

# The Impact of Carbon Emission Disclosure on Firm Valuation: Exploring the Moderating Role of Foreign Ownership

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## ABSTRACT

The value of a firm, as reflected in fluctuations of the composite stock price index, is influenced by various factors, including carbon emission disclosure, which has garnered increasing attention from stakeholders due to concerns over global warming. This research investigates the impact of carbon emission disclosure on firm value, with foreign ownership as a moderating variable. The study focuses on energy sector companies listed on the Indonesia Stock Exchange from 2020 to 2022. A purposive sampling method was used to select the research sample, resulting in 84 observations. The theoretical framework of this study is grounded in signaling theory, legitimacy theory, and agency theory. Data analysis was conducted using Moderated Regression Analysis (MRA) through EViews software. The findings reveal that carbon emission disclosure has a negative effect on firm value. Furthermore, the results indicate that foreign ownership does not strengthen the relationship between carbon emission disclosure and firm value.

**Keywords:** Firm value, carbon emission disclosure, foreign ownership, energy companies

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## ABSTRAK

Nilai perusahaan yang tercermin pada fluktuasi indeks saham gabungan disebabkan oleh berbagai faktor. Pengungkapan emisi karbon semakin mendapat perhatian berbagai pemangku kepentingan karena fenomena pemanasan global. Penelitian ini bertujuan untuk mengetahui pengaruh pengungkapan emisi karbon pada nilai perusahaan dengan kepemilikan asing sebagai variabel moderasi. Populasi penelitian adalah perusahaan sektor energi yang terdaftar di Bursa Efek Indonesia pada tahun 2020-2022. Sampel ditentukan dengan metode purposive sampling yang menghasilkan 84 amatan. Penelitian ini menggunakan teori sinyal, teori legitimasi, dan teori agensi. Dengan menggunakan software Eviews, teknik analisis data yang digunakan adalah Moderated Regression Analysis dengan software EViews. Temuan analisis menunjukkan bahwa pengungkapan emisi karbon berpengaruh negatif terhadap nilai perusahaan. Temuan analisis menunjukkan bahwa kepemilikan asing tidak dapat memperkuat pengaruh pengungkapan emisi karbon pada nilai perusahaan.

**Kata Kunci:** Nilai perusahaan, pengungkapan emisi karbon, kepemilikan asing, perusahaan energi

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## INTRODUCTION

Firm value is a critical metric for assessing a company's overall worth, encompassing various financial components and reflecting the perspectives of multiple stakeholders. Increasing firm value is often a top priority for companies (Mardiana et al., 2023). It serves as an indicator of how effectively a company utilizes its resources, as perceived by investors (Machmuddah et al., 2020). A higher firm value enhances investor confidence in the company's performance, encouraging them to invest in companies with greater value (Mardiana et al., 2023). This increase in firm value is directly linked to an increase in shareholder wealth (Daromes et al., 2020). Firm value is often reflected in the company's stock price, with higher stock prices indicating higher firm value (Darmastika & Ratnadi, 2019). On the Indonesia Stock Exchange, stock price movements are tracked through the Composite Stock Price Index (IDX Composite), which fluctuates based on supply and demand dynamics (Machmuddah et al., 2020).

At the end of 2020, the IDX Composite decreased by 5.09% compared to 2019. On March 24, 2020, the IDX Composite reached its lowest point at 3,937.63, a level not seen since June 4, 2012, when it was at 3,654.58. By the end of 2021, the IDX Composite had risen to 6,581.5, marking a 10.08% increase compared to the end of 2020. However, the growth of the IDX Composite in 2022 was slower, with an increase of only 4.09%. By the close of trading in 2022, the IDX Composite had dropped by 0.14% to 6,850.62. The fluctuations in the IDX Composite from 2020 to 2022 reflect the influence of various factors, both financial and non-financial, on firm value.

Signaling theory posits that carbon emission disclosure acts as a signal that can reduce information asymmetry between managers and investors (Connelly et al., 2011). Investors may view such disclosure positively, as it demonstrates the company's commitment to transparency and environmental responsibility in managing carbon emissions (Kurnia et al., 2020). This enhanced transparency can improve the company's external reputation, attract more investors, and ultimately increase firm value. Legitimacy theory further supports this view, suggesting that a company's operations must align with societal norms and regulations to gain legitimacy. Companies respond to societal pressures by disclosing carbon emissions from their operations to achieve, maintain, or enhance their legitimacy.

Carbon emissions are a significant aspect of carbon accounting within the corporate social responsibility framework. Over time, excessive carbon emissions contribute to global warming and climate change. As a result, carbon emission reporting has garnered increasing attention from various stakeholders, including company managers, consumers, investors, regulators, standard setters, non-governmental organizations, and academics (Jiang et al., 2021). Carbon dioxide (CO<sub>2</sub>) is the most significant contributor to the increase in greenhouse gases, accounting for 80% of emissions, followed by N<sub>2</sub>O (8%), CH<sub>4</sub> (6%), and other fluorinated gases (26%) (BMKG, 2023). Indonesia has committed to reducing carbon emissions through Act No. 26 of 2016, following the ratification of the Paris Agreement. At the 28th Conference of Parties (COP 28) of the UNFCCC in 2023, Indonesia also committed to limiting the rise in global temperatures to no more than 1.5°C. The implementation of Presidential Regulation Number 98 of 2021 on the Carbon Economic Value underscores the government's prioritization of carbon

emission issues. Carbon emission disclosure is a key component of corporate transparency and accountability. However, since such disclosure in sustainability reports remains voluntary, not all Indonesian companies participate (Hermawan et al., 2018).

Research by Hardiyansah et al. (2021), Jiang et al. (2021), Khatib et al. (2023), and Kurnia et al. (2021) indicates that carbon emission disclosure positively influences a firm's value. Conversely, Liu et al. (2023), Choi & Luo (2021), Mahmudah et al. (2023), and Alsaifi et al. (2020) have found that such disclosures negatively impact firm value. Adding to this complexity, studies by Houten & Wedari (2023) and Primanandari et al. (2021) suggest that carbon emission disclosure does not affect a firm's value. These conflicting findings highlight the inconsistency in the relationship between carbon emission disclosure and firm value, suggesting a need to explore various moderating variables that might reconcile these differences.

Agency theory offers a useful lens to examine this issue, particularly the separation of ownership between the agent (investor) and the principal (manager), which often leads to information asymmetry. The ownership structure serves as a mechanism of corporate governance that mitigates principal-agent conflicts and reduces agency costs. One key aspect of ownership structure is foreign ownership, which has been extensively studied in the corporate disclosure literature (Adel et al., 2019; Nagata & Nguyen, 2017). Research has shown that foreign ownership can positively affect firm value, as foreign investors are generally more incentivized to monitor management closely (Nguyen et al., 2020; Nofal, 2020; Rashid, 2020). However, agency theory also suggests that the significant separation between foreign investors and the company, exacerbated by geographical, linguistic, cultural, and legal barriers, contributes to information asymmetry (Tsang et al., 2019). Consequently, foreign investors often push for greater transparency in disclosures, including carbon emission information, to reduce this asymmetry.

In 2020, foreign direct investment in Indonesia increased by 1.62%, reaching US\$28.67 billion. The Indonesia Investment Coordinating Board reported a further increase in foreign investment inflows to US\$43 billion in 2022, the highest level ever recorded for the country. The energy sector was the leading recipient of this investment, accounting for over US\$16 billion in 2022. Foreign investors have demonstrated their capacity to improve corporate governance and potentially influence sustainability practices, which can, in turn, affect a company's financial performance (Dyck et al., 2019). Despite the significant role foreign ownership may play, its impact on sustainability reporting and firm value remains underexplored in the literature (Liou et al., 2023; Motta & Uchida, 2018). Therefore, this study seeks to examine the moderating effect of foreign ownership on the relationship between carbon emission disclosure and firm value.

The energy sector is particularly relevant to this investigation, as it has emerged as Indonesia's largest contributor to greenhouse gas emissions, responsible for 584,284 Gg CO<sub>2</sub>e, or 56% of the nation's total emissions in 2020 (KLHK, 2023). Between 2016 and 2021, emissions from Indonesia's energy sector increased to 784.8 gCO<sub>2</sub>/kWh, surpassing the G20 average, which saw a decline of 8.1% to 444.7 kWh. In 2022, emissions from this sector rose by 6.9% compared to the previous year, reaching 715.95 Mton CO<sub>2</sub>e (KLHK, 2023). Given its

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significant contribution to national emissions, the energy sector is the focal point of this research.

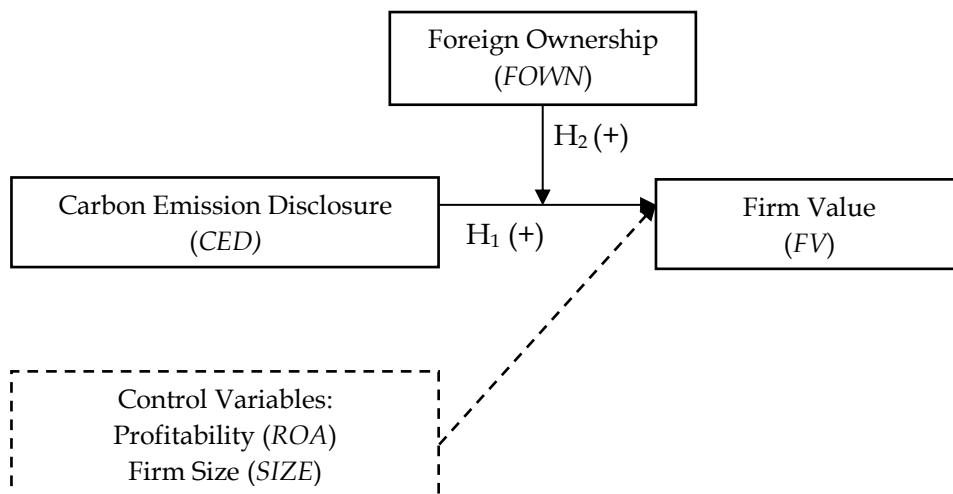
Signaling theory suggests that the voluntary disclosure of carbon emissions can serve as a positive signal to investors, thereby enhancing company value (Kurnia et al., 2020). Such disclosures reflect a company's commitment to transparency and environmental responsibility in managing its carbon footprint. This transparency mitigates information asymmetry between the company and investors, leading to more favorable assessments of the company (Lee & Cho, 2021). The positive signal can enhance external reputation, attract more investors, and ultimately increase the company's value. This is supported by legitimacy theory, which provides the premise that to maintain legitimacy, companies voluntarily report their carbon emissions (Deegan, 2019). Carbon emissions disclosure aims to mitigate public pressure and reduce the risk of losing legitimacy. Companies that have achieved legitimacy tend to have a better public image and reputation (Alfayerds & Setiawan, 2021). Research by Jiang et al. (2021), Khatib et al. (2023), and Kurnia et al. (2021) demonstrates that carbon emissions disclosure positively impacts company value. Such disclosure indicates the company's transparency in managing its environmental impact and operations. Investors who prioritize environmental issues are more inclined to invest in companies that exhibit a commitment to sustainability. Therefore, carbon emissions disclosure can be considered a strategic advantage for companies, as it has the potential to attract more investors, increase demand for company shares, and ultimately enhance company value.

**H<sub>1</sub>:** Carbon emissions disclosure has a positive effect on firm value.

Agency theory suggests that foreign ownership leads to improved corporate governance, which is expected to reduce agency conflicts and enhance company value. Agency theory posits that foreign investors will urge management to increase disclosure, including information on carbon emissions, to mitigate information asymmetry. Information asymmetry arises from the significant separation between foreign investors and the company due to geographical distance and barriers in language, culture, and law (Tsang et al., 2019). Research by Nguyen et al. (2020), Nofal (2020), Rashid (2020), Kao et al. (2019), and Putri & Setiawan (2023) indicates that foreign ownership can enhance firm value. This is because the presence of foreign investors in the ownership structure is perceived positively by other investors in the capital market (Kao et al., 2019). Foreign investors in developing countries consider environmental policies when making investment decisions (Azar et al., 2021). They tend to increase their investment ownership in companies that report CSR (Marshall et al., 2022). Carbon emission disclosure, a voluntary aspect included in sustainability or annual reports, demonstrates the firm's transparency in environmental management. Research by Bose et al. (2023), Kim et al. (2021), and Jung & Kim (2020) shows that foreign ownership positively impacts carbon emission disclosure. Foreign shareholders pay greater attention to the company's social and environmental responsibilities, particularly carbon emission disclosure. This aligns with the findings of Kantudu et al. (2023) and Putra & Wirakusuma (2017), which state that foreign ownership strengthens the impact of CSR disclosure on company value. Foreign investors are more inclined to invest in companies that are socially responsible. Foreign

ownership can exert additional pressure on companies to comply with stringent environmental regulations, both domestic and international. The presence of foreign ownership encourages companies to enhance carbon emission disclosure as part of good governance practices. By increasing carbon emission disclosure and adhering to regulations, companies can reduce the risk of fines and litigation, as well as improve long-term financial stability. This can enhance positive perceptions from investors and positively influence firm value.

**H<sub>2</sub>:** Foreign ownership strengthens the impact of carbon emission disclosure on firm value.



**Figure 1. Research Model**

Source: Research Data, 2024

## RESEARCH METHOD

The data for this study were sourced from secondary data, specifically annual reports and sustainability reports, which were accessed through the official website of the Indonesian Stock Exchange ([www.idx.co.id](http://www.idx.co.id)) and the official websites of the respective companies. A documentation study was employed as the method for data collection. The research population consisted of all energy companies listed on the Indonesia Stock Exchange from 2020 to 2022. The sample was determined using a purposive sampling method, with the selection criteria focusing on companies that published sustainability reports or annual reports disclosing carbon emissions for the period from 2020 to 2022.

Firm value was assessed by calculating the ratio of market capitalization and debt to the replacement cost of assets. Tobin's Q, as described by Kurnia et al. (2021), was used as the metric for measuring firm value. The formula is as follows:

$$FV_{i,t} = \frac{\text{Market Value of Equity } i,t + \text{Book Value of Debt } i,t}{\text{Total Assets } i,t} \dots \dots \dots (1)$$

Carbon emission disclosure is evaluated using the seven indicators outlined in the Global Reporting Initiative (GRI) standards 305, as presented in the company's sustainability or annual report. Companies that disclose information in accordance with these standards receive a score of one for each disclosed item,

while a score of zero is assigned for non-disclosure. The total score is then divided by the maximum possible number of indicators and multiplied by one hundred percent (Wahyuningrum et al. 2021).

Foreign ownership is defined as the percentage of shares held by foreign investors in a company. This measurement is based on the methodology outlined by Saini & Singhania (2019), as detailed below:

$$FOWN_{i,t} = \frac{\text{Total share owned by foreign investor}}{\text{Total outstanding share}} \times 100\% \dots \dots \dots (3)$$

The research incorporates profitability and firm size as control variables. Profitability is a ratio that reflects how effectively a company manages its assets to generate profit. The indicator used to measure profitability, as described by Machmuddah et al. (2020), is outlined below:

Firm size is determined by the scale of the company, measured by its total assets. To minimize excessive fluctuations in the data, the natural logarithm of total assets is used as a proxy for firm size (Nguyen et al., 2021).

The data analysis technique utilized in this study is Moderated Regression Analysis (MRA), conducted using Eviews 12 software. The following section presents the moderated regression model employed in the analysis.

Where:

A = Constant

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  = Regression coefficients of the independent, moderating, and control variables

*FV* = Firm value

CED = Carbon emission disclosure

*FOWN* = Foreign ownership

*ROA* = Profitability

*SIZE* = Firm size

$\epsilon$  = standard error

## RESULTS AND DISCUSSION

During the data analysis process, 20 sample data points were identified as outliers and subsequently eliminated. Outliers, defined as observations that deviate significantly from other data points, can potentially distort the results of statistical analysis. After removing these outliers, the total sample for the study comprised 84 observations.

**Table 1. Determination of Research Sample**

Criteria	Number of observations			
	2020	2021	2022	Total
<b>Population:</b>				
Energy sector companies listed on the Indonesia Stock Exchange during the period 2020-2022	66	71	75	212
<b>Criteria:</b>				
Companies that did not publish a sustainability report or an annual report disclosing carbon emissions during the 2020-2022 period	(46)	(33)	(29)	(108)
Outlier data	(7)	(5)	(8)	(20)
<b>Total observations</b>	<b>13</b>	<b>33</b>	<b>38</b>	<b>84</b>

Source: Research Data, 2024

The descriptive statistics include the mean, maximum value, minimum value, standard deviation, and total observations for variables such as firm value, carbon emission disclosure, foreign ownership, profitability, and company size. The results of this analysis are presented in Table 2.

**Table 2. Descriptive Statistics**

	FV	CED	FOWN	ROA	SIZE
Mean	1.177	0.562	0.248	0.101	29.943
Maximum	3.451	1.000	0.821	0.616	32.755
Minimum	0.512	0.142	0.000	-0.383	26.175
Std. Dev.	0.543	0.217	0.233	0.178	1.479
Observations	84	84	84	84	84

Source: Research Data, 2024

The firm value variable has an average value of 1.177. A Tobin's Q value exceeding 1 indicates that, on average, the sample firms are valued higher than their replacement cost, suggesting that the average firm value of the sample is considered overvalued. The maximum firm value in the sample is 3.451, achieved by PT Super Energy Tbk. (SURE) in 2021. The carbon emission disclosure variable has an average value of 0.562, indicating that the sample firms, on average, disclosed several carbon emission indicators in accordance with GRI Standards 305. The maximum value for carbon emission disclosure is 1.000, which was achieved by PT Bukit Asam Tbk. (PTBA) in 2021 and 2022, and by PT Perusahaan Gas Negara Tbk. (PGAS) from 2020 to 2022. This indicates that PTBA and PGAS disclosed all indicators required by GRI Standards 305. The foreign ownership variable has an average value of 0.248, reflecting a relatively low percentage of foreign ownership in the sample firms. The maximum value for foreign ownership is 0.821, achieved by PT Indo Tambangraya Megah Tbk. (ITMG) in 2021. The standard deviations of the variables for firm value, carbon emission disclosure, foreign ownership, and firm size are smaller than their means, indicating consistent data distribution. In contrast, the profitability variable exhibits a standard deviation larger than its mean, suggesting greater variability in the data.

The selection of the panel data regression model aims to identify the most appropriate model among the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The Chow test is used to determine whether CEM or FEM is more appropriate, while the Hausman test identifies whether FEM or REM is preferable. The Lagrange Multiplier test helps determine

whether REM or CEM is more suitable. The Chow test results indicate an F probability value of  $0.598 > 0.05$ , leading to the selection of CEM as the preferred model. The Hausman test results show a chi-square probability value of  $0.595 > 0.05$ , favoring REM. The Lagrange Multiplier test results yield a p-value of  $0.577 > 0.05$ , again supporting the selection of CEM. Based on these tests, the panel data regression estimation is conducted using CEM, which employs the Ordinary Least Squares (OLS) approach (Pandono & Sofyan, 2018).

Classical assumption tests, including the normality test, multicollinearity test, heteroskedasticity test, and autocorrelation test, were conducted. The normality test shows a probability value of  $0.118 (p > 0.05)$ , indicating that the data is normally distributed. The multicollinearity test results show the following VIF values: carbon emission disclosure at 1.474; foreign ownership at 1.369; profitability at 1.002; and firm size at 1.414. All variables have VIF values below 10, indicating that the regression model does not exhibit multicollinearity. The heteroskedasticity test results show a Prob. F-statistic value of  $0.764 (p > 0.05)$ , indicating that the regression model passes the heteroskedasticity test. The autocorrelation test results show a Durbin-Watson value of 1.992, which falls between dU (1.746) and 4-dU (2.254), indicating no autocorrelation in the residuals.

**Table 4. Results of Moderated Regression Analysis (MRA)**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.553	2.662	0.207	0.835
CED	-0.262	0.114	-2.286	0.025
FOWN	0.009	0.029	0.316	0.752
CED*FOWN	0.007	0.023	0.332	0.740
ROA	0.191	0.021	9.100	0.000
SIZE	-0.036	0.767	-0.047	0.962
Adjusted R-squared	0.547			
F-statistic	21.100			
Prob (F-statistic)	0.000			

Source: Research Data, 2024

Moderated Regression Analysis (MRA) aims to determine the effect of carbon emission disclosure on firm value and the influence of foreign ownership in moderating the impact of carbon emission disclosure on firm value. Based on the regression results, the following equation represents the linear regression model with the moderation variable.

$$Y = 0,553 - 0,262 CED + 0,009FOWN + 0,007CED*FOWN + 0,191ROA - 0,039SIZE + e$$

The F-test shows a significance value of  $0.000 < 0.05$ , indicating that the regression model used in this study is appropriate. The coefficient of determination (R-squared) test reveals that the R-squared ( $R^2$ ) value is 54.7%, meaning that 54.7% of the variation in firm value is explained by carbon emission disclosure, foreign ownership, the interaction between carbon emission disclosure and foreign ownership, profitability, and firm size. The remaining 45.3% is influenced by variables not included in this study.

In the hypothesis testing (t-test), the probability value for the carbon emission disclosure variable is  $0.025 < 0.05$ , with a t-value of -2.286 and a regression coefficient of -0.262. This indicates that carbon emission disclosure negatively affects firm value, leading to the rejection of the first hypothesis (H1). This suggests

that carbon emission disclosure is not effective in demonstrating a company's commitment to environmental responsibility, resulting in negative perceptions from investors. Investors may view carbon emission disclosure as mere advertising or compliance with government policies, rather than something beneficial to them (Firmansyah et al., 2021). These results are consistent with studies by Mahmudah et al. (2023), Liu et al. (2023), Choi & Luo (2021), and Alsaifi et al. (2020), which also found that carbon emission disclosure negatively impacts firm value. Carbon emission disclosure is often seen as a cost and an investment without tangible benefits (Alsaifi et al., 2020). This study's findings do not support the research by Hardiyansah et al. (2021), Jiang et al. (2021), Khatib et al. (2023), and Kurnia et al. (2021), which claimed that carbon emission disclosure positively impacts firm value. Differences in results compared to previous studies may be due to variations in study locations, sample sizes, and the indicators used for measuring carbon emission disclosure. While the findings align with signaling theory, the carbon emission information disclosed by companies is perceived as bad news. Carbon emission disclosure requires significant costs for data collection, reporting, and emission reduction, leading to negative investor perceptions. The results also align with legitimacy theory, as companies disclose carbon emissions to gain legitimacy from stakeholders, yet stakeholders may actually view this information negatively. Businesses with higher carbon emission levels often face greater legitimacy threats (Datt et al., 2019). Disclosure of high carbon emission levels can be seen as a failure to meet societal and environmental expectations, leading to negative investor perceptions and a decline in firm value (Luo et al., 2022; Muhammad & Aryani, 2021).

The interaction variable between carbon emission disclosure and foreign ownership has a t-value of 0.332, with a probability value of 0.740 and a regression coefficient of 0.007. Given that the probability value of 0.740 is greater than 0.05, the second hypothesis (H2) is rejected. This indicates that foreign ownership does not strengthen the impact of carbon emission disclosure on firm value. The presence of foreign shareholders does not guarantee an increase in firm value through their oversight of carbon emission disclosure. This may be attributed to foreign shareholders originating from jurisdictions with different environmental standards and priorities, resulting in divergent expectations compared to local stakeholders. Additionally, a lack of understanding of Indonesian regulations and market conditions may hinder foreign investors' ability to assess the impact of a company's emission information on its performance. Although foreign ownership may be associated with better governance practices, its influence is limited when it constitutes only a minority shareholding. This limited influence is insufficient to drive significant changes in carbon emission disclosure practices or alter market perceptions of the disclosed carbon emission information. These findings contradict studies by Putra & Wirakusuma (2017) and Kantudu et al. (2023), which suggest that foreign ownership can strengthen the impact of corporate social responsibility (CSR) disclosure on firm value. However, the results are consistent with research by Istikomah et al. (2023), Kansil (2021), and Julekhah & Rahmawati (2019), which state that foreign ownership does not influence firm value. The results also align with studies by Hasanudin et al. (2022), Fibriyanti & Widagdo (2022), and Rahayu & Damayanthi (2018), which indicate that foreign ownership

does not strengthen the impact of CSR on firm value. Foreign investors cannot directly influence companies as their participation is limited to shareholder meetings (Hasanudin et al., 2022; Rahayu & Damayanthi, 2018). This limited influence is not sufficient to significantly affect the assessment of a company's business operations, including carbon emission disclosure (Istikomah et al., 2023). Foreign investors tend to prioritize the return on their investments and are less concerned with the company's social and environmental conditions (Hasanudin et al., 2022). These findings are inconsistent with agency theory, indicating that foreign investors do not effectively serve as a monitoring mechanism in influencing corporate environmental policies.

From a theoretical perspective, this study's findings provide empirical evidence on the impact of carbon emission disclosure on firm value, as explained by signaling theory and legitimacy theory. However, the findings do not support agency theory, as the oversight mechanisms employed by foreign shareholders are not sufficiently effective in influencing corporate environmental policies.

## CONCLUSION

Based on the research findings, several conclusions can be drawn. First, carbon emission disclosure negatively impacts firm value. The more carbon emission disclosure items that comply with GRI Standard 305 are revealed in the sustainability or annual report, the lower the firm's value. Second, foreign ownership does not strengthen the impact of carbon emission disclosure on firm value. Foreign investors do not effectively act as a monitoring mechanism to influence corporate policies on carbon emission disclosure. This study offers practical implications for regulators, providing a reference for designing incentive policies for companies that disclose carbon emissions. For companies, the research can serve as a guide in evaluating their carbon emission disclosure strategies. Additionally, for investors, this study offers insights into the factors to consider when evaluating carbon emission disclosures in energy sector companies in Indonesia and making informed investment decisions.

This study has several limitations. First, it utilizes GRI Standards 305 indicators to measure carbon emission disclosure. Future research is encouraged to employ alternative proxies, such as the Carbon Disclosure Leadership Index (CDLI) score or a checklist developed by the Carbon Disclosure Project (CDP), to measure carbon emission disclosure. Second, it is recommended that future studies include additional variables that might affect firm value, such as Environmental, Social, and Governance (ESG) scores. Moreover, future research could explore other moderating variables, such as ownership concentration, that might strengthen the relationship between carbon emission disclosure and firm value.

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