicators of these measurements.

Carbon Emission Disclosure

Carbon Emission Disclosure is one way for companies to disclose their environmental practices. This environmental disclosure includes information on energy consumption intensity and greenhouse gas emissions, corporate governance and climate change-related initiatives, achievement of greenhouse gas emission reduction targets, as well as risks associated with climate change (Kelvin et al., 2017). Carbon Emission Disclosure divides its disclosure into five categories of indicators, namely Greenhouse Gas Emission Accounting (GHC), Climate Change Opportunity and Risk Index (CC/Climate Cahnge), Carbon Emission Accountability (ACC-Carbon Emission Accountability), Energy Consumption Accounting (EC/Energy Consumption) and RC (Greenhouse Gas Reduction and Cost).

Green Innovation

Refers to the adoption of new methods or adjustments in production processes that are intended to minimize harmful environmental effects. This includes enhancing energy efficiency, reducing pollution, recycling waste, and creating environmentally conscious product designs. In this study, green innovation is based on the research by (Agustia et al., 2019), which is analyzed through the content of company annual and sustainability reports. Several indicators are applied to assess whether a company has

implemented environmentally friendly innovations. The results from this content analysis are presented in ratio form. The indicators include: (1) the use of new technologies in production to reduce consumption of energy, water, and waste, (2) utilization of materials that are less harmful and do not cause pollution, (3) application of eco-friendly packaging materials such as biodegradable paper or plastic, and (4) use of recyclable or reusable components in the production process.

Return On Equity

Companies are able to obtain a certain level of profit that can be measured through the profitability ratio (Fahmi, 2014:81). According to (Rudianto, 2021: 129) annual profits contribute to an increase in the wealth of owners and companies, this wealth can bring the company closer to its goals. Because business continuity is influenced by the company's ability to generate profits sustainably, the company's ability is considered important. Investors will consider the profitability of the company. When assessing profitability, investors usually refer to *Return on Equity* (ROE). This is due to the fact that ROE describes the relationship between a company's net profit and the investments it makes (Fahmi, 2014:83). In this case, the company should make the greatest possible profit by managing its assets in the most effective way to attract investors. The rate of return on assets can be calculated by dividing the amount of net assets by the total (Ismanto & Rosini, 2023). *Return on Equity* (ROE) describes an organization's ability to achieve a high overall value of capital. A high ROE indicates that the organization has good profitability because it has the ability to optimize its assets to increase profits.

The Effect of *Environmental, Social and Governance* (ESG) Performance on Firm Value

A growing number of sustainability reports are being disclosed indicating that companies' beliefs in ESG performance can influence investor and public perceptions. There has been an increase in investor interest in ESG-based financial instruments, showing that ESG performance is now a major consideration in investor decision-making (I. N. Sari, 2021). Stakeholder theory states that stakeholder trust in the company is influenced by positive ESG performance, thereby increasing the firm value. Since *stakeholders* control the resources needed by the company to run its operations, meeting the interests of stakeholders will result in the sustainability of the company. Indirectly, the implementation of ESG is aimed at companies as an effort to maintain relationships with stakeholders while meeting the interests of shareholders. The optimal application of ESG performance has the potential to increase public legitimacy and overall firm value. Research by Sadiq et al. (2020) in Malaysia shows that an increase in the ESG index correlates with an increase in the value of a company. Research by (Adhi

& Cahyonowati, 2023) also supports that ESG performance has a positive influence on firm value. Based on this explanation, the hypotheses developed in this study are:

H1: *Environmental, Social and Governance* (ESG) performance has a positive effect on the firm value.

Green Innovation to Firm value

(Agustia et al., 2019) stated that the company's main goal is not only to create value for shareholders but also for all stakeholders. To achieve this goal, managers who are able to improve environmental and social performance for the company's sustainability in the future are needed. The theory of legitimacy according to (Adhi & Cahyonowati, 2023) emphasizes that the sustainability of a company depends on its ability to align business processes with applicable societal norms. One of the things that can be applied by companies is green innovation to minimize adverse environmental impacts that can ultimately increase the value of the company. Research by (Zuhrufiyah & Anggraeni, 2019) shows that the green innovation process has a significant positive influence on firm value, but green innovation products do not show a similar influence. Research by Agustia et al. (2019) also found that green innovation through content analysis has a significant positive effect on firm value. However(Yao et al., 2019) found different results that eco-innovation has no effect on firm value. Therefore, the researcher wants to prove the influence of green innovation on the firm value through the following hypothesis:

H2: Green Innovation has a positive effect on Firm value

Carbon Emission Disclosure to Firm value

A company's evaluation by stakeholders will rise in proportion to how openly it discloses carbon emissions. Investors will be more inclined to put their money into the business by purchasing its shares as a result of their increased interest in it. (Adhi & Cahyonowati, 2023) study also clarified why Indonesian investors are more drawn to environmentally conscious businesses, particularly in light of possible climate change. (Meyliana & Sudibyo, 2022) numerous supporting studies revealed that business value was positively impacted by carbon emission disclosure.

H3 : Carbon Emission Disclosure has a positive effect on Firm value

Clarify the role of ROE as a moderator:

1. ROE moderates the relationship between ESG and Firm Value.
2. ROE moderates the relationship between Green Innovation and Firm Value.
3. ROE moderates the relationship between Carbon Emission Disclosure and Firm Value.

Each hypothesis can be built on the basis of stakeholder theory and legitimacy theory, and it reinforces that profitability can enhance the credibility of the company's sustainability practices.

METHOD

Population and Sample

Secondary data for this study was gathered from the sustainability report database (db.globalreporting.org), Yahoo Finance, the Indonesia Stock Exchange's official website, and ESGI Data Company. Mining businesses registered between 2000 and 2022 on the Indonesia Stock Exchange (IDX) comprise the study's population. Purposive sampling, or sampling with criteria, is the sample technique employed in this investigation. 42 out of 126 observation samples were acquired using this sampling technique. Table 1 below displays the sample criteria.

Table 1. Sample Selection

No company		Criteria
1	Mining Companies Listed on the IDX 2020-2022	62
2	Incomplete companies publish variable data up to 2022	(20)
3	Companies that publish Financial Reports and can be downloaded via ESGI	42
4	Observation Total 42x 3	**126**

Source: BEI (Processed)

Table 2. Sample Distribution Based on Industrial Sector

No	Sector	Frecuency	Persentation
1	Coal Production	24	57%
2	Oil & Gas Production	4	9,5%
3	Gold	2	4,7%
4	Iron &Steel	6	14,2%
5	Metal	4	9,5%
6	Cooper Dan Aluminium	2	4,7%
	Total	**42**	**100%**

Source: BEI (Processed)

The following table shows the number and percentage distribution of the company samples used in the research based on their respective industries. The total sample includes 42 mining companies listed on the Indonesia Stock Exchange (IDX) from 2020 to 2022. According to sector distribution, 24 companies, or about 57% of the sample, come from the coal production industry. This shows the dominance of coal companies in the mining sector listed on the IDX and also highlights their primary focus on environmental sustainability. The next sector with the highest number of companies is Iron & Steel, with 6 companies (14.2%). Then, Oil & Gas Production and Metal each contributed 4 companies (9.5%). As for the Gold sector, as well as Copper and Aluminium, each is represented by 2 companies or about 4.7% of the total sample.

Dependent Variable

Firm values

Firm value is the amount that the business has earned and is used to gauge its success as well as the wealth of its investors or shareholders (Agustia et al., 2019). The

value of the company that uses the reference in the (Meyliana & Sudibyo, 2022) study is the dependent variable used in this study. It is calculated using the Price Book Value Ratio, which compares the stock market value ratio by dividing the current stock price by the book value per share, which is calculated as follows:

$$Price\ Book\ Value = \frac{Current\ Stock\ Price}{Book\ Value\ Per\ Share}$$

(Fahmi, 2022)

Independent Variables

Environmental, Social and Governance (ESG) Performance

ESG performance is a standard designed to evaluate and regulate environmental, social and corporate governance performance (Sadiq et al., 2023). ESG performance measurements were proxied using ESG scores published by Bloomberg and secondary data obtained from ESGI.

Green Innovation

Energy efficiency, pollution reduction, trash recycling, and green product design are the results of this new method or change to the production process that lessens the impact of environmental harm. In this study, "green innovation" refers to the research conducted by Agustia et al. (2019) based on the content of the company's sustainability or annual report. The company's adoption of green innovations will be assessed using a number of measures. Ratios will be used to quantify the findings of this content analysis. The following are the indications that will be employed in the content analysis: (1) New technologies are used in the production process to cut waste, water, and energy (2). The product makes use of fewer dangerous or non-polluting components (environmentally friendly materials) (3). utilizing product packaging that is friendly to the environment (such as paper and plastic) and (4). Materials or components used in production can be recycled or reconditioned.

Carbon Emission Disclosure

The disclosure of the carbon emission disclosure index in annual reports or sustainability reports, which are often independent, are two ways to measure carbon emission disclosure. Referring to the research of Choi et al. (2013) and Herawaty and Vernanda (2020), the carbon emission disclosure index consists of five categories with a total of eighteen items. Each disclosed item is assigned a score of 1, and the non-disclosed item is assigned a score of 0. The scores are then added up and divided by the total disclosure.

Return On Equity (ROE)

ROE describes how a company utilizes its resources in order to generate profits (Santoso and Handoko, 2023). Profitability is measured through Return on Equity

(ROA). This ratio states the size between profit after tax and equity in providing returns to shareholders (Ismanto et, al., 2023) with a calculation formula, namely:

$$Return\ On\ Equity : \frac{Net\ Profit\ After\ Tax}{Total\ Equity}$$

(Fahmi, 2022)

The analysis method of this study uses multiple linear regression analysis techniques to process data. The tool used to analyze the data is SPSS (*Statistical Product and Solutions)* software version 27. The multiple linear regression equation model of this study is as follows:

PBV = α + β1ESGit+ β2GIit+ β3CEDit+ β4ROE.ESGit+ β5ROE.GIit+ β6ROE.CEDit+ εit

Information:

PBV = Firm value
A = Constant
B1-5 = Regression Coefficient
ESG = *Environmental, Social and Governance* Performance
GI = *Green Innovation*
CED = *Carbon emission disclosure*
ROE = Profitability
E = Error
I = Company
T = Year

RESULT AND DISCUSSION

Result

Tabel 3. Descriptive Statistics

	Minimum	Maximum	Mean	Std Deviation	N
ESG	22,11	73,86	46,10	10,5923132	126
GI	0,250	0,875	0,47487	0,1313509	126
CED	0,0000	1,0000	0,36723	0,33609123	126
ROE	-0.24456	0,4500	0,05489	0,08355570	126
ESG. ROE	20,48555	70,500	45,02600	9,33938899	126
GI. ROE	0,4433000	23,2232	0,103455	1,65323222	126
CED. ROE	0,1111539	4,43444	1,44566	1,32846533	126
CV	0,3330231	7,55755	2,44342	1,4987776	126
					126
Valid N (listwise)					126

Note

ESG= Environment social governance, GI= Green innovation, CED= Carbon Emission Disclosure, ROE=Return on equity, CV= *Firm value*

The average company that implements ESG is represented by the mean value (average) of 46 for the ESG variable. Green innovation has a minimum of 0.250, a maximum of 0.875, and an average of 0.47487. There is also a maximum of 1.000, a minimum of 0.0000, and an average of 0.36 for carbon emission disclosure. A high of

0.45 and a low of -0.244 were achieved for the return on equity value, while a top of 7.55 and a minimum of 0.33 were attained for the firm value.

Classic Assumption Test

The classical assumption test used in this study is the normality test, the autocorrelation test, the multicollinearity test and the heteroskedastisitas test as a consideration of whether or not there is a violation of classical assumptions according to (Ghozali, 2011) as follows:

Normality Test

To determine whether the regression model, the independent variable, the residual dependent variable, or both have a normal distribution or not, the normality test uses a one-sample approach. The findings of this study's normalcy test and the Kolmogorov-Smirnov test are displayed in the table below:

Table 4. Normality Test Results

Description	Level of significance	Asymp.sign(2-tailed)	Decision
Multiple regression equation	0,05	0,022	Data is normally distributed

Source: Processed Data

Based on Asymp. Bidirectional sig. (2-Tailed) greater than 0.05 (Sig > 5%) then normally distributed

Multicollinearity Test

Based on the results of the multicollinearity test to find out whether the regression model occurs multicollinearity can be shown as follows**:**

Table 5. Multicollinearity Test Results of the Regression Model

Variable	Collinierity Statistics	VIF	Conclusion
Independent	Tolerance		
ESG	0,985	1,059	Multicollinearity Does Not Occur
GI	0,623	1,668	Multicollinearity Does Not Occur
CED	0,950	1,659	Multicollinearity Does Not Occur

Source : Data Processed

In table.5 it can be seen that the tolerance value of all variables is above 0.10 with the VIF value is below 10 which means that all variables are free of multicollinearity

Autocorrelation Test

Based on the results of autocorrelation testing to find out whether regression models occur autocorrelated, this study using the Durbin Watsoon Test or called (DW-test) can be shown as follows:

Table 6. Results of Regression Model Autocorrelation Testing

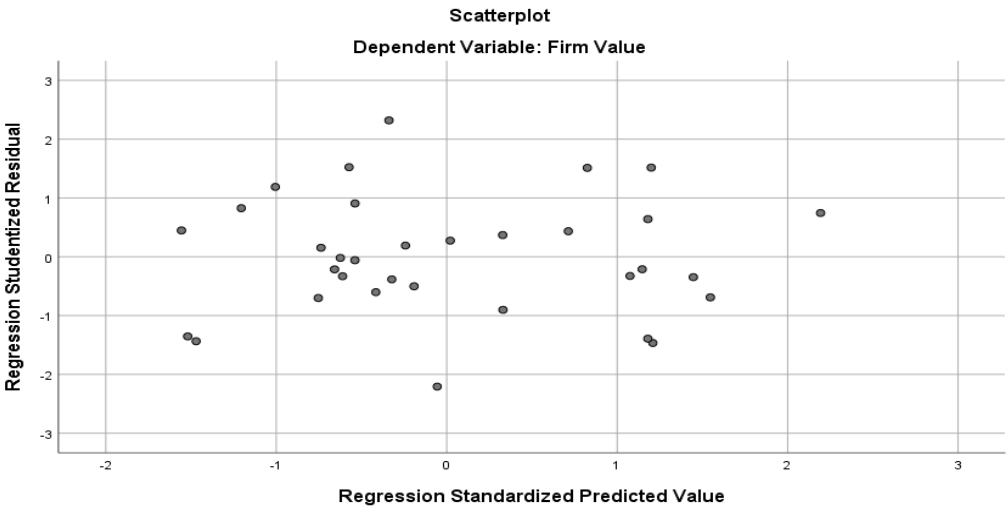
Regresssion Model	R	R Square	Adjusted R Square	Std.error of the estimate	Durbin-watson
	0,669	0,447	0,423	0,51999161	1,882

Source: Processed Data

There is no autocorrelation from the regression model, according to the findings of the autocorrelation test of the regression model table 6, which indicates that the durbin-Watson value of 1.882 for the regression model is smaller than the 4-DU value and more than the DU value.

Heteroscedasticity Test

The following can be demonstrated based on the findings of the heteroscedasticity test, which establishes whether the residual distribution is even or the error's variance must be homogeneous. By looking at the distribution of the dots in the figure below, one can use the scatterplot graph to determine whether or not heteroscedasticity occurs. Heteroscedasticity is not present in the regression model, as shown by figures 2, which show that the scattering points are dispersed randomly above and below the value 0 on the Y axis.



Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	,187	2,277		,082	,935		
	Environment Social Governance (X1)	1,075	,507	,374	2,121	,042	,785	1,275
	Green Innovation (X2)	-,013	,730	-,003	-,018	,986	,913	1,095
	Carbon Emission Disclosure (X3)	,073	,059	,227	1,239	,225	,724	1,381

a. Dependent Variable: Firm Value

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5,239	3	1,746	3,694	,022[b]
	Residual	14,183	30	,473		
	Total	19,422	33			

a. Dependent Variable: Firm Value

b. Predictors: (Constant), Carbon Emission Disclosure (X3), Green Innovation (X2), Environment Social Governance (X1)

Discussion

Table 7. Hypothesis Testing Results

Model	Unstandardized coefficient		Standardized Coefficient beta	t	Mr.
	B	Std. Error			
(Constant)					
ESG	1.966	0.572	1.254	4.120	0.000
GI	2.110	1.152	0.919	1.930	0.039
CED	2.445	1.336	1.269	1.914	0.030
ESG. ROE	0.632	0.254	1.102	3.762	0,011
GI. ROE	0.305	0.419	0.505	2.067	0,028
CED. ROE	0.632	0.460	1.122	1.863	0,045

The Influence of Environmental, Social and Governance (ESG) on Firm Value (H1)

This study concluded that corporate value is positively impacted by ESG. At a 5% significance level, the firm value will be impacted by either strong or poor ESG performance in this instance. Since the test's findings support the previously put forth hypothesis—that ESG performance increases firm value—H1 is approved. ESG has a favorable impact on business value, according to research by Adhi and Cahyonowati (2023) and Adlah and Febrianto (2023), which is consistent with the findings of this study. The test findings were able to validate the stakeholders' theory.

Despite giving preference to profitable stocks, investors still take ESG performance into account when making investing decisions (Harahap, 2023). The high stock prices of businesses that do well in terms of ESG are proof of this. Even though companies listed on the IDX have not yet released a comprehensive sustainability report, it is indisputable that the use of ESG has demonstrated the ability to impact firm value by improving corporate performance, albeit not significantly. Also, the outcomes of the tests that were conducted are consistent with the legitimacy theory.

The corporation engages in ESG-based initiatives to boost public trust and cultivate a positive image, in addition to upholding its relationships with stakeholders and satisfying shareholder interests. A company's low value is a result of its ESG performance, as indicated by its ESG score. Therefore, it can be said that one of the elements contributing to the company's poor value is its ESG performance.

The Influence of Green Innovaton on Firm Value (H2)

The hypothesis that green innovation has a positive impact on the company's value can be proven and accepted based on the results of the hypothesis test, which are displayed in table 7. The regression model's t value of 1.930 indicates that the hypothesis has a significance value of 0.000 and 0.039. The study's findings are consistent with those of Agustia et al. (2019), who found that the company's objective is to generate value for all stakeholders in order to remain "sustainable" and have its business practices accepted by society. This is based on the theory of legitimacy. According to stakeholders' desires, green innovation also applies low-pollution production methods and procedures (Husnaini & Tjahjadi, 2021). Green innovation-enabled business processes incentivize businesses to turn waste output into profitable products that boost their worth. Investors will assume that the company will stay "sustainable" due to the numerous benefits of green innovations that are implemented to its business plan. According to Rosenbusch, Rauch, and Bausch (2013), a stakeholder's interest in a firm increases with its environmental performance, and this in turn increases the company's value.

The Effect of Carbon Emission Disclosure on Firm Value (H3)

The value of t in the regression model in table 7, with a t-value calculated at 1.914 indicating the influence of positive direction, indicates that the hypothesis that Carbon Emission Disclosure had a significant positive effect on the firm value was successfully proven and accepted based on the results of the hypothesis test exhibited in table 7 with a significance value of 0.030. The findings of this study support those of Anggraeni (2015) and Matsumura et al. (2014), who clarified that disclosure of carbon emissions is a type of environmental management transparency and capability.

The legitimacy hypothesis states that the company's carbon emissions data can be used as a positive confirmation to gain market and local community legitimacy (Anggraeni, 2015). Furthermore, the stakeholder community may benefit economically from the disclosure of carbon emissions as proof of environmental responsibility, such as by investing in renewables or alternative energy sources that lower carbon emissions, as well as by seeing an improvement in revenue and company reputation (Matsumura et al., 2014).

The Influence of Environmental, Social and Governance (ESG) on Firm Value with ROE as a Moderator (H4)

Profitability increases the impact of ESG performance on business value, according to this study. According to the test results, ROE increases the impact of ESG performance on firm value, which is the previously put forward premise. Arofah and Khomsiyah's (2023) research, which found that financial performance as measured by

ROE can reduce the impact of ESG performance on business value, is in conflict with the findings of this study. A company's worth will increase as its ESG performance, which is moderated by ROE, improves. Divergent opinions exist over how to value businesses among investors and other stakeholders. Sustainability and profitability are frequently at the center of these divergent viewpoints.

The Influence of Green Innovation on Firm Value with ROE as a Moderator (H5)

According to this study, the impact of green innovation on business value is strengthened by profitability. The test results support the previously put forward hypothesis, which states that profitability increases the impact of green innovation on business value, supporting the acceptance of H5. These findings are consistent with study by (Daromes et al., 2020), which found that the impact of green innovation on firm value can be mitigated by financial performance as measured by ROE. ROE has the ability to mitigate by amplifying the impact of GI on PBV. When ROE rises in tandem with green innovation, the firm's value rises as well. The results demonstrate that, once moderated by profitability as measured by ROE, green innovation can raise the company's value.

Often companies experience obstacles in creating environmentally friendly innovations because they are contrary to the business orientation that prioritizes profitability, but companies can allocate their resources more easily to implement environmentally friendly innovations when the company has optimal profitability. Green Innovation that requires greater costs can only be carried out if the company has high enough profitability. Companies that continue to innovate green and are balanced with high levels of profits are likely to gain much more legitimacy from shareholders and stakeholders. Therefore, profitability can encourage green innovation in increasing firm value.

The Effect of Carbon Emission Disclosure on Firm Value with ROE as a Moderator (H6)

Table 7 regression model hypothesis test findings demonstrate that, with a significance value of 0.045, ROE performance can mitigate the association between CED and company value. The findings of this study are consistent with those of Asnita (2019), who found that ROE performance influences firm value, and Anggraeni (2015), who found that environmental performance can mitigate the positive link between firm value and carbon emission disclosure. Given that customers presently favor environmentally friendly products, it is envisaged that the adoption of good environmental performance would enable businesses to take proactive measures to adopt green technologies for environmentally friendly processes and products (Husnaini & Tjahjadi, 2021).

In addition, ROE performance can help companies to deal with environmental impacts, where the environmental impact can be in the form of carbon emissions produced and can be useful information for *stakeholders* (Chu et al., 2013), where the information is evidence to obtain legitimacy that there is a compatibility between the existence of the company is not intrusive or *congruent* with the existence of value systems that exist in society and the environment (Asnita, 2019). However, according to Anggraeni's (2015) research, ROE performance as an effort to preserve the environment does not affect market value where the ROE rating cannot be a guarantee to increase the firm value. In addition, not all investors pay attention to environmental performance as a criterion in investing and assumptions about environmental costs that will affect investor income Asnita (2019).

The results of this study indicate that ESG has a positive impact on Firm Value. This is consistent with the Legitimacy theory (Suchman, 1995), which states that companies gain legitimacy through social and environmental responsibility practices. These findings are also in line with the research by Adhi & Cahyonowati (2023) and Sadiq et al. (2023), which found that ESG performance contributes to the increase in company value through positive investor perception.

Meanwhile, the relationship between Green Innovation and Firm Value is also significant. This supports the Stakeholder Theory (Freeman, 1998) which states that innovations that consider sustainability can enhance stakeholder satisfaction and attract investment.

ROE has proven to be a moderator that strengthens the influence of ESG, Green Innovation, and Carbon Emission Disclosure on Firm Value. This supports the signaling theory approach, which states that high profitability serves as a positive signal that strengthens the market's perception of the company's sustainability performance (Rudianto, 2021).

The Influence of ESG, Green Innovation, Carbon Emission disclosure on Firm Value (H7)

This study examines the simultaneous influence of corporate sustainability practices represented by Environmental, Social, and Governance (ESG) disclosure, green innovation, and carbon emission disclosure—on corporate value. In modern business dynamics, these three aspects are important indicators that reflect social and environmental responsibility that can influence investor perceptions and long-term financial sustainability. In this context, Return on Equity (ROE) is used as a mediating variable, because ROE represents management efficiency in managing shareholder capital to generate profits. Theoretically, sustainability practices and carbon emission disclosure can strengthen financial performance, which in turn increases the attractiveness of the company in the eyes of the capital market and encourages an

increase in corporate value. That the influence of ESG, Green innovation and carbon emission disclosure has a simultaneous influence with F count 3.694 and F table 2.840 and significant less than 0.05.

CONCLUSSION

According to this study, the value of mining businesses listed on the Indonesia Stock Exchange for the 2020–2022 period is positively impacted by ESG performance, green innovation, and carbon emission disclosure. ROE-based profitability enhances the impact of carbon emission transparency, green innovation, and ESG performance on company value. Businesses might try to achieve high firm value by enhancing the performance of these three activities when they are very profitable.

The study's scope is restricted to mining firms that were listed between 2020 and 2022 on the Indonesia Stock Exchange, and its sole method of measuring profitability is Return on Equity (ROE). Based on these constraints, the recommendation that is anticipated to be taken into account by the subsequent study is to extend the research time and use additional companies listed on the Indonesia Stock Exchange as a research sample in order to generate more broadly applicable findings. In addition, the next study uses other indicators as a measurement of *green innovation disclosure* and takes measurements of variables that are different from previous research, such as the eco-efficiency ratio by dividing environmental performance by financial performance to measure eco-efficiency, and for profitability measures can be used other measures profit margin or Return on Investment as a proxy for profitability.

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