

The Effect of Carbon Emission Disclosure, Corporate Social Responsibility, and Eco-Efficiency on the Value of Energy Sector Companies

Teresia Ramayana Sitohang, Diah Amalia

Teresiaramayana6@gmail.com, diahamalia@polibatam.ac.id

Business Management Study Program, Department of Managerial Accounting
Batam State Polytechnic

ABSTRACT

This study aims to analyze the effect of carbon emission disclosure, Corporate Social Responsibility (CSR) disclosure, and eco-efficiency on the value of companies in the energy sector listed on the Indonesia Stock Exchange (IDX) for the 2021–2025 period. This research is motivated by increasing regulatory pressures and investor expectations for the transparency of the company's environment in the energy sector, amid the inconsistency of previous research results regarding the relationship between these sustainability variables and company value. The research uses an associative quantitative approach with secondary data in the form of annual reports and sustainability reports from 45 energy sector companies selected through purposive sampling, resulting in 225 observations over five years of observation. Company value was measured using Tobin's Q ratio, carbon emission disclosure using the Carbon Emission Disclosure (CED) index based on GRI 305, CSR disclosure using the Corporate Social Responsibility Index (CSRI) based on GRI G4, and eco-efficiency using the ratio of net sales to total assets. Data were analyzed using multiple linear regression with the help of SPSS 26. The results showed that carbon emission disclosure had no significant effect on company value, while CSR and eco-efficiency disclosure had a positive and significant effect respectively. Simultaneously, the three independent variables had a significant effect on the company's value with the ability to explain by 55.7 percent. These findings indicate that CSR disclosure is the most dominant determinant in the formation of corporate value in the energy sector in Indonesia.

Keywords: carbon emission disclosure, corporate social responsibility, eco-efficiency, corporate value, energy sector.

ABSTRACT

This study aims to analyze the effect of carbon emission disclosure, Corporate Social Responsibility (CSR) disclosure, and eco-efficiency on firm value in the energy sector listed on the Indonesia Stock Exchange (IDX) during the 2021–2025 period. The study is motivated by increasing regulatory pressure and investor expectations regarding environmental transparency, amid inconsistent findings in prior studies on the relationship between these sustainability variables and firm value. This study employs a quantitative associative approach using secondary data from annual reports and sustainability reports of 45 energy sector companies selected through purposive sampling, yielding 225 observations over five years. Firm value is measured using Tobin's Q, carbon emission disclosure using the Carbon Emission Disclosure (CED) index based on GRI 305, CSR disclosure using the Corporate Social Responsibility Index (CSRI) based on GRI G4, and eco-efficiency using the ratio of net sales to total assets. Data were analyzed using multiple linear regression with SPSS 26. The results show that carbon emission disclosure has no significant effect on firm value, while CSR disclosure and eco-efficiency each have a significant positive effect. Simultaneously, the three independent variables significantly affect firm value, explaining 55.7 percent of its variation. These findings indicate that CSR disclosure is the most dominant determinant of firm value formation in Indonesia's energy sector.

Keywords: carbon emission disclosure, corporate social responsibility, eco-efficiency, firm value, energy sector.

1. Introduction

The energy sector is a sector that includes companies engaged in the extraction and provision of energy-related products and services, including petroleum mining, natural gas, coal, energy industry support service providers, and alternative energy products and services providers based on the Indonesia Stock Exchange Industrial Classification (IDX-IC). Company revenues in this sector are greatly influenced by fluctuations in world energy commodity prices, so that the market valuation of energy sector companies is dynamic and complex.

Company value is an investor's perception of the company's successful asset management and performance, which is often reflected in the stock price. For the energy sector, a high company value reflects market confidence in the profitability and sustainability of the business in the future. In the modern era, investor valuations no longer only rely on conventional financial aspects, but also consider the management of non-financial risks such as environmental and social issues, so that carbon emission disclosure and Corporate Social Responsibility (CSR) also affect the company's value.

In the midst of the urgency of climate change, the world's attention is focused on industrial decarbonization efforts, including the energy sector, which is one of the largest contributors to greenhouse gas emissions. Carbon emission disclosure is a strategic signal of the company's commitment to the green economy transition that affects market valuations. In addition, CSR disclosure plays a crucial role in maintaining the company's long-term existence, because the company's legitimacy in the modern era is no longer only measured by its financial profitability but also by its real contribution to social and environmental issues. In addition to these external disclosures, the implementation of eco-efficiency is also an important determinant of business sustainability through minimizing the use of natural resources while reducing operational costs and boosting profitability.

Although theoretically these three variables are believed to be able to increase company value, the results of previous research still show inconsistencies. Some studies found a significant positive effect of carbon emission disclosure and CSR on company value, while other studies found that carbon emission disclosure did not have a significant effect because investors were still oriented towards short-term financial performance. Similarly, in the eco-efficiency variable, some studies

found a positive influence, while other studies found that eco-efficiency investments actually responded negatively in the short term because they were considered to increase the burden of operational costs. The existence of this research gap is the main motivation for this study to re-examine the relationship between carbon emission disclosure, CSR disclosure, and eco-efficiency to company value in the energy sector listed on the IDX for the 2021-2025 period.

Based on this description, the formulation of this research problem is whether carbon emission disclosure, CSR disclosure, and eco-efficiency affect company value, both partially and simultaneously. The purpose of this study is to determine the effect of carbon emission disclosure, CSR disclosure, and eco-efficiency on company value in the energy sector on the IDX. This research is expected to make a theoretical contribution to the development of managerial accounting science as well as a practical contribution to company management, investors, and regulators in formulating better sustainability disclosure policies.

2. Literature Review

Legitimacy Theory

The legitimacy theory explains that companies seek to gain and maintain legitimacy from the community through activities that are in accordance with applicable social norms and values, and the sustainability of the company is highly dependent on public acceptance of its operational activities (Atiningsih & Setiyono, 2023; Suchman, 1995; Deegan, 2002). In this study, carbon emission disclosure, CSR disclosure, and the implementation of eco-efficiency are forms of social and environmental responsibility carried out by companies to show sustainability commitment so as to gain legitimacy from the community and investors.

Theory Stakeholder

Stakeholder theory explains that the company is not only responsible to shareholders, but also to all stakeholders such as employees, society, government, consumers, and the environment (Donaldson & Preston, 1995; Nguyen, 2025). In the context of this study, the disclosure of CSR and carbon emissions is a form of corporate transparency to stakeholders regarding the environmental and social impacts of its activities, which in turn can increase stakeholder trust and have a positive impact on the company's value.

Previous Research

Table 1. Summary of Previous Research

Source: Processed from a research proposal (2026).

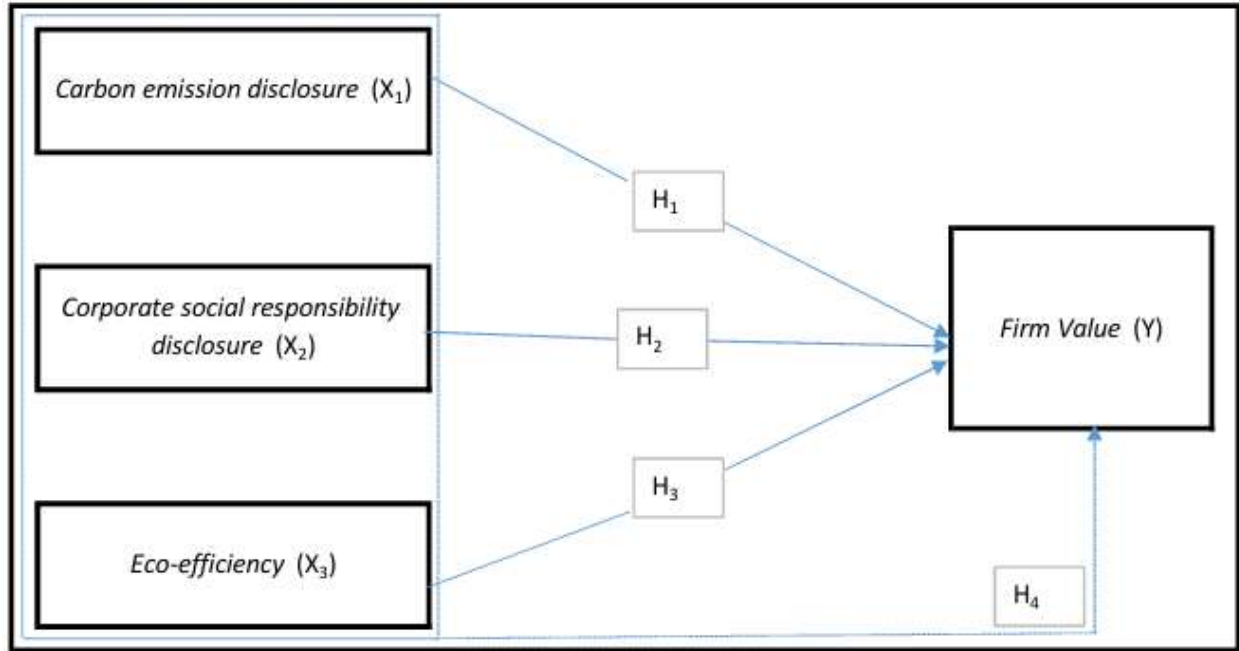
Researcher	Variable/Focus	Key findings	Relevance
Fitri & Putra (2025)	Disclosure of Carbon Emissions, CSR, <i>Eco-efficiency</i> , and Corporate Value	Carbon emission disclosure does not have a significant effect partially, but has a significant effect simultaneously with CSR and <i>eco-efficiency</i>	Shows <i>research gaps</i> while supporting simultaneous testing.
Kurnia et al. (2021)	Disclosure of Carbon Emissions and Corporate Value	Disclosure of carbon emissions has a positive effect on the company's value because it increases investor confidence.	Supporting the alleged positive impact of carbon emissions disclosure
Astuti et al. (2025)	Disclosure of Carbon Emissions and Corporate Value	Carbon emissions disclosure does not have a significant effect because investors are short-term-oriented.	Showing a <i>research gap</i> (insignificant results) in the disclosure of carbon emissions.
Yuliandhari et al. (2023)	Simultaneous disclosure of Carbon Emissions, CSR, and <i>Eco-efficiency</i>	All three variables together have a significant effect on the company's value.	Supports simultaneous effect testing of sustainability variables.
Princess & Rahmah (2025)	Disclosure of Carbon Emissions and Corporate Value	Disclosure of carbon emissions has a positive effect on the company's value because it increases investor confidence.	Supporting the alleged positive impact of carbon emission disclosure.
Primary & Sustainable (2025)	Disclosure of Carbon Emissions and Corporate Value	Carbon emissions disclosure does not have a significant effect because investors are short-term-oriented.	Showing a <i>research gap</i> (insignificant results) in the disclosure of carbon emissions.
Nugroho & Saputra (2025)	Disclosure of Carbon Emissions and Corporate Value	Disclosure of carbon emissions has a positive effect on the company's value because it increases investor confidence.	Supporting the alleged positive impact of carbon emissions disclosure
Sustainable (2025)	Disclosure of CSR and Company Values	CSR disclosure has a positive effect on a company's value because it increases reputation and legitimacy	Supporting the alleged positive influence of CSR disclosure.
Hardiyansah et al. (2021)	Disclosure of Carbon Emissions and Corporate Value	Disclosure of carbon emissions has a positive effect on the company's value because it increases investor confidence.	Supporting the alleged positive impact of carbon emission disclosure.
Stuart (2024)	Disclosure of CSR and Company Values	CSR disclosure has a positive effect on the company's value because it	Supporting the alleged positive influence of CSR disclosure.

		increases reputation and legitimacy.	
Machmuddah et al. (2020)	Disclosure of CSR and Company Values	CSR disclosure has a positive effect on the company's value because it increases reputation and legitimacy.	Supporting the alleged positive influence of CSR disclosure.
Tsang et al. (2024)	Disclosure of CSR and Company Values	CSR disclosure has a positive effect on the company's value because it increases reputation and legitimacy.	Supporting the alleged positive influence of CSR disclosure.
Nguyen (2025)	Disclosure of CSR and Company Values	CSR disclosure has a positive effect on the company's value because it increases reputation and legitimacy.	Supporting the alleged positive influence of CSR disclosure.
Shawn (2024)	Simultaneous disclosure of Carbon Emissions, CSR, and <i>Eco-efficiency</i>	All three variables together have a significant effect on the company's value.	Supports simultaneous effect testing of sustainability variables.
Rahmanita (2020)	Disclosure of Carbon Emissions and Corporate Value	Disclosure of carbon emissions has a positive effect on the company's value because it increases investor confidence.	Supporting the alleged positive impact of carbon emission disclosure.
Squirting (2025)	<i>Eco-efficiency</i> and Corporate Value	Eco-efficiency investment is responded to negatively in the short term because it is considered to increase the cost burden.	Showing a <i>research gap</i> (opposite/negative results) on <i>eco-efficiency</i> .

Frame of Mind

The framework of this study describes the relationship between independent variables, namely carbon emission disclosure (X1), CSR disclosure (X2), and eco-efficiency (X3), to the dependent variable, namely company value (Y), as presented in Figure 1.

Figure 1. Frame of Mind
Source: Processed from a research proposal (2026).



Hypothesis Development

Carbon emission disclosure is the delivery of information about the amount of greenhouse gas emissions produced by companies and their control efforts. Based on Legitimacy Theory and Stakeholder Theory, broad disclosure of carbon emissions shows the company's commitment to sustainability so as to gain legitimacy and investor trust. Although some studies found insignificant influences, the majority of studies showed a positive influence direction (Nugroho & Saputra, 2025; Kurnia et al., 2021; Hardiyansah et al., 2021), so that the hypothesis was formulated:

H1: Disclosure of carbon emissions has a positive effect on the value of the company.

Corporate Social Responsibility (CSR) is a form of corporate responsibility for economic, social, and environmental aspects. According to Stakeholder Theory, a company's success is not only determined by its ability to generate profits, but also by its ability to meet stakeholder expectations, while in Legitimacy Theory, CSR activities are a means of gaining social legitimacy. Previous research has found many positive influences of CSR on company value (Utami, 2024; Lestari, 2025; Machmuddah et al., 2020; Tsang et al., 2024), so the hypothesis is formulated:

H2: Corporate Social Responsibility (CSR) disclosure has a positive effect on company value.

Eco-efficiency is the company's ability to generate economic value with more efficient use of resources and lower environmental impact. In the perspective of Legitimacy Theory, the application of eco-efficiency shows concern for the environment so as to gain community legitimacy, while reducing operational costs and increasing profitability. Previous research has supported the positive influence of eco-efficiency on company value (Rahmawati, 2024; Atiningsih & Setiyono, 2023; Pelawi & Inawati, 2024; Wasyiah et al., 2025), so that the hypothesis was formulated:

H3: Eco-efficiency has a positive effect on the company's value.

The three independent variables reflect the company's responsibility for environmental, social, and economic aspects in an integrated manner. Based on the Theory of Legitimacy and Stakeholder Theory, companies that are able to meet stakeholder expectations through environmental transparency, social activities, and environmental efficiency will simultaneously gain higher legitimacy and trust, as found by previous research (Wijaya, 2024; Fitri & Putra, 2025; Yuliandhari et al., 2023), so that the hypothesis is formulated:

H4: Carbon emission disclosure, Corporate Social Responsibility (CSR) disclosure, and eco-efficiency simultaneously affect company value.

3. Research Methods

This study uses an associative-causal quantitative approach that aims to examine the influence of carbon emission disclosure, CSR disclosure, and eco-efficiency on company value. The data used are secondary data in the form of annual reports, sustainability reports, financial reports, and stock price data of energy sector companies obtained through the official website of the Indonesia Stock Exchange (idx.co.id) and the official website of each company. The population of this study is all energy sector companies listed on the IDX during the period 2021–2025.

Table 2. Number of Research Samples

Source: Processed from a research proposal (2026).

Yes	Sample Selection Criteria	Total
1	Energy sector companies listed on IDX in 2021 – 2025	66
2	Energy sector companies that publish annual financial statements from 2021 – 2025	(5)
3	Energy sector companies that publish sustainability reports for 2021 – 2025	(6)
4	Companies that disclose information related to carbon & CSR emission data, and eco-efficiency data are available during the research period.	(4)
5	Energy Sector Companies use Rupiah currency	(6)
	Number of research samples	45
	Research year period 2021 – 2025	5
	Total sample during the study period	225

The

operationalization and measurement of research variables are presented in Table 3.

Table 3. Variable Operations

Source: Processed from a research proposal (2026).

Variabel	Dimensions	Indicators/Measurements	Scale	Source
Company Value (Y)	Market to book value ratio	Tobin's Q = (MVS + Total Liabilities) / Total Assets	Ratio	Fitri & Putra (2025)
Carbon Emissions Disclosure (X1)	Transparency of GHG emissions	$CED = \sum \text{Items Disclosed} / \text{Total Items (7 items GRI 305)}$	Ratio	Fitri & Putra (2025)
CSR Disclosure (X2)	Social and environmental responsibility	$CSRI = \sum X_{ij} / N_j$ (91 item GRI G4)	Ratio	Fitri & Putra (2025)
Eco-Efficiency (X3)	Resource usage efficiency	$\text{Eco-Efficiency} = \text{Net Sales} / \text{Total Aset} \times 100\%$	Ratio	Fitri & Putra (2025)

Source: Researcher-processed data (2026)

Data was collected through a documentation study method, namely by downloading and reviewing the financial statements, annual reports, and sustainability reports of energy sector companies listed on the IDX for the period 2021–2025. Data analysis was carried out using IBM SPSS 26 software through several stages, namely: (1) descriptive statistical analysis to describe data characteristics through minimum, maximum, mean, and standard deviation values; (2) classical assumption tests including normality tests, multicollinearity tests, heteroscedasticity tests, and

autocorrelation tests; (3) multiple linear regression analysis; and (4) hypothesis testing through t-tests (partial), F tests (simultaneous), and determination coefficients (R^2).

The multiple linear regression model used in this study is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Remarks: Y = Company Value; α = Constant; β_1 , β_2 , β_3 = Regression Coefficient; X1 = Carbon Emission Disclosure; X2 = CSR Disclosure; X3 = Eco-Efficiency; e = Error Term. The partial (t-test) and simultaneous (F-test) hypothesis testing criteria used a significance level of $\alpha = 0.05$, where a Sig. < value of 0.05 indicates that the hypothesis is accepted and a Sig. > value of 0.05 indicates that the hypothesis is rejected.

4. Results and Discussion

Results

This study uses secondary data from 45 energy sector companies listed on the IDX during the 2021–2025 period, resulting in 225 observations. The sample covers various subsectors based on the IDX-IC classification, including coal mining, petroleum, natural gas, and energy service and distribution providers, including large-scale companies such as PGAS, PTBA, MEDC, ITMG, and BYAN.

Descriptive Statistical Analysis

The results of descriptive statistical analysis of the transformed data (BoxCox for Tobin's Q and $\ln(1+x)$ for eco-efficiency) are presented in Table 4.

Table 4. Descriptive Statistical Analysis Results

Variabel	N	Minimum	Maximum	Mean	Std. Deviation
TOBINC_BC (Y)	225	– 0,4462	0,8968	0,1872	0,4023
CED (X1)	225	0,1429	1,0000	0,8373	0,1530
CSR (X2)	225	0,2000	0,6500	0,4052	0,0841
LN_ECOEFF (X3)	225	0,0000	5,5150	3,7391	1,0372

The corporate value variable (TOBINC_BC) has an average of 0.1872 with a standard deviation of 0.4023. Prior to the transformation, the original Tobin's Q value ranged from 0.2578 to 20.3440 with an average of 1.9942, where an average above 1 indicates that the market value of IDX energy

sector companies in general exceeds its book value. The carbon emission disclosure variable (CED) had an average of 0.8373, indicating that the sample companies have disclosed approximately 83.73% of the 7 GRI 305 items, with Scope 1 and Scope 2 items being the most disclosed. The CSR disclosure variable had an average of 0.4052 or approximately 40.52% of the 91 GRI G4 items, reflecting the still voluntary nature of CSR disclosure in developing countries. The eco-efficiency (LN_ECOEFF) variable has an average of 3.7391, which is equivalent to a net sales to total assets ratio of 59.55% before the transformation, with considerable variation between subsectors due to differences in asset intensity.

Classic Assumption Test

Before the regression analysis was carried out, classical assumption testing was first carried out to ensure that the regression model produced an estimate that was the Best Linear Unbiased Estimator (BLUE) (Ghozali, 2021). The normality test using the One-Sample Kolmogorov-Smirnov with Lilliefors correction, reinforced with the values of Skewness, Kurtosis, and Shapiro-Wilk tests, is presented in Table 6.

Table 5. Residual Normality Test Results

Remarks	Results
N	225
Mean Residual	0,0000000
Std. Deviation Residual	0,26607179
Test Statistic (D) — Kolmogorov-Smirnov (Lilliefors)	0,049
Asymp. Sig. (2-tailed)	0,200
Skewness	0,138
Kurtosis	– 0,550
Shapiro-Wilk Sig.	0,167

Source: SPSS output, data processed (2026)

Asymp. Sig. values of 0.200 and Shapiro-Wilk Sig. of 0.167, both greater than $\alpha = 0.05$, indicating that the residual is normally distributed. This result is reinforced by the values of Skewness (0.138) and Kurtosis (–0.550) which are within the acceptable range, so that the assumption of normality is fulfilled after the BoxCox transformation of Tobin's Q (after winsorize 5%) and LN(1+x) at eco-efficiency.

Table 7. Multicollinearity Test Results

Variabel	Tolerance	LIVE	Remarks
CED (X1)	0,961	1,040	No multicollinearity
CSR (X2)	0,999	1,001	No multicollinearity
LN_ECOEFF (X3)	0,961	1,041	No multicollinearity

Source: SPSS output, data processed (2026)

All independent variables showed a Tolerance value of > 0.10 and VIF < 10 , with the highest Condition Index value of 18.074 (below the threshold of 30), so it can be concluded that there is no multicollinearity among independent variables (Ghozali, 2021).

Table 8. Heteroscedasticity Test Results (Glejser Test)

Variabel	B	Std. Error	t	Say.	Remarks
(Constant)	0,116	0,078	1,499	0,135	–
CED (X1)	0,037	0,067	0,554	0,580	Insignificant
CSR (X2)	0,212	0,120	1,768	0,078	Insignificant
LN_ECOEFF (X3)	– 0,004	0,010	– 0,390	0,697	Insignificant

Source: SPSS output, data processed (2026). Dependent variables: ABS_RES.

All independent variables showed significance values greater than $\alpha = 0.05$, so there were no variables that significantly affected the residual absolute value and the regression model was free of heteroscedasticity problems.

Table 9. Autocorrelation Test Results (Durbin-Watson)

Remarks	Value
Durbin-Watson Statistic	2,016
dL (n = 225, k = 3, $\alpha = 5\%$)	1,745
dU	1,799
4 – dU	2,201
Conditions : dU < DW < 4 – dU	1,799 < 2,016 < 2,201 (auto-correlation-free)

Source: SPSS output, data processed (2026)

The Durbin-Watson value of 2.016 is between dU (1.799) and 4–dU (2.201), so the regression model is declared free of both positive and negative autocorrelation problems.

Multiple Linear Regression Analysis

The results of multiple linear regression analysis are presented in Table 7.

Table 10. Results of Multiple Linear Regression Analysis

Variabel	B	Std. Error	Beta	t	Say.
(Constant)	- 1,622	0,138	-	- 11,757	<0.001
CED (X1)	0,128	0,119	0,049	1,073	0,284
CSR (X2)	3,334	0,213	0,697	15,661	<0.001
LN_ECOEFF (X3)	0,094	0,018	0,242	5,323	<0.001

Source: SPSS output, data processed (2026). Dependent variables: TOBINQ_BC.

Based on Table 7, the regression equation was obtained: $TOBINQ_BC = -1.622 + 0.128 CED + 3.334 CSR + 0.094 LN_ECOEFF + e$. The CED coefficient of 0.128 indicates a positive but insignificant direction (Sig. = 0.284). The CSR coefficient of 3.334 with the largest standardized Beta (0.697) shows a positive and very significant influence (Sig. < 0.001). The LN_ECOEFF coefficient of 0.094 with Beta 0.242 also shows a positive and significant influence (Sig. < 0.001). Based on the Beta coefficient, the order of variable contribution is CSR (0.697) > eco-efficiency (0.242) > CED (0.049).

Table 11. Determination Coefficient (R²) Test Results

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	0,750	0,563	0,557	0,2679

Source: SPSS output, data processed (2026). Predictors: CED, CSR, LN_ECOEFF.

An Adjusted R² value of 0.557 indicates that the three independent variables together are able to explain 55.7% of the variation in company values, while the remaining 44.3% are explained by factors other than the model. This value is relatively high for accounting and finance research that uses non-financial variables as predictors (Hair et al., 2019).

Table 12. Test Results F (Simultaneous)

Model	Sum of Squares	df	Mean Square	F	Say.
Regression	20,394	3	6,798	94,737	<0.001
Residual	15,858	221	0,072	-	-
Total	36,252	224	-	-	-

Source: SPSS output, data processed (2026).

An F value of 94.737 with a significance of < 0.001 indicates that the simultaneous disclosure of carbon emissions, CSR, and eco-efficiency has a significant effect on the company's value.

Table 13. Summary of Hypothesis Test Results (t-test)

Hipotesis	Variabel	b	Say.	Directions	Results
H1	CED → Company Value	0,128	0,284	Positive	Rejected
H2	CSR → Company Values	3,334	<0.001	Positive	Accepted

Hipotesis	Variabel	b	Sig.	Directions	Results
H3	Eco-Efficiency → Company Value	0,094	<0.001	Positive	Accepted
H4	CED+CSR+Eco-Eff. → Company Value (Simultan)	–	<0.001	–	Accepted

Source: SPSS output, data processed (2026)

Discussion

The test results showed that H1 was rejected: carbon emission disclosure had no significant effect on the company's value ($\beta = 0.128$; Sig. = 0.284). Despite the positive coefficient direction, the effect was not statistically significant, which is consistent with previous research in the Indonesian context which found that investors in emerging market capital markets are still oriented towards short-term financial performance rather than environmental information (Pratama & Lestari, 2025; Astuti et al., 2025). This condition can also be explained by the ambivalence of market interpretations of emissions disclosures: on the one hand it reflects sustainability commitments, on the other hand it indicates future regulatory risk exposures, so that its net impact on the value of the company is insignificant, plus the limitation of independent verification of disclosure claims that has the potential to raise investor scepticism towards greenwashing practices.

H2 is accepted: CSR disclosure has a positive and very significant effect on the company's value ($\beta = 3.334$; Sig. < 0.001) and is the variable with the largest contribution (Beta = 0.697). These findings are consistent with research that found that CSR disclosure in energy sector company sustainability reports has a positive effect on Tobin's Q (Widyastuti, 2024; Utami, 2024; Lestari, 2025), as well as confirming the relevance of Legitimacy Theory and Stakeholder Theory, where comprehensive CSR disclosure builds social legitimacy and investor trust that has an impact on company value.

H3 is accepted: eco-efficiency has a positive and significant effect on the company's value ($\beta = 0.094$; Sig. < 0.001). This effect can be explained through three paths, namely the profitability path (asset efficiency increases profits), the signaling path (efficiency reflects the quality of management to the market), and the operational cost reduction path. This finding is in line with research that found eco-efficiency is easier for investors to verify through financial figures than

textual emission disclosure claims, making it more effective as a positive signal for the market (Rahmawati, 2024; Yuliandhari et al., 2023).

H4 was accepted: simultaneously, the disclosure of carbon emissions, CSR, and eco-efficiency had a significant effect on the company's value ($F = 94.737$; $\text{Sig.} < 0.001$) with an Adjusted R^2 of 0.557. The acceptance of H4 even though H1 was partially rejected indicates a complementarity effect among the three dimensions of sustainability, where a comprehensive sustainability profile is assessed by investors more comprehensively than the evaluation per dimension. These findings are consistent with research that found that carbon emission disclosure, eco-efficiency, and green innovation simultaneously affect company value (Yuliandhari et al., 2023), and confirms that company legitimacy is formed cumulatively from various complementary dimensions of sustainability (Suchman, 1995; Deegan, 2002).

5. Closing

Conclusion

This study aims to analyze the effect of carbon emission disclosure, CSR disclosure, and eco-efficiency on company value in the energy sector listed on the IDX for the 2021–2025 period. All classical regression assumptions (normality, multicollinearity, heteroscedasticity, and autocorrelation) are met, so that the regression results are reliable. The test results show that carbon emission disclosure has no significant effect on company value (H1 is rejected), while CSR (H2) and eco-efficiency (H3) disclosure have a positive and significant effect, respectively, with CSR disclosure being the most dominant determinant. Simultaneously, the three independent variables have a significant effect on the company's value (H4 accepted) and are able to explain 55.7% of the variation.

Research Implications

Theoretically, this study strengthens the relevance of Legitimacy Theory and Stakeholder Theory in explaining the relationship between sustainability disclosure and corporate value in Indonesia's energy sector. Practically, energy sector company management is advised to prioritize improving the quality and scope of CSR disclosure and implementing eco-efficiency consistently, as both

have proven to be real determinants of company value in the eyes of investors, while carbon emission disclosure needs to be supported by independent verification to be more trusted by the market.

Research Limitations

This study has several limitations, including the use of pooled OLS that has not controlled the heterogeneity of the company that is not observed, the inclusion of financial control variables such as profitability, leverage, and company size, and CSR data that has not been entirely sourced from manual content analysis that has been verified directly for all 225 observations.

Suggestions

For the management of companies in the energy sector, it is recommended to expand the scope of carbon emission disclosure with the support of independent verification and improve operational efficiency in a sustainable manner. For regulators, the OJK and IDX are advised to strengthen the standardization of sustainability disclosure formats, including considering the gradual adoption of the ISSB IFRS S1 and S2 standards. For further research, it is recommended to add financial control variables, test the possible non-linear relationship between sustainability disclosure and company value, use verified CSR data through direct content analysis, and apply panel data methods such as Fixed Effects Model (FEM) or Random Effects Model (REM) to control unobserved company heterogeneity.

BIBLIOGRAPHY

- Apriliani, L., Kadir, & Hifni, S. (2024). Sustainability accounting: Corporate value and carbon emission disclosure. *Gorontalo Accounting Journal*, 7(1), 91–102. <https://doi.org/10.32662/gaj.v7i1>
- Astuti, P. F., Anisykurlillah, I., & Maulana, I. (2025). Carbon emission disclosure, environmental performance, and firm value: The role of financial performance. *JIA: Jurnal Ilmiah Akuntansi*, 10(1). <https://doi.org/10.23887/jia.v10i1.55564>

- Atiningsih, S., & Setiyono, B. (2023). The Effect of Eco-Efficiency on Company Value. *Journal of Accounting and Investment*.
- Deegan, C. (2002). Introduction: The legitimising effect of social and environmental disclosures — a theoretical foundation. *Accounting, Auditing & Accountability Journal*, 15(3), 282–311. <https://doi.org/10.1108/09513570210435852>
- Donaldson, T., & Preston, L. E. (1995). The stakeholder theory of the corporation: Concepts, evidence, and implications. *Academy of Management Review*, 20(1), 65–91. <https://doi.org/10.5465/amr.1995.9503271992>
- Fahmi, R., & Kurniawan, D. (2025). Green banking and environmental efficiency in the energy sector. *Journal of Sustainable Management and Business*.
- Fitri, A. N., & Putra, V. D. C. (2025). The effect of carbon emission disclosure, corporate social responsibility disclosure, and eco-efficiency on firm value. *E-Jurnal Akuntansi*, 35(11), 2130–2146.
- Ghozali, I. (2021). Application of multivariate analysis with the IBM SPSS 26 program (Edition 10). Publishing Board, Diponegoro University.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.
- Hardiyansah, M., Agustini, A., & Rizki, A. (2021). Carbon emission disclosure and firm value: Evidence from Indonesian listed companies. *Journal of Accounting and Finance*.
- Hidayat, R. (2025). The effect of carbon emission disclosure on company value in the energy sector. *Journal of Contemporary Accounting*.
- Kurnia, A., Putri, N., & Saputra, D. (2021). Carbon emission disclosure and firm value: Evidence from Indonesia. *Journal of Multiparadigm Accounting*.
- Lestari, D. (2025). Corporate social responsibility disclosure and firm value. *Journal of Accounting and Financial Research*.
- Lumbantoruan, P. (2025). The effect of carbon emission disclosure and CSR on the value of companies in the energy sector. *Journal of Economics and Business*.
- Machmuddah, Z., Utomo, S., & Suhartono, E. (2020). Corporate social responsibility and firm value: Evidence from Indonesia. *Indonesian Journal of Accounting and Auditing*.
- Maharani, D., Puspita, I., Suhaimah, K., & Saadah, K. (2024). Carbon emissions disclosure and firm value: A study of firms in Indonesia. *International Journal of Academe and Industry Research*, 5(3), 22–45. <https://doi.org/10.53378/ijair.353078>
- Manurung, M. S., Faisal, Y. A., Sumirat, E. A., & Cahyandito, H. M. F. (2024). Indonesia emission cut 2030: Is carbon transparency the optimal strategy for companies? *International Journal of Halal Research*, 6(1), 31–35.
- Nguyen, T. H. (2025). Sustainability disclosure, stakeholder trust and firm value. *International Journal of Business and Society*.

- Nugroho, A., & Saputra, R. (2025). Carbon emission disclosure and firm value: The role of environmental transparency. *Journal of Sustainability Accounting*.
- Park, S. K., Kim, Y., & Lee, J. (2024). The effects of carbon emissions trading on profitability and value: Evidence from Korean listed firms. *Journal of International Financial Management & Accounting*, 35(2). <https://doi.org/10.1111/jifm.12211>
- Pelawi, M., & Inawati, D. (2024). Eco-efficiency and firm value: Evidence from Indonesian companies. *Indonesian Journal of Accounting and Finance*.
- Pradana, A., & Handayani, R. (2025). Firm value and investor perception in Indonesian banking industry. *Journal of Finance and Energy*.
- Pratama, A. (2024). Climate risk management and carbon disclosure in banking sector. *Journal of Environmental Accounting*.
- Pratama, A., & Lestari, D. (2025). Disclosure of carbon emissions and corporate value: Empirical evidence in Indonesia. *Journal of Accounting Research*.
- Putri, S. A., & Rahmah, N. A. (2025). The effect of carbon emission disclosure, green innovation, and intellectual capital on firm value. *The Sixth International Research Conference on Management and Business*, 1402–1414.
- Rahmanita, S. A. (2020). The effect of carbon emission disclosure on the value of companies with environmental performance as a moderation variable. *Accounting: Journal of Integrative Accounting*, 6, 54–66.
- Rahmawati, N. (2024). Eco-efficiency and firm value: Empirical evidence from Indonesia. *Journal of Accounting and Business*.
- Santoso, H. (2024). Corporate value and investor confidence in the energy sector. *Journal of Modern Economics*.
- Shahzad, M., Ahmed, Z., & Khan, R. (2024). Environmental and social performance as determinants of firm value. *Sustainability*.
- Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, 20(3), 571–610. <https://doi.org/10.5465/amr.1995.9508080331>
- Sugiyono. (2022). Quantitative, qualitative, and R&D research methods. Alfabeta.
- Suryani, D., & Wijaya, A. (2025). Corporate social responsibility and banking sustainability. *Indonesian Journal of Management*.
- Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking*, 1(1), 15–29.
- Tsang, A., Wang, K., & Lee, J. (2024). Non-financial disclosure and firm value. *Journal of Corporate Finance*.
- Utami, S. (2024). Corporate social responsibility disclosure and firm value. *Journal of Accounting and Finance*.

- Wasyiah, N., Putra, Y., & Rahman, F. (2025). Environmental performance, eco-efficiency and firm value. *Journal of Sustainable Accounting*.
- Widyastuti, T. (2024). Assessing the impact of sustainability report disclosures and CEO attributes on the Indonesian energy sector: Implications for capital market performance. *Cogent Business & Management*, 11(1), 2392044. <https://doi.org/10.1080/23311975.2024.2392044>
- Wijaya, A. (2024). The effect of carbon emission disclosure, CSR, and eco-efficiency on the value of energy companies. *Journal of Accounting and Financial Research*.
- World Business Council for Sustainable Development. (2000). *Eco-efficiency: Creating more value with less impact*. WBCSD.
- Wulandari, R. (2025). Green innovation, eco-efficiency and firm value. *Journal of Management and Environment*.
- Yuliandhari, W. S., Saraswati, R. S., & Rasid Safari, Z. M. (2023). The effect of carbon emission disclosure, eco-efficiency and green innovation on company value. *Owner: Research and Journal of Accounting*, 7(2), 1526–1539. <https://doi.org/10.33395/owner.v7i2.1301>