

The Effect of Carbon Emission Disclosure and Green Investment on Firm Value

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Abstract: Firm value is a crucial indicator that provides information to investors for making investment decisions. Today, investors also consider a company's commitment to environmental issues, especially in the energy sector, which significantly contributes to carbon emissions. This study aims to empirically examine the effect of carbon emission disclosure and green investment on firm value. The theoretical framework employed includes signaling theory and legitimacy theory. Firm value is measured using the Tobin's Q ratio. Carbon emission disclosure is measured through content analysis based on the GRI 305 standards, while green investment is measured using the PROPER rating issued by the Ministry of Environment and Forestry. This study also includes three control variables: firm size, leverage, and profitability. The analytical method used is multiple linear regression, with secondary quantitative data collected from companies' annual reports and sustainability reports. The sample consists of 69 companies with a total of 271 observations. The findings reveal that carbon emission disclosure has a positive effect on firm value, while green investment does not have a significant effect on firm value. This research is expected to contribute to the development of signaling and legitimacy theories and serve as a practical reference for investors in considering environmental aspects when making investment decisions.

Keywords: Carbon Emission Disclosure, Firm Value, Green Investment

Received: June, 12, 2025;

Revised: June, 28 2025;

Accepted: July, 11 2025

Published: July, 15 2025

Curr. Ver.: July, 15 2025



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1. Introduction

As the business landscape continues to evolve rapidly, companies are increasingly expected to enhance their firm value, as it serves as a key benchmark for investors in making capital investment decisions (Kusumaningrum & Iswara, 2022). Every business entity is fundamentally established with the goal of maximizing firm value to improve shareholder wealth (Hardiyansah et al., 2021). Firm value is essential to investors because it serves as a signal that conveys vital information needed for informed investment decisions (Damayanthi, 2019). A high firm value strengthens investor confidence in a company's performance (Hardiyansah et al., 2021), leading them to favor investments in firms with stronger valuations (Rusmana & Purnaman, 2020). Firm value is often reflected in stock prices — the higher the stock price, the greater the firm value (Bella Angraini & Murtanto, 2023).

Stock price movements on the Indonesia Stock Exchange (IDX) are measured through the Composite Stock Price Index (IHSG). The IHSG reflects the performance of all listed stocks on the exchange. As shown in Table 1, IHSG experienced both upward and

downward trends from 2019 to 2023. These fluctuations are a natural occurrence driven by supply and demand dynamics in the capital market.

Table 1. Composite Stock Price Index 2019-2023 (Rupiah)

Month	2019	2020	2021	2022	2023
January	6.532.97	5.940.05	5.862.35	6.631.15	6.839.34
February	6.443.35	5.452.70	6.241.80	6.888.17	6.843.24
March	6.468.75	4.538.93	5.985.52	7.071.44	6.805.28
April	6.455.35	4.716.40	5.995.62	7.228.91	6.915.72
May	6.209.12	4.753.61	5.947.46	7.148.97	6.633.26
June	6.358.63	4.905.39	5.985.49	6.911.58	6.661.88
July	6.390.50	5.149.63	6.070.04	6.951.12	6.931.36
August	6.328.47	5.238.49	6.150.30	7.178.59	6.953.26
September	6.169.10	4.870.04	6.286.94	7.040.80	6.939.89
October	6.228.32	5.128.23	6.591.35	7.098.89	6.752.21
November	6.011.83	5.612.42	6.533.93	7.081.31	7.080.74
December	6.299.54	5.979.07	6.581.48	6.850.62	7.272.80

Source: Indonesia Stock Exchange, 2023

The development of the Composite Stock Price Index (IHSG) shows a long-term upward trend despite a sharp drop in 2020 due to the Covid-19 pandemic, with a significant recovery to hit a record high in December 2023 of 7.272.80. This fluctuation reflects market dynamics influenced by global and sectoral factors, including the energy sector which is the focus of this study. Through the IDX Industrial Classification (IDX-IC) classification launched by the IDX in January 2021, investors can now more accurately assess sectoral performance, including the energy sector which experienced significant volatility throughout 2021–2023. This condition emphasizes the importance of companies to maximize their Firm Value in order to attract investor interest and achieve corporate goals optimally.

Table 2. IDX ENERGY 2021 – 2023 (Rupiah)

Month	2021	2022	2023
January		1.294.89	2.171.30
February	767.95	1.324.38	2.101.21
March	712.98	1.481.34	2.103.64
April	744.55	1.618.91	2.094.86
May	737.21	1.750.72	1.709.55
June	719.90	1.638.18	1.737.97
July	760.08	1.857.72	1.924.10
August	752.72	1.899.49	2.034.88
September	996.28	1.920.30	2.131.67
October	1.000.37	2.069.50	2.007.98
November	1.046.55	2.078.75	2.019.10
December	1.139.50	2.279.55	2.100.86

Source: Investing.com, 2023

Data from IDX Energy during the 2021–2023 period indicates a growing trend in the energy sector stock index, despite some fluctuations in 2023. The significant increase from 767.95 at the beginning of 2021 to 2.279.55 by the end of 2022 reflects a positive growth in firm value. However, not all energy sector companies were able to maintain optimal performance. One example is PT RMK Energy Tbk, which experienced a decline in sales and

share price due to violations of environmental regulations. This case highlights how external factors, particularly environmental issues, can directly affect market perception and firm value.

This study is grounded in signaling theory and legitimacy theory. According to signaling theory, companies convey important information to reduce information asymmetry by disclosing environmental issues, such as carbon emissions, to reduce information asymmetry. Meanwhile, legitimacy theory emphasizes the importance of gaining social approval to maintain public trust and business continuity. In this context, environmental disclosure becomes a strategic tool for companies to build reputation and a positive image among stakeholders.

Carbon emission disclosure has become a central concern as it reflects a company's responsibility in addressing climate change. According to the International Energy Agency (IEA), global carbon emissions reached 37.4 gigatons of CO₂ in 2023, with Indonesia among the top emitters. This condition underscores the urgency for companies to be transparent in managing carbon emissions—not only as part of environmental mitigation efforts, but also as a strategy to enhance firm value in the eyes of investors.

Based on this phenomenon, companies can disclose carbon emission information through sustainability or annual reports to send positive signals to investors or shareholders (Apriliana, 2019). Carbon emission disclosure is crucial as a form of corporate responsibility and transparency in facing climate change (Widyanti et al., 2024). Companies are now expected not only to generate profit from operational activities but also to be accountable for the carbon they produce as part of environmental stewardship (Sari & Budiasih, 2022). Increased carbon emission disclosure helps maintain firm value within the community (Kristari & Teruna, 2023).

In Indonesia, carbon emission disclosure is classified as voluntary and is typically included in corporate sustainability reports (Dewi et al., 2019). The Indonesian government, through Law No. 40 of 2007 concerning Limited Liability Companies, Article 66 Paragraph (2c), mandates that annual reports must include a report on the implementation of Corporate Social and Environmental Responsibility. Furthermore, Financial Services Authority Circular Letter No. 30/SEOJK.04/2016 instructs that the annual reports of issuers or public companies include information on social and environmental responsibilities. These regulations align with the Global Reporting Initiative (GRI) Standards, which recommend that companies in environmentally sensitive sectors fully disclose their carbon emissions (Kuswanto, 2019).

Including carbon emission disclosures in annual or sustainability reports can serve as a positive signal to investors, indicating that the company has low investment risk, thus resulting in a lower cost of equity. A lower cost of equity tends to increase share prices or firm value (Kelvin et al., 2017). This aligns with signaling theory, which posits that public disclosures made by companies can be interpreted as signals for investment decisions (Tanasya & Handayani, 2020). Carbon disclosure makes it easier for stakeholders to assess a company's performance in managing emissions. Additionally, such transparency enhances corporate legitimacy in society by demonstrating a commitment to environmental responsibility (Afni et al., 2023).

Studies on the impact of carbon emission disclosure on firm value have yielded mixed results. Some research (Kurnia et al., 2021; Wenni Anggita et al., 2022; Afni et al., 2023) found a positive effect of carbon disclosure on firm value. However, other studies (Gunawan, 2024; Shafira, 2024; Prasetyo & Prijanto, 2024) reported no significant effect.

Another factor influencing firm value is green investment. Green investment refers to capital allocation practices that prioritize the preservation of natural resources, the development of renewable energy sources, clean air and water initiatives, and other environmentally friendly activities (Anisah, 2020). Green investment reflects a company's commitment to responsible business practices, thereby enhancing its reputation, investor trust, and competitiveness. As such, it can strengthen a company's competitive advantage, reputation, and ultimately, firm value (Tanasya & Handayani, 2020).

The implementation of green investment is regulated by national legislation. One of the key regulations is Law No. 25 of 2007 on Investment, which in Article 3 paragraph (1) states that investment must be conducted on an environmentally conscious basis. Green investment has become a key focus of global and national investment agendas. Public awareness of climate change and excessive emissions has driven the need for companies to focus on sustainability through renewable energy and reduced reliance on fossil fuels (Fitriana et al., 2024). The concept of green investment seeks to align corporate activities with societal norms and values, thereby enhancing firm value. This aligns with legitimacy theory, which suggests that companies strive to operate in accordance with prevailing environmental norms (Tanasya & Handayani, 2020).

Research findings on the effect of green investment on firm value are also inconsistent. Some studies (Mentari & Dewi, 2023; Triyani & Rusmanto, 2023; Murwaningsari & Rachmawati, 2023) found a positive influence of green investment on firm value. However, other research (Larasati et al., 2023; Afni et al., 2023) found no significant relationship.

Based on these phenomena and the inconsistencies in previous studies, this research aims to re-examine the effects of carbon emission disclosure and green investment on firm value. This study incorporates three control variables: firm size, leverage, and profitability. Control variables are used to neutralize the effects of external factors, ensuring that the influence of the independent variables on the dependent variable remains isolated (Sugiyono, 2020:71).

Firm size describes the scale of a company, which can be measured by total assets, sales volume, average sales, or market value of shares (Vilantika & Agus Santoso, 2022). Larger firms generally possess more assets (Arisudhana & Priyanto, 2023). In this study, firm size is measured by the natural logarithm of total assets (Sandy & Ardiana, 2023). Investors tend to favor large firms as investment targets due to their perceived stability. As more investors invest, share prices rise, which ultimately increases firm value (Maheswari & Erawati, 2024). Prior studies (Hapsoro, 2020; Abundanti & Dewi, 2019; Afni et al., 2023) confirm that firm size has a positive and significant impact on firm value.

Leverage is a financial ratio that assesses the extent to which a company relies on debt to finance operations and increase profitability within a given period (Siagian et al., 2022). In line with Afni et al. (2023), leverage in this study is measured using the Debt to Asset Ratio. Research by Heliani et al. (2023), Afni et al. (2023), and Vitriani et al. (2024) indicates that leverage affects firm value. High leverage can be seen as a sign that the company effectively manages debt to generate higher profits using external funding.

Profitability refers to a company's ability to generate profit from its operational activities (Utami & Astika, 2024). Profitability in this study follows Adevia & Lisiantara (2022), using Return on Assets (ROA) as the metric. ROA reflects the ratio of net income to total

assets or capital. Studies by Alif et al. (2023), Utami & Astika (2024), and Vitriani et al. (2024) find that profitability positively and significantly influences firm value.

This study offers two key contributions compared to previous research. First, it focuses specifically on energy sector companies listed on the Indonesia Stock Exchange (IDX), as the energy sector is a major contributor to carbon emissions and experiences significant stock value fluctuations. These characteristics pose unique challenges in maintaining and enhancing firm value. This focus aligns with Kurnia et al. (2021), who recommended examining industries with significant environmental consequences. Second, this study incorporates three control variables—firm size, leverage, and profitability—whereas earlier studies (e.g., Sari & Budiasih, 2022; Wenni Anggita et al., 2022; Dian Rahmawati Putri & Murtanto, 2023; Kurnia et al., 2020; Rusmana & Purnaman, 2020) did not operationalize such controls in their models.

2. METHOD

This study uses a quantitative approach with an associative design to analyze the effect of carbon emission disclosure and green investment on Firm Value in the energy sector listed on the Indonesia Stock Exchange (IDX) for the period 2019–2023. The sample was selected using the purposive sampling method and resulted in 271 observations after the outlier process. The dependent variable in this study is firm value as measured by the Tobin's Q ratio, while the independent variables are carbon emission disclosure (referring to the GRI 305 standard) and green investment (proxied by the PROPER rating). The control variables used include company size, leverage, and profitability.

Data collection was conducted through non-participant observation methods by accessing sustainability reports and annual reports from the official websites of the IDX and companies. Quantitative data were processed using the SPSS program through stages of descriptive statistical analysis, classical assumption tests (normality, heteroscedasticity, multicollinearity, and autocorrelation), and multiple linear regression analysis. Model testing was conducted using the F test (model feasibility), determination coefficient test (R^2), and t test (the effect of each independent variable on the dependent variable).

This study is based on signaling theory which states that companies provide signals to investors through environmental information disclosure to reduce information asymmetry. Although carbon emission disclosure and green investment aim to improve market perception of the company, the effectiveness of the signal is highly dependent on investor response. With a systematic methodology design, standardized variable measurement, and comprehensive statistical analysis, this study is expected to provide significant scientific contributions in understanding the relationship between sustainability practices and corporate economic value.

3. RESULTS AND DISCUSSION

Classical Assumption Test Results

1) Normality Test

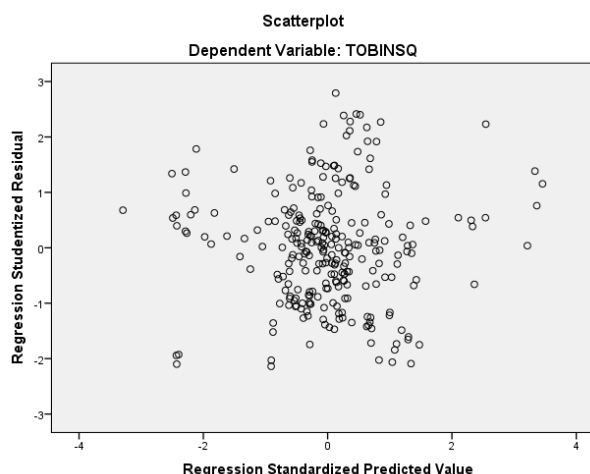
Table 3. Normality Test Results

		Unstandardized Residual
N		271
Normal Parameters ^{a,b}	Mean	0.0000000
	Std. Deviation	0.53796904
Most Extreme Differences	Absolute	0.052
	Positive	0.052
	Negative	-0.028
Test Statistics		0.052
Asymp. Sig. (2-tailed)		0.068 ^c
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		

Source: Processed data, 2025

Based on the results of the normality test above, it can be concluded that the data is normally distributed. This result can be seen from the Asymp sig of 0.068 which is greater than 0.05.

2) Heteroscedasticity Test

Picture 1. Heteroscedasticity Test Results

Source: Processed data, 2025

Based on the results of the heteroscedasticity test using the scatterplot model, there is no heteroscedasticity event. This result can be shown from the scatter plot pattern which does not form a certain pattern and is not collected in a certain position.

3) Multicollinearity Test

Table 4. Multicollinearity Test Results

Variables	Collinearity Statistics	
	Tolerance	VIF
CED	0.670	1.493
GI	0.671	1.491
SIZE	0.808	1.237
LEV	0.994	1.006
ROA	0.954	1.049

Source: Processed data, 2025

Based on Table 4, the results of the multicollinearity test show that all variables have a tolerance value above 0.10 and a VIF value below 10. This indicates that there is no multicollinearity between the independent variables in the regression model. Thus, all variables can be used in the model without causing bias due to multicollinearity.

4) Autocorrelation Test

Table 5. Autocorrelation Test Results

Model	Durbin-Watson
1	1.122

Source: Processed data, 2025

Based on table 5, the results of the Durbin-Watson test above show that the Durbin-Watson (DW) value is 1.122. The Durbin-Watson value of 1.122 is compared using a significance level of 5%, the number of samples (N) = 271 and 5 independent variables. By looking at the Durbin-Watson table, it was found that the du value was 1.837. The data criteria are said to pass the Durbin-Watson test if $du < dw < 4-du$. From the results of this study, the results obtained were $1.837 > 1.122 < 2.163$, so the results in this study are said to have autocorrelation or do not pass the autocorrelation test.

Based on research (candradewi & yasa 2018), to obtain proper research, the Cochran-ortcutt method was carried out. According to (Ghozali, 2018:125) The Cochran-ortcutt method is one of the methods used to overcome the problem of autocorrelation, where research data is converted into lag form. The following are the results after the Cochran-ortcutt method is carried out.

Table 6. Autocorrelation Test Results

Model	Durbin-Watson
1	2.031

Source: Processed data, 2025

Based on table 6, it is known that the Durbin Watson (dw) value is 2.031. This value is between the dU and 4-dU values for a sample size of 271 and 5 independent variables with a dU value of 1.837 and a 4-dU value of 2.163. Thus, $du < dW < 4-du$ is $1.837 < 2.031 < 2.163$, where this result indicates that the regression model used does not experience autocorrelation.

Regression Analysis Test Results

Table 7. Results of Multiple Linear Regression Analysis Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error			
1	(Constant)	3.325	0.369		9.009	0.000
	CED	0.300	0.122	0.153	2.466	0.014
	GI	0.018	0.022	0.050	0.813	0.417
	SIZE	-0.092	0.013	-0.411	-7.293	0.000
	LEV	-0.068	0.083	-0.042	-0.822	0.412
	ROA	1.959	0.260	0.391	7.542	0.000

Source: Processed data, 2025

Based on the results of the multiple linear regression analysis presented in the table, the regression equation is:

$$\text{Tobins'Q} = 3.325 + 0.300 \text{ CED} + 0.018 \text{ GI} - 0.092 \text{ SIZE} - 0.068 \text{ LEV} + 1.959$$

$$\text{ROA} + \epsilon \dots \dots \dots (7)$$

Based on the regression equation above, it can be explained that:

- 1) The constant value (a) is 3.325 means that if the independent variables of carbon emissions (CED) and Green Investment (GI) and the control variables of company size (Size), leverage (LEV) and profitability (ROA) are considered to have a value of zero, then the firm value (TOBINS'Q) will have a value of 3.325 units.
- 2) The value of the carbon emission disclosure (CED) regression coefficient is 0,300 with significance value $0.014 < 0.05$. Where if carbon emissions increase by one unit, the company's value will increase by 0.300 units, assuming other variables remain constant.
- 3) The regression coefficient value of Green Investment (GI) is 0.018 with a significance level of $0.417 > 0.05$. This indicates that if Green Investment increases by one unit, the firm value will increase by 0.018 units, assuming other variables remain constant.
- 4) The regression coefficient value of Company Size (SIZE) has a coefficient of -0.092 with a significance of $0.000 < 0.05$. If the company size increases by one unit, the firm value actually decreases by -0.092, assuming other variables remain constant.
- 5) The leverage regression coefficient value has a coefficient of -0.068 with a significance of $0.412 > 0.05$, if leverage increases by one unit, the firm value will decrease by -0.068 units, assuming other variables are constant.
- 6) The profitability regression coefficient value has a coefficient of 1.959 with a significance of $0.000 < 0.05$. If profitability increases by 1 unit, then the firm value increases by 1.959 units, assuming other variables remain constant.

Model Feasibility Test Results (F Test)

Table 8. Results of Model Feasibility Test (F Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	36.707	5	7.341	24.897	0.000b
	Residual	78.141	265	0.295		
	Total	114.848	270			

Source: Processed data, 2025

Based on table 8, the results of the model feasibility test show an F value of 24.897 with a significance of 0.000, which means that the overall regression model is significant and has good ability in explaining the relationship between independent variables and firm value.

Results of the Determination Coefficient Test (R2 Test)

Table 9. Results of the Determination Coefficient Test (R2 Test)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.565a	0.320	0.307	0.54302

Source: Processed data, 2025

Based on table 9, the results of multiple linear regression analysis conducted to test the effect of carbon emissions and green investment on firm value, obtained an R Square value of 0.307 indicating that 30.7 percent of the variation in firm value can be explained by independent variables (carbon emissions, green investment, firm size, leverage, and

profitability), while the remaining 69.3% percent is explained by other variables not included in this model. This shows that the regression model has sufficient explanatory power in explaining the factors that influence firm value.

Hypothesis Test Results (t-Test)

Table 10. Hypothesis Test Results

Model		Unstandardized Coefficients B	t	Sig.
1	(Constant)	3.325	9.009	0.000
	CED	0.300	2.466	0.014
	GI	0.018	0.813	0.417
	SIZE	-0.092	-7.293	0.000
	LEV	-0.068	-0.822	0.412
	ROA	1.959	7.542	0.000

Source: Processed data, 2025

- 1) Based on table 10, it shows that the regression coefficient value of the carbon emission variable is 0.300 with the value of $t = 2.466$ and significance 0.014. Significance value $0.014 < 0.05$ indicates that carbon emissions have a positive and significant effect on firm value.
- 2) The regression coefficient value of the green investment variable is 0.018 with a t value of 0.813 and a significance of 0.417. The significance value of $0.417 > 0.05$ means that green investment has no effect on firm value.

Discussion

The Impact of Carbon Emission Disclosure on Firm Value

Based on the results of the test conducted using multiple linear regression analysis, it states that carbon emission disclosure has a positive effect on firm value. It can be concluded that the first hypothesis (H_1) is accepted. This means that the higher the level of carbon emission disclosure by the company, the higher the firm value in the eyes of investors and stakeholders.

This research was conducted on an energy sector company, where in carrying out its operational activities to meet the needs and expectations of stakeholders, the company is inseparable from the potential to cause impacts on the environment, one of which is carbon emissions. The presence of carbon emissions in the company's operational activities has a negative impact on the environment around the company. This negative impact can reduce the company's reputation in the eyes of investors. The company certainly will not take the risk of losing investors by causing a negative impact on the environment. Therefore, the company needs to minimize the negative impacts caused by carbon emissions on the environment. One of the preventive efforts that can be made by the company is by disclosing carbon emissions, which can be said to be an indirect investment that can increase the firm value in the eyes of investors.

The Influence of Green Investment on Firm Value

Based on the test results conducted using multiple linear regression analysis, it states that green investment disclosure has no effect on firm value. It can be concluded that the second hypothesis (H_2) is rejected. This means that although there is an increase in green investment in firm value, it does not have an impact on increasing firm value.

One of the company's efforts to show its concern for the environment is through green investment, which is an investment directed at environmentally friendly and sustainable activities. In Indonesia, a real form of this commitment can be seen through the achievement of the PROPER rating issued by the Ministry of Environment and Forestry Number 1 of 2021 concerning the Company Performance Rating Assessment Program in Environmental Management. This assessment is carried out based on the company's compliance in controlling pollution, including air pollution, as well as additional initiatives carried out by the company in environmental management. Companies, especially in the energy sector, that have succeeded in obtaining a green or gold PROPER rating are perceived as having a high awareness of environmental responsibility, because they are considered to have invested in technology or systems that support sustainability. Therefore, PROPER can be used as an indicator to identify companies that carry out green investment, as well as a reflection of the extent to which the company responds to environmental issues in its business practices. Although green investment reflects the company's commitment to environmental sustainability, its implementation does not always have a positive impact on firm value.

4. CONCLUSION

- 1) Carbon emission disclosure has a positive effect on firm value. This means that the more complete the carbon emission disclosure made by the company, the greater the positive perception from the market and stakeholders towards the company's environmental commitment, which can ultimately increase the firm value.
- 2) Green Investment has no effect on firm value. This means that although there is an increase in green investment, it does not have a significant impact on firm value.

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