



**THE EFFECT OF CARBON EMISSION DISCLOSURE ON COMPANY
VALUE USING CORPORATE GOVERNANCE AS A MODERATING
VARIABLE**

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Abstract

This study aims to determine the effect of carbon emission disclosure and profitability on firm value with corporate governance as a moderating variable. The research method used is quantitative method, with SPSS software, and data analysis techniques using multiple linear regression analysis, and Moderated Regression Analysis (MRA). This study uses a sample of holding companies involved in the energy sector, and listed on the Indonesia Stock Exchange (IDX) from 2019 to 2023. The results show that carbon emission disclosure has a negative effect on firm value, and corporate governance is able to strengthen the relationship between carbon emission disclosure and firm value.

Keywords: Carbon Emission Disclosure, Firm Value, Corporate Governance



INTRODUCTION

Global warming has become a major concern in various international forums, and also domestically, such as Indonesia. Global warming is defined as an increase in the Earth's temperature caused by the accumulation of greenhouse gases, for example, carbon dioxide (CO₂) in the atmosphere, thus interfering with the absorption and emission of infrared radiation (Climate Central, 2024; Dharmawansyah, 2019). Based on information from ICDX (2021), the energy sector was identified as the largest contributor to greenhouse gas emissions in Indonesia. This sector contributed 76%, or equivalent to 37.2 Gigatons CO₂e of total emissions among the 10 sectors listed on the Indonesia Stock Exchange (IDX).

As a form of commitment to efforts to combat climate change, Indonesia has ratified the Paris Agreement through Law Number 16 of 2016. This international agreement aims to limit the increase in global average temperature to no more than 2°C by 2100 (Fasya et al., 2024). In his research, Alphayerds & Setiawan (2021) found that companies use sustainability reports and annual reports as a medium to communicate information about carbon emission disclosure. The legal basis for preparing sustainability reports is regulated in the Financial Services Authority Regulation (POJK) Number 51/POJK.03/2017.

Even though binding regulations have been established, disclosure of information regarding carbon emissions in Indonesia is still voluntary disclosure (Bahriansyah & Lestari Ginting, 2022). Because low awareness of the impacts of climate change, limited resources, and weak regulation (Hardiyansah & Agustini, 2021). So that the company is able to produce



responsible carbon emission disclosure, Corporate Governance (CG) is required to regulate transparent and responsible company management (Blesia et al., 2023). The company's efforts to conduct transparent carbon emission disclosure (Soetardjo & Nurmawati, 2024a) are proof that the company is trying to improve corporate value as corporate image, because an increase in corporate image tends to be followed by an increase in share prices (Khafifah et al., 2022).

The impact of Carbon Emission Disclosure (CED) on firm value with corporate governance moderation has been widely studied in various empirical studies, such as research conducted by Sari et al., (2024), which indicates disclosure of carbon emissions makes a beneficial contribution to the firm value manufacturing company. Study by Firmansyah et al., (2021) Identifying the CED variable with the GHG measurement index 305-4, actually has a negative impact on firm value. Research result Afrilia & Astuti, (2023) shows that carbon emissions disclosure, as measured by 18 indicators from the Bae Choi framework (Choi et al., 2013), resulting in a significant negative effect on firm value. Furthermore, research by Firmansyah et al., (2021) and Blesia et al., (2023), concluded that governance is not suitable as a moderating variable because it is considered to fail to describe the relationship between firm value and carbon emissions disclosure.

This study presents a novelty, focusing on the energy sector, which has so far received less attention, because most previous studies have focused more on the manufacturing sector. In addition, the indicators of corporate governance used are gender diversity in the board of directors, different from previous studies that put more emphasis on independent commissioners and



audit committees. This approach provides a new perspective in viewing the role of corporate governance in the relationship between carbon emission disclosure, profitability, and company value.

LITERATURE REVIEW

Signaling Theory

Signaling theory describes the role of firms as signalers. (Spence, 1978) to investors and market participants, as a solution to information asymmetry or inequality of access to important information between company management and external parties. (Afnilia & Astuti, 2023). Disclosure of carbon emissions can be accepted as a positive signal representing corporate transparency and responsibility, whereas a negative signal, because it indicates the company is subject to fines, litigation, or operational restrictions (Perdichizzi et al., 2024).

Stakeholder Theor

According to stakeholder theory, companies have obligations to various stakeholders. (Freeman, 2010) like shareholders, communities, suppliers, customers, creditors, and other parties affected by business operations. (Liong, 2022). Therefore, the company management needs to manage assets and operational activities accurately, effectively, efficiently, and measurably.

Carbon Emission Disclosure

In the context of environmental accountability, disclosure of carbon emissions is a manifestation of responsibility for the ecological consequences arising from a company's operational activities (Yuliandhari et al., 2023). Measurement in projecting carbon emission disclosure, using tabulation applied by Bae Choi, from a checklist sourced from the Carbon Disclosure



Project (CDP)(Putikadea & Siregar, 2023).CDP is classified into 5 categories that are relevant to climate change issues, and 18 disclosure items are the benchmarks for evaluation. The measurement process is carried out using a carbon disclosure checklist, with a dichotomous scale approach. The assessment is carried out by giving a score of 1 for each disclosure item fulfilled by the company, and a score of 0 if the item is not disclosed. The maximum score that can be obtained is 18, while the minimum score is 0.

Company Values

Enterprise value is often used as a key metric to evaluate a company's long-term viability and potential (Apriliani et al., 2024).The growth in company value is indicated by increasing share prices, which can generate profits and prosperity for shareholders (Ariyanti & Novitasari, 2022).

Corporate Governance

Corporate governance can be defined as the systems, rules, practices, and processes that a company uses to manage and control its operations, with a focus on creating sustainable value for shareholders and other stakeholders (Putri & Putri, 2022). In this study, the corporate governance variable uses the independent commissioner indicator. The independent board of commissioners, including the board of directors, has a supervisory function related to strategic decisions, management, and laws (Rezaee, 2019).

Hypothesis Formulation

The Relationship between Carbon Emission Disclosure and Company Value

According to stakeholder theory, a business entity is said to be accountable if the company management is able to take responsibility for preserving and minimizing environmental damage resulting from its



operational activities, through disclosure of carbon emissions to the public (Firmansyah et al., 2021). The signaling theory perspective supports the existence of a relationship between CED and firm value (Alfayerds & Setiawan, 2021). Signaling theory can clarify information asymmetries regarding why firms decide to undertake CED and how CED affects firm value on the stock exchange (Dewi & Budiadnyani, 2024).

H1: Carbon emission disclosure has a positive effect on company value.

The Relationship of Corporate Governance in Moderating Carbon Emission Disclosure to Company Value

According to the signaling theory perspective, the information imbalance between management and shareholders requires management to communicate transparently to the public. This step is essential to overcome the knowledge gap and balance the interests of both parties. (Firmansyah & Triastie, 2020). Based on stakeholder theory, solid corporate governance encourages companies to utilize assets more efficiently in investment activities (Firmansyah & Triastie, 2020) and convey information to the public with a better level of transparency (Herawaty et al., 2021).

H2: Corporate Governance can strengthen the correlation between Carbon Emission Disclosure and Company Value

RESEARCH METHOD

This research uses quantitative methods, and is based on secondary data such as annual reports and sustainability reports, from energy sector holding companies listed on the Indonesia Stock Exchange between 2019-2023. Secondary data can be accessed through the company's official website or the



Indonesia Stock Exchange website (www.idx.co.id). This study is also enriched by a literature review covering various scientific publications, articles, theses, and previous studies relevant to the issues discussed.

The sampling technique used was purposive sampling, so that it was obtained 75 research data that met the criteria. Data processing techniques using software Statistical Package for the Social Sciences (SPSS), and data analysis techniques using regression analysis, including hypothesis testing, classical assumption testing, and Moderate Regression Analysis (MRA). The independent variable (X) in this study is carbon emission disclosure, which is measured using the carbon disclosure project (CDP), and the dependent variable (Y) used is the company value, which is calculated using Tobin's Q. While the moderating variable (M) used is corporate governance, which is measured using the independent commissioner indicator.

RESULTS AND DISCUSSION

Descriptive Statistical Test

The results of descriptive statistical tests on independent variables, dependent variables, and moderating variables can be seen in the table below:

Table 1.

Descriptive Analysis Results

Variable	N	Mean	StDev	Minimum	Maximum
CED	75	0.8160	0.2117	0.2800	1,0000
NP	75	1.2225	1,3872	0.4902	12,5533
CG	75	0.4348	0.1376	0.2000	1,0000

Source: SPSS output, processed by the author



Interpretation:

1. The measurement results of the carbon emission disclosure variable are in the range of 0.28-1, with an average of 0.816 and a standard deviation of 0.2117.
2. The results of measuring the company value variable are in the range of 0.4902-12.5533, with an average of 1.2225 and a standard deviation of 1.3872.
3. The measurement results of the corporate governance variable are in the range of 0.2-1, with an average of 0.4348 and a standard deviation of 0.1376.

Classical Assumption Test

Normality Test

Normality test using the Kolmogorov-Smirnov method, considering the number of samples as many as 75 observations. This test aims to verify the normality of the residual distribution, where the normality criteria are met if the significance value exceeds 0.05.

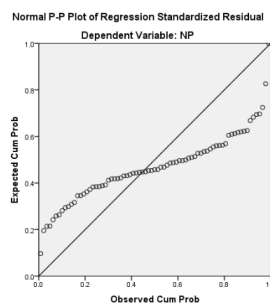


Figure 1

Source: SPSS output, processed by the author

Interpretation:

There are deviations of data points from the diagonal line in the PP plot regression standardized graph, which indicates the existence of extreme data,



so that the data does not meet the assumption of normality. To overcome this problem, data transformation is carried out (Ghozali, 2016). In this study, the form of data transformation carried out is the natural logarithm.

Table 2.

Normality Test After Data Transformation

	Unstandardized Residual
N	75
Asymp. Sig. (2-tailed)	.065

Source: SPSS output, processed by the author

The data in Table 2 shows a P-value > 0.05, so the data meet the normality criteria.

Multicollinearity Test

The results of the multicollinearity test can be seen in the following table:

Table 3.

Multicollinearity Test Result

Model	Collinearity Statistics	
	Tolerance	VIF
X1	0.980	1,020
M	0.980	1,020

Source: SPSS output, processed by the author

Interpretation:

The carbon emission disclosure (X) and corporate governance (M) variables do not show any indication of multicollinearity. This conclusion is based on the tolerance value > 0.10 and the Variance Inflation Factor (VIF) value < 10, indicating that there is no significant correlation between the independent variables.

Autocorrelation Test

The Lagrange Multiplier test is used in this study to identify the presence of autocorrelation. If an indication of autocorrelation is found, then



the correction is carried out using the Cochrane-Orcutt approach.(Ghozali, 2018), as shown:

Table 4. Autocorrelation Test Results

Model	Sig.
RES_2	0.834

Source: SPSS output, processed by the author

Interpretation:

The significance value of RES_2 is 0.834 > 0.05, meaning that there is no statistical dependence between the current value of the dependent variable and previous observations in the model.

Heteroscedasticity Test

Heteroscedasticity test using the White Test, such as the data in the table below:

Table 5. Heteroscedasticity Test Using the White Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.342	0.117	0.053	0.53895

Source: SPSS output, processed by the author

Interpretation:

If the calculated C2 value < C2 table: no symptoms occur/free from heteroscedasticity test

C2 count = n x R Square

=75 x 0.117

=8,775

C2 table



df = n-1
 =75-1
 =74
 = 95.081467 (table C2 result)

So that the calculated C2 value is 8.775 and the C2 table value is 95.081467 (8.775 < 95.081467), meaning that there are no symptoms of heteroscedasticity.

Multiple Linear Regression Analysis

T-Test

The T-test aims to measure the partial influence of each independent variable on the dependent variable. The following are the results of the T-test:

**Table 6.
Coefficients Table**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-0.084	0.062		-1,348	0.182
X1	-0.483	0.149	-0.355	-3,249	0.002

Source: SPSS output, processed by the author

Based on the moderated regression test in the table above, a regression equation model can be created as follows:

$$Y = \alpha + \beta CED$$

$$Y = -0.084 - 0.483X$$

Interpretation:

The significance value in this study is 0.02 (<0.005), and the linear regression coefficient value is -0.483, meaning that carbon emission disclosure has a significant negative effect on company value, or when carbon emission



disclosure decreases by 0.483 or 48.3%, it is in line with a decrease in company value of 48.3%.

F Test

The purpose of the F-test is to test whether the regression model is simultaneously significant in explaining the variation of the dependent variable. Here are the results of the F-test:

Table 7.
F Test Results (Anova)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.137	2	1,069	8,725	.000b
Residual	8,818	72	.122		
Total	10,955	74			

Source: SPSS output, processed by the author

Interpretation:

The significant value of 0.002 (<0.05) and the calculated F value of 10,555 illustrate that the carbon emission disclosure variable has a significant simultaneous effect on the dependent variable (company value).

Coefficient of Determination

The coefficient of determination shows the extent to which the independent variable (X) is able to explain the variation in the dependent variable (Y) through the coefficient of determination value. The following are the results of the coefficient of determination test:

Table 8.
Results of Determination Coefficient Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.355	0.126	0.114	0.43159

Source: SPSS output, processed by the author



Interpretation:

The Adjusted R Square value of 0.114 or 11.4% concludes that the variation of the dependent variable (company value) can be explained by the independent variable or the carbon emission disclosure variable is able to influence the company value by 11.4%, with the remaining 88.6% being influenced by other variables outside this study.

MRA Test

The following is a table that presents the results of the MRA test.

Table 9. MRA Test Results

Capital	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-0.100	0.268		-0.374	0.710
X	0.058	0.592	0.012	0.097	0.923
M	0.800	1,353	0.589	0.591	0.556
X*M	-2,699	2,858	-0.950	-0.944	0.348
R2 (X1)	0.126		F Count	3,914	
R2 (X1*M)	0.142		Significance of F	0.012	

Source: SPSS output, processed by the author

Interpretation:

1. Corporate governance plays a significant role or is able to strengthen the relationship between carbon emission disclosure and company value, as seen from the significance value of the F Test (0.012<0.05).
2. After the corporate governance variable as a moderation was added to the research model of carbon emission disclosure on company value, the R-square value increased from 0.126 to 0.142, meaning that the interaction variable (corporate governance) contributed 14.2% to the relationship



between carbon emission disclosure and company value, while 85.8% was caused by factors outside the research.

The effect of carbon emission disclosure on company value

The regression coefficient of the carbon emission disclosure variable is -0.483 with a significance value of 0.002, as indicated by the results of the partial hypothesis test (T-Test). This indicates a significant negative effect of carbon emission disclosure on company value. Assuming *ceteris paribus*, the regression coefficient value is -0.483, meaning that every one-unit increase in carbon emission disclosure will trigger a decrease of 0.483 in firm value. Therefore, hypothesis 1 is rejected.

The reason why hypothesis 1 was rejected was influenced by the transparency of the increase in carbon emissions, which only published by some companies because of regulations stating that carbon emission disclosure is voluntary disclosure (Belinda & Sulfitri, 2025), and the openness of carbon emission disclosure information does not provide added value, because it is considered a burden, which can trigger negative reactions from the public, affect the company's image, and investor interest. In addition, the high cost of implementing CED, such as environmental audits, systematic reporting, and investment in low-carbon technology, is believed to be able to suppress the profits of business entities, thus having implications for the decline in the company's overall value (Pradnyawati & Werastuti, 2024a).

Based on signaling theory, increasing carbon emission disclosure is perceived as a negative signal by investors. Investors will assess that the company is at risk of fines, litigation, or operational restrictions, thus increasing concerns about future financial risks.(Perdichizzi et al., 2024). This



phenomenon occurs due to investor preferences in Indonesia, which generally place more emphasis on the aspect of obtaining capital gains in evaluating company performance (Rangga & Kristanto, 2023). From the perspective of stakeholder theory, companies are responsible for meeting the interests and expectations of shareholders and investors. When carbon emission disclosures raise concerns, the company will be considered to have failed to meet investor and stakeholder expectations.

This research is consistent with the findings of studies conducted by Afnilia & Astuti, (2023), Firmansyah et al., (2021), Laksani et al., (2021), Pradnyawati & Werastuti, (2024), Prasetyaningsih et al., (2025), Rangga & Kristanto, (2023), and Shafira, (2024). The study proves that carbon emission disclosure has a negative effect on company value.

The influence of corporate governance in moderating carbon emission disclosure on company value

It can be concluded from the results of moderated regression analysis that the significance value of the interaction variable between carbon emission disclosure and corporate governance is $0.012 < 0.05$. This provides evidence that corporate governance plays a role in moderating or strengthening the relationship between carbon emission disclosure and company value. Thus, hypothesis 2 is accepted.

The effectiveness of supervision by independent commissioners implies that the implementation of the duties and responsibilities of the board of commissioners in supervising and providing strategic direction to management regarding company policies has the potential to be responded to positively by stakeholders. (Soetardjo & Nurmawati, 2024).



In the context of signaling theory, the presence of independent commissioners strengthens the credibility of information provided by the company to the market, including information on carbon emissions. Disclosure of carbon emissions supervised by independent commissioners provides a positive signal to investors that the company is committed to environmental responsibility and transparent business practices, which ultimately increases the market's perception of the company's value.

Meanwhile, based on stakeholder theory, independent commissioners act as a liaison between the interests of various parties, including the community, investors, and regulators. By ensuring that carbon emission disclosures are carried out accurately and responsibly, independent commissioners help companies meet stakeholder expectations, which can strengthen the company's legitimacy and reputation in the eyes of the public.

This study has linear results with previous studies conducted by Pradnyawati & Werastuti, (2024), Soetardjo & Nurmawati, (2024), and (Qurniasih et al., 2024) because the results of this study illustrate the ability of corporate governance to moderate the relationship between carbon emission disclosure and company value.

CONCLUSION

1. There is a negative influence between carbon emission disclosure and company value.
2. Corporate governance measured using independent commissioners can provide a positive influence or strengthen the relationship between carbon emission disclosure and company value.



Implications

1. Theoretical Implications

This study theoretically confirms that the integration of signaling theory and stakeholder theory within a sustainability framework reveals the role of carbon emission disclosure as a non-financial signal that can reduce information asymmetry.

2. Practical Implications

In practice, the companies in this study used the Carbon Disclosure Project (CDP) as an international guideline to increase the credibility of carbon emission data.

Suggestion

1. Further Research

Further researchers are recommended to use carbon emission disclosure indicators, which have been adopted as carbon emission reporting standards in Indonesia, referring to applicable regulations such as Presidential Regulation No. 61 of 2011 and guidelines from the Global Reporting Initiative (GRI) Standards, so that the carbon emission disclosure information to be tested is able to interpret the accuracy between the published carbon emission disclosure and the actual state of the company.

2. Company

Companies are advised to be more proactive in disclosing information related to carbon emissions in a consistent, structured manner, and in accordance with international standards, such as the Carbon Disclosure Project (CDP) and the Global Reporting Initiative (GRI). Although carbon emission disclosure can be received as a positive or negative signal, the transparency of carbon emission



disclosure still shows the company's responsibility for the impact of environmental damage caused by the company's operational activities.

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