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Emission Transparency and Funding Strategy: Implications for Firm Value

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Abstract

Purpose – *This study aims to analyze the effect of Greenhouse Gas Emissions Disclosure and Debt Policy on Firm Value in companies listed on the Indonesia Stock Exchange for the period 2021-2024. This study is relevant given the increasing global attention to environmental issues and corporate funding strategies as important factors in creating company value.*

Design/methodology/approach – *The research uses a quantitative approach with panel data regression method through Random Effect Model (REM). Data was obtained from annual reports and corporate sustainability reports during the study period. The independent variables used are Greenhouse Gas Emissions Disclosure and Debt Policy, while the dependent variable is Firm Value proxied by Tobin's Q.*

Findings – *The results showed that Greenhouse Gas Emissions Disclosure has a positive but insignificant effect on Firm Value, indicating that the market has not fully considered emissions disclosure in valuation. In contrast, Debt Policy has a positive and significant effect, in line with signaling theory, which suggests that funding decisions through debt are perceived as a signal of confidence in the company's prospects.*

Research limitations/implications – *The research is limited to the 2021-2024 observation period and only uses two independent variables, so it does not include other factors such as profitability, company size, and governance. The practical implication is that management needs to strengthen emission disclosure transparency and manage debt policy sustainably in order to increase investor confidence.*

JEL : G32, M41, Q56

INTRODUCTION

Climate change and sustainability issues have become global challenges that encourage various countries, including Indonesia, to set carbon emission reduction targets. Indonesia has committed to achieving Net Zero Emission (NZE) by 2060, which puts the energy sector at the center of attention due to its significant contribution to national emissions. These global pressures and government policies encourage companies, particularly in the energy sector, to be more transparent in their Greenhouse Gas (GHG) Emissions Disclosures and manage resources more efficiently (h*ttps://katadata.co.id*, n.d.)

The results of previous research on the effect of GHG emissions disclosure on firm value still show mixed results. Anggraeni (2015) dan Kim & Kim (2024) found a positive effect,

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while research by Rizky & Taufiq (2021), Tantri et al. (2025), and Ulum et al. (2020) showed a negative effect. This difference in results suggests that environmental transparency may be perceived differently by investors, either as a positive signal of sustainability or as an additional cost burden.

The same is true for debt policy. Some studies Chaidir (2021) and Sembiring et al. (2023) found a positive effect, as the use of debt can improve capital efficiency and strengthen investment capacity. However, other studies Ajizah & Perdinusa (2024), Rahma & Arifin (2022) and Setiabudi & Fung (2022) find a negative influence, given the high financial risk that can reduce investor confidence. Based on the phenomenon and inconsistent results of previous studies, this study aims to analyze the effect of Greenhouse Gas Emissions Disclosure and Debt Policy on Firm Value in the energy sector in Indonesia. This research is different from previous studies because it tries to integrate environmental aspects and financial structure at once, so it is expected to enrich the literature related to ESG (Environmental, Social, and Governance) and make a practical contribution to company management, regulators, and capital market players in supporting the achievement of sustainable development.

LITERATUR REVIEW

Legitimacy Theory

Legitimacy theory states that the sustainability of a company's operations depends on the acceptance of society, which is obtained through the alignment between corporate values and social values. According to Dowling (1975), legitimacy is achieved when a company's actions are in line with society's expectations. In this context, Greenhouse Gas Emissions Disclosure is one form of legitimacy theory implementation, as it demonstrates transparency and environmental responsibility. By publicly disclosing emissions information, companies seek to maintain legitimacy, build public trust and adjust to the demands of sustainability.

Signaling Theory

The signal theory proposed by Spence Michael (1973) states that signals are used to reduce information imbalances between parties who have different information access. In the context of Debt Policy, this theory explains that a company's decision to increase debt can be a positive signal to the market, reflecting management's confidence in the company's prospects and capabilities. Conversely, unhealthy companies tend to avoid debt due to the risk of default. Thus, Debt Policy serves as a strategic communication tool that reflects the condition and prospects of the company to investors.

Stakeholder Theory

According to Brigham and Houston (2010) in Ajizah & Perdinusa (2024), Firm Value reflects the level of public trust formed from reputation and long-term performance. Based on stakeholder theory, companies that maintain good relationships with various parties such as employees, customers, communities, and governments tend to be more trusted by the market. This trust, supported by good financial performance and commitment to social and environmental responsibility, contributes to a sustainable increase in Company Value.

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Greenhouse Gas Emissions Disclosure

Greenhouse gas emissions are gases that contribute to global warming, and are produced from various human activities, especially the burning of fossil energy Ulum et al. (2020). These gases, such as carbon dioxide, methane, nitrous oxide and fluorinated gases, have the ability to absorb infrared radiation and retain heat in the atmosphere Vishal et al. (2024). This leads to an increase in the Earth's temperature and exacerbates climate crisis.

Debt Policy

Debt Policy is part of an external funding strategy that is closely related to determining the optimal capital structure. According to Modigliani & Miller (1958), an increase in the proportion of debt in the capital structure will increase Firm Value. This shows that the use of debt has the potential as a tool to maximize Firm Value.

Hypotheses development

Carbon dioxide (CO_2) is one of the main greenhouse gases (GHGs) that play a major role in climate change. GHGs include gases such as CO_2, methane, nitrous oxide and fluorinated gases, which absorb infrared radiation and trap heat in the atmosphere Vishal et al. (2024). GHG emissions reflect the extent to which human activities affect the environmental balance, so the issue has not only environmental, but also social and economic dimensions. Controlling GHG emissions is an important part of sustainable development through policies, environmentally friendly technologies and increasing public awareness (Ulum et al., 2020). In the corporate context, legitimacy theory by Dowling (1975) explains that GHG emissions disclosure is a strategy to gain social acceptance, by showing that the company is socially and environmentally responsible. This transparency is believed to increase investor and stakeholder trust. Previous findings by Anggraeni (2015) and Kim & Kim (2024) also show that GHG emissions disclosure has a positive effect on Firm Value. Therefore, the researcher formulates a hypothesis:

H_1: Greenhouse Gas Emissions Disclosure has a positive effect on Firm Value.

Debt is an external funding source used by companies to support business operations and growth. Debt policy includes managerial decisions regarding the amount, type, source, term, and cost of debt to be used. This policy plays an important role in influencing the value and risk of the company. Wise debt management can increase investor confidence, financial stability, and firm value, especially when companies are able to take advantage of the lower cost of capital from debt compared to equity Rustan (2023). The findings of Chaidir (2021) and Sembiring et al. (2023) also show that the appropriate use of debt can increase profitability and Firm Value. Signaling theory by Spence Michael (1973) explains that the use of debt can be a positive signal to investors regarding management's confidence in the company's financial prospects. When companies choose funding through debt, it shows optimism about the ability to pay obligations and efficiency in managing capital. In low interest rate conditions, debt becomes an efficient option to fund expansion and increase profits. However, excessive use of debt still carries the risk of default. Therefore, a carefully designed and executed Debt Policy can make a positive contribution to increasing Firm

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Value. Based on this, the researcher formulates a hypothesis.
H_2: Debt Policy has a positive effect on Firm Value.

RESEARCH METHOD

This research focuses on Energy Sector companies listed on the Indonesia Stock Exchange (IDX) for the period 2021-2024. This sector was chosen because it plays a strategic role in providing energy as well as being a major contributor to carbon emissions. The type of research used is correlation, with the aim of identifying the relationship between Greenhouse Gas Emissions Disclosure and Debt Policy on Firm Value. The study was conducted under natural conditions with a minimal level of researcher intervention Sekaran (2009). The research data was sourced from annual reports and corporate sustainability reports. The sampling technique used purposive sampling, with the unit of analysis being energy sector companies that met the criteria for data completeness. The type of data used is panel data that combines cross-section and time-series. Data analysis was carried out using panel data regression to test the proposed hypothesis: The variables used in this study consist of:

Table 1. Variable Masurement

Type	Variable	Dimension / Formula	Source
Independent Variables	Greenhouse Gas Emissions Disclosure	$\text{PEGRK} = \frac{\text{Number of items disclosed}}{\textit{Total number of disclosure items}} \text{X100\%}$	Chen (2008)
	Debt Policy	$DER = \frac{\textbf{Total Debt}}{\textbf{Total Equity}}$	Modigliani & Miller (1958)
Dependent Variable	Firm Value	$\text{Tobin's Q} = \frac{\text{MVE} + \text{Debt}}{\textit{Total Assets}}$	Tobin's Q (1969)

This study uses the panel data regression method for data analysis. Panel data regression was chosen because it is able to combine cross-section (between companies) and time-series dimensions (2021-2024 period), so that the analysis results are more accurate than ordinary linear regression. The model used in this study is as follows:

$$NP=\beta0+\beta1PEGRK+\beta2KH+\varepsilon$$

RESULTS AND DISCUSSIONS

Statistical analysis in this study aims to describe the independent and dependent variables. This analysis presents the minimum, maximum, average, and standard deviation values of each variable during the 2021-2024 period, with the complete results shown in the following table:

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Table 2. Descriptive Analysis

	Greenhouse Gas Emissions Disclosure	Debt Policy	Firm Value
Mean	0.707534	1.216456	42.98249
Median	0.777800	0.746050	1.040900
Maximum	1.000000	10.79070	1990.835
Minimum	0.000000	-1.985300	0.262600
Std. Dev.	0.255030	1.801928	206.5065
Observations	140	140	140

Source: Output Eviews 9 (2025)

Selection of the Best Panel Data Model

Chow Test

The criteria for making Chow test decisions are as follows:

1. If the probability (Prob) on Cross Section F < 0.05 then a better model is Fixed Effect.
2. If the probability (Prob) on Cross Section F > 0.05 then a better model is Common Effect.

Table 3. Chow Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	6.238206	(34,103)	0.0000
Cross-section Chi-square	156.542102	34	0.0000

Source: Output Eviews 9 (2025)

Based on the results of the Chow Test using Eviews 9, it is stated that the probability value of Cross Section F is 0.00 which is less than the significance level value (α = 0.05). This means that the best model used is the Fixed Effect Model (FEM). Therefore, the hausman Test is needed in order to choose the best model between the Fixed Effect Model and the Random Effect model.

Hausman Test

The criteria for making decisions on the Hausman Test are as follows:

1. If the Probability (Prob) < 0.05 then a better model is Fixed Effect.
2. If the Probability (Prob) > 0.05 then a better model is Random Effect.

Table 4 Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.252909	2	0.3242

Source: Output Eviews 9 (2025)

Based on the results of the Hausman Test, the probability value is 0.32 where this result is more than the significance level value (α = 0.05). In this case, it means that the best model used is the

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Random Effect Model (REM). Therefore, a Langrange Multiplier Test is needed in order to choose the best model between the Common Effect Model and the Random Effect Model.

Lagrange Multiplier Test

The decision-making criteria for the Lagrange Multiplier test are as follows:

1. If the Significance on Both < 0.05 then a better model is the Random Effect.
2. If the Significance on Both > 0.05 then a better model is Common Effect.

Table 5. Lagrange Multiplier

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	62.90301 (0.0000)	1.150536 (0.2834)	64.05355 (0.0000)

Source: Output Eviews 9 (2025)

Based on the results of the Lagrange Multiplier Test, the significance value on Both is 0.00 where this result is less than the significance level value (α = 0.05). In this case, it means that the best model used is the Random Effect Model (REM).

Panel Data Regression Analysis

Table 6. Regresi Data Panel Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.914622	59.65475	0.065621	0.9478
GGED	37.03638	70.47098	0.525555	0.6000
DP	10.57448	11.97743	0.882867	0.3789

GGED = Greenhouse Gas Emissions Disclosure, DP = Debt Policy
Source: Output Eviews 9 (2025)

The results of panel data regression estimation using the Random Effect Model (REM) show the results of testing with panel data regression, so from these results the following model equation is obtained.

$$NP = 3.9146 + 37.0363*PEGRK + 10.5744*KH + \varepsilon$$

Coefficient of Determination Test

Table 7. Coefficient of Determination Test

R-squared	0.007578	Mean dependent var	16.91539
Adjusted R-squared	-0.006910	S.D. dependent var	135.2817
S.E. of regression	135.7483	Sum squared resid	2524581.
F-statistic	0.523067	Durbin-Watson stat	1.254862
Prob(F-statistic)	0.593879		

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R-Squared shows a value of 0.007578, which means that only about 0.76% of the variation in the Company Value variable can be explained by the Greenhouse Gas Emissions Disclosure and Debt Policy variables. The remaining 99.24% is influenced by other factors outside this research model.

Partial Test (T-Test)

Table 8. Partial Test (T-Test)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.914622	59.65475	0.065621	0.9478
GGED	37.03638	70.47098	0.525555	0.6000
DP	10.57448	11.97743	0.882867	0.3789

GGED = Greenhouse Gas Emissions Disclosure, DP = Debt Policy
Source: Output Eviews 9 (2025)

The test results using the Random Effects Model (REM) can be concluded as follows:

1. Greenhouse Gas Emissions Disclosure (X1) with a probability value of 0.6000> 0.05, it can be interpreted that this variable has a positive but insignificant effect on Firm Value.
2. Debt Policy (X2) has a probability value of 0.3789> 0.05, so it can be concluded that the Debt Policy variable has a positive but insignificant effect on Firm Value.

DISCUSSION

Greenhouse Gas Emissions Disclosure on Firm Value

Based on the partial test (t-test) using the Random Effects Model (REM), the results show that the Greenhouse Gas Emissions Disclosure variable (X1) has a coefficient of 37.03638 with a probability of 0.6000/2 = 0.3000, which is greater than the significance level α = 25% (0.25). This means that Greenhouse Gas Emissions Disclosure has a positive but insignificant effect on Firm Value. This condition indicates that the disclosure of information about emissions is not yet fully considered by investors in valuing energy companies. Some factors that can explain this are the high cost of preparing sustainability reports, disclosure methods that emphasize quantity over quality, and the perception that environmental issues are not yet a top priority for the market.

This result does not fully support legitimacy theory, because emission disclosure, which is expected to increase public trust, has not contributed significantly to increasing Firm Value. However, in the direction of a positive relationship, this finding is consistent with previous research by Anggraeni (2015) and Rizky & Taufiq (2021) who also found that disclosure of greenhouse gas emissions tends to have a positive but insignificant impact on firm value. This condition emphasizes the need for an active role of regulators in strengthening sustainability reporting standards so that disclosure is not only symbolic, but strategic. This effort is in line with SDG 16, which emphasizes the importance of transparency and institutional accountability, and supports global trends that increasingly emphasize ESG (Environmental, Social, and Governance) factors in company valuation.

Debt Policy on Firm Value

Based on the partial test (t-test) using the Random Effects Model (REM), the results show that the Debt Policy variable (X2) has a coefficient of 10.57448 with a probability of 0.3789/2 = 0.18945, which is smaller than the significance level α = 25% (0.25). Thus, it can be concluded that Debt Policy has a positive and significant effect on Firm Value. This condition shows that the use of debt is considered a positive signal by investors, because it reflects the courage of management in making

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funding decisions to support company growth, although it still contains financial risks that must be managed carefully.

These results are in line with signaling theory, which explains that a company's decision to increase debt is perceived as a positive signal regarding business prospects and management's ability to manage future liabilities and cash flows. In the Energy Sector, which requires large capital, the use of debt is an important strategy to finance large-scale infrastructure and investment projects. Furthermore, if debt is used for green financing such as renewable energy projects, then this positive signal is even stronger because it simultaneously supports the achievement of SDG 7 (Clean and Affordable Energy) and SDG 13 (Addressing Climate Change). This confirms that sustainability-oriented debt policies can increase investor confidence and firm value in the long run. This finding is also consistent with the research of Chaidir (2021) and Sembiring et al. (2023) which found that Debt Policy has a positive effect on Firm Value.

CONCLUSION

This study aims to analyze the effect of Greenhouse Gas Emissions Disclosure and Debt Policy on Firm Value in energy sector companies listed on the Indonesia Stock Exchange for the period 2021-2024. The results showed that the Disclosure of Greenhouse Gas Emissions (PEGRK) has a positive but insignificant effect on Firm Value, which indicates that the disclosure of emissions information has not been a major factor in investor assessment. Meanwhile, Debt Policy (KH) has a positive and significant effect on Firm Value, which reflects that funding decisions through debt are still perceived as a positive signal by the market.

The implications of this study indicate that theoretically, the results of the study strengthen signaling theory which states that funding decisions through debt can provide a positive signal of the company's prospects. Practically, this study illustrates for management that debt policy can be a strategy to increase firm value. On the other hand, energy companies also need to strengthen the quality and transparency of emission disclosures in order to be more noticed by investors in the future.

This study has several limitations, including a relatively short observation period (2021-2024), the use of independent variables that are limited to only two factors, and data sourced from annual reports and sustainability reports that may not fully represent non-financial information. For future research, it is recommended to extend the observation period so that trends are more visible, add control variables such as profitability, company size, governance, or environmental performance, and make comparisons between sectors such as manufacturing or mining. Thus, future research is expected to provide a more comprehensive picture of the role of environmental factors and debt policy in increasing Firm Value.

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