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The Effect of Renewable Energy, Eco-Efficiency, and Carbon Emission Disclosure on Firm Value

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Abstract

Increasing attention is being paid to corporate value, which is influenced not only by financial performance but also by environmental sustainability practices such as renewable energy, eco-efficiency, and carbon emission disclosure. The purpose of this study is to analyze the effect of renewable energy, eco-efficiency, and carbon emission disclosure on corporate value in the basic materials manufacturing sector listed on the Indonesia Stock Exchange for the 2021–2025 period. This study uses a quantitative descriptive-explanatory approach using secondary data from annual reports and sustainability reports. The research sample consisted of 37 companies with 143 observations analyzed using multiple linear regression and classical assumption tests. The results show that renewable energy has no significant effect on corporate value, while eco-efficiency and carbon emission disclosure have a positive and significant effect on corporate value. Simultaneously, all three variables influence corporate value, although their explanatory power is relatively low. The conclusion of this study confirms that certain sustainability aspects, particularly environmental efficiency and emission transparency, play a significant role in improving market perceptions of companies. These findings provide implications for companies, investors, and regulators in strengthening sustainability strategies to sustainably increase corporate value in the future.

Keywords

Carbon Emission Disclosure, Eco-Efficiency, Firm Value, Renewable Energy, Sustainability Accounting.

1. Introduction

Firm value represents the market's assessment of a company's overall performance and future prospects, which is generally reflected in its stock price (Hardiyansah et al., 2021). A stock price that exceeds book value indicates strong growth prospects and positive investor expectations, whereas a price below book value suggests weaker perceived performance and future potential (Rachmawati, 2021). Accordingly, firm value reflects not only a company's financial condition but also its ability to manage strategic aspects, including environmental and social issues. As a key indicator for shareholders, firm value is influenced by both financial and non-financial performance. In the chemical manufacturing sector, companies that improve operational efficiency, enhance transparency, and demonstrate commitment to environmental sustainability tend to receive more favorable market valuations (Nazwa & Fitri, 2022).

The manufacturing industry plays an important role in enhancing firm value; however, its operational activities also generate environmental impacts such as greenhouse gas emissions. Currently, corporate valuation is not only assessed based on financial performance but also on how companies demonstrate responsibility toward the environment (Ong et al., 2016). Therefore, firms are encouraged to implement sustainability strategies such as carbon emission disclosure, eco-efficiency practices, and improvements in environmental performance. Carbon emission disclosure reflects the extent of a company's transparency regarding its environmental impact, while eco-efficiency aims to ensure that resource utilization is more efficient without harming the environment (Hapsoro & Falih, 2020; Adrizky et al., 2025).

Climate change refers to the increase in Earth's surface temperature caused by the accumulation of greenhouse gases in the atmosphere. Various gases such as carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, hydrochlorofluorocarbons, and ozone contribute to this phenomenon. However, carbon emissions are the primary focus as they are considered the largest contributor to climate change. In this context, the manufacturing sector, as one of the industries that produces significant carbon emissions, receives greater attention, particularly in terms of measuring, controlling, and disclosing emissions generated from its operational activities (Román & Kabir, 2024).

Therefore, this study uses carbon emission disclosure as one of the measures of sustainability in manufacturing companies, particularly in the chemical industry. This disclosure provides information regarding the amount of greenhouse gas emissions generated from corporate operations, as well as explains the efforts undertaken to manage and reduce such environmental impacts. In the chemical industry, where production processes tend to generate relatively high emissions, carbon emission disclosure becomes essential to assess the extent of corporate environmental responsibility (Adrizky et al., 2025; Nurjannah et al., 2025).

One of the efforts that manufacturing companies in the chemical industry can undertake to support environmental sustainability is through investment in renewable energy. The use of renewable energy can reduce dependence on fossil fuels, which are the main source of carbon emissions in production processes. In addition, companies can also implement eco-efficiency by optimizing the use of raw materials, energy, and other resources to maintain economic value while reducing environmental impacts (Aulia & Machdar, 2023). This is particularly important given that the chemical industry generally produces substantial emissions and waste.

In addition to the adoption of renewable energy, manufacturing companies can also apply the concept of eco-efficiency as an effort to improve environmental performance. The principle of eco-efficiency emphasizes the effective use of resources in production processes, enabling companies to produce goods with lower energy

consumption, raw material usage, and costs. This concept also helps reduce waste and minimize pollution resulting from operational activities. Thus, eco-efficiency not only improves firm efficiency and productivity but also reduces negative environmental impacts. Furthermore, the implementation of eco-efficiency reflects a company's commitment to proper environmental management, thereby increasing investor confidence and providing added value to the firm (Nashrulloh & Achyani, 2024).

Based on the background and phenomena described above, this study aims to analyze the effect of renewable energy, eco-efficiency, and carbon emission disclosure on firm value in the manufacturing sector, particularly in the chemical industry. This research is important considering the increasing demand for sustainable business practices that not only focus on economic performance but also consider environmental aspects. The findings are expected to contribute to the development of environmental accounting and sustainability literature, as well as serve as a reference for companies, investors, and regulators in understanding the role of sustainability strategies in enhancing firm value. Thus, this study is expected to provide empirical evidence regarding the importance of integrating environmental aspects into business and investment decision-making in the manufacturing sector.

2. Literature Review and Hypothesis Development

2.1. The Effect of Renewable Energy on Firm Value

From the perspective of Stakeholder Theory, the use of renewable energy represents one of the company's efforts to meet the needs and expectations of various stakeholders, including investors, government, society, and the environment (Freeman & Mcvea, 2005). The adoption of renewable energy reflects a company's commitment to environmental sustainability and its effort to reduce dependence on fossil fuels, which may cause negative environmental impacts. In addition to providing environmental benefits, renewable energy usage can also improve energy efficiency and support sustainable economic growth, thereby creating added value for the company (Satrianto & Ikhsan, 2024; Amalia & Bertuah, 2025).

This is in line with the study by Chung et al. (2024), which found that renewable energy has a positive effect on firm value. The results indicate that companies that increase their use of renewable energy tend to receive better evaluations from investors because they are perceived as having a strong commitment to sustainability and long-term value creation. However, Honesty (2025) found that renewable energy has a negative effect on firm value due to the high costs required for its implementation. Nevertheless, based on Stakeholder Theory, the use of renewable energy is still considered capable of enhancing stakeholder trust and providing long-term benefits for the company (Freeman, 2010). Based on the theoretical foundation and previous empirical findings, the following hypothesis is formulated.

H1: Renewable energy has a positive effect on firm value.

2.2. The Effect of Eco-Efficiency on Firm Value

From the perspective of Signaling Theory, the implementation of eco-efficiency is considered a positive signal sent by the company to investors and stakeholders regarding its commitment to operational efficiency and environmental sustainability. Companies that apply eco-efficiency demonstrate their ability to optimize resource utilization, reduce environmental impacts, and improve operational effectiveness. These conditions can enhance the company's reputation and create a positive perception among investors. Furthermore, eco-efficiency practices reflect the company's capability to integrate environmental responsibility

into business strategies, which may strengthen stakeholder trust and reduce information asymmetry between companies and external parties (Damas et al., 2021). By providing credible environmental signals through sustainable practices, companies can improve their legitimacy and potentially increase their competitive advantage and long-term value (Connelly et al., 2011; Satrio, 2020).

This is consistent with the study by Marini and Herawaty (2024), which found that eco-efficiency has a positive effect on firm value. The results show that companies implementing eco-efficiency practices tend to be more attractive to investors because they are considered committed to sustainability and better prepared to face environmental regulations and risks. This finding is supported by Atiningsih and Setiyono (2023), who demonstrated that companies adopting eco-efficiency through ISO 14001 certification tend to have higher firm value compared to those that do not implement the concept. Based on the theoretical foundation and previous studies, the following hypothesis is formulated:

H2: Eco-efficiency has a positive effect on firm value.

2.3. The Effect of Carbon Emission Disclosure on Firm Value

Carbon emission disclosure affects firm value because it relates to how stakeholders and investors assess a company's environmental responsibility (Kurnia et al., 2021; Yuliandhari et al., 2023; Fadila, 2025). Companies that are able to manage and disclose carbon emission information transparently generally gain higher levels of trust, which can contribute to an increase in firm value. This is consistent with Legitimacy Theory, which explains that companies seek to gain and maintain societal approval by demonstrating commitment to environmental management through transparent carbon emission disclosure (Nuurhasanat & Haq, 2024). Siswati (2025) demonstrate that carbon emission disclosure has a positive effect on firm value. Companies that are transparent in disclosing their carbon emissions are perceived more favorably by investors, as it reflects a genuine commitment to environmental sustainability.

In addition, from a Stakeholder Theory perspective, carbon emission disclosure serves as a means for companies to communicate information to stakeholders regarding the environmental impact of their operational activities. This information reflects the company's commitment to sustainable and responsible business practices, which becomes a consideration for investors in assessing firm performance and prospects. The broader the disclosure of carbon emissions, the higher the level of stakeholder trust, as the company is perceived to be more environmentally responsible. This is supported by research showing that carbon emission disclosure has a positive and significant effect on firm value, meaning that companies with greater transparency in disclosing carbon emissions tend to have higher firm value compared to those that do not disclose it (Rusmana & Purnaman, 2020; Aeni & Murwaningsari, 2023; Rahmasari & Irwansyah, 2024).

H3: Carbon emission disclosure has a positive effect on firm value.

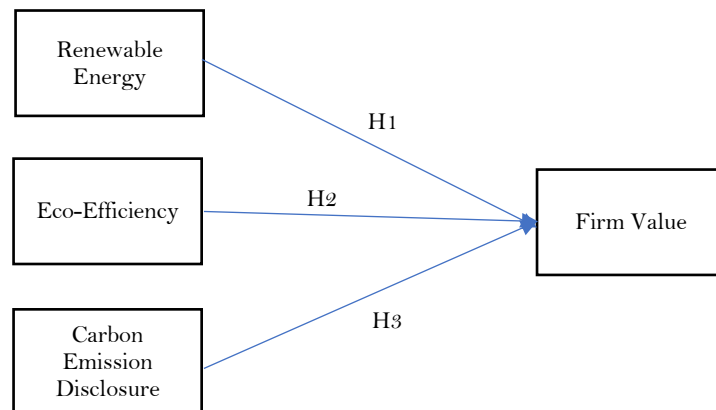


Figure 1. Research Framework

Figure 1 illustrates the research framework, in which renewable energy (H1), eco-efficiency (H2), and carbon emission disclosure (H3) are proposed as independent variables influencing firm value as the dependent variable. The model assumes that each sustainability-related factor has a direct effect on firm value and is tested through three research hypotheses.

3. Methods

This study employs a quantitative research method with a descriptive-explanatory approach to analyze the effect of renewable energy, eco-efficiency, and carbon emission disclosure on firm value in basic materials manufacturing companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2025 period. The quantitative approach is used to examine relationships among variables objectively through numerical data and statistical analysis, while the descriptive-explanatory approach describes variable conditions and explains the influence of independent variables on the dependent variable (Sugiyono, 2018). The dependent variable, firm value, is measured using Tobin's *Q*, which reflects market perception of company performance and prospects. The independent variables consist of renewable energy, eco-efficiency, and carbon emission disclosure. Renewable energy is measured using Renewable Energy Consumption (REC), representing the proportion of renewable energy consumption to total energy consumption. Eco-efficiency is measured using PROPER and ISO 14001 certification with a dummy scale (1 for ownership and 0 otherwise) (Helmina et al., 2022). Carbon emission disclosure is measured using the Carbon Disclosure Index (CDI) based on the 18-item checklist developed by Choi et al. (2013), covering climate change, greenhouse gas emissions, energy consumption, and emission accountability.

The population of this study consists of all manufacturing companies in the basic materials sector listed on the IDX during the 2021–2025 period, totaling 113 companies. The data used are secondary data obtained from annual reports and sustainability reports accessed through the official IDX website and each company's official website. The sample selection process in this study was conducted using purposive sampling based on predetermined criteria. The population consisted of manufacturing companies in the basic materials sector listed on the IDX during the 2021–2025 period, resulting in 113 companies with a total of 565 observations. Subsequently, 41 companies that did not consistently publish Annual Reports during the observation period were excluded, reducing the observations by 205. Furthermore, 5 companies that did not consistently publish Sustainability Reports were excluded, resulting in a reduction of 25 observations. In addition, 28 companies that did not disclose ISO 14001 and/or PROPER information during 2021–2025 were removed, reducing the observations by 140. After considering the outlier data

exclusion of 52 observations, the final sample consisted of 37 companies with a total of 143 observations for the 2021–2025 period.

Data analysis in this study employs multiple linear regression using SPSS version 29 to examine the effect of the independent variables on the dependent variable (Ghozali, 2021). Prior to hypothesis testing, classical assumption tests are conducted, including tests of normality, multicollinearity, heteroscedasticity, and autocorrelation, to ensure that the regression model satisfies the Best Linear Unbiased Estimator (BLUE) criteria. Hypothesis testing is carried out using the t-test to assess partial effects, the F-test to evaluate simultaneous effects, and the coefficient of determination (R^2) to measure the extent to which the independent variables explain the dependent variable. In addition, descriptive statistical analysis is used to describe the characteristics of the research data.

4. Results

Descriptive statistical analysis is used to describe the general characteristics of the research data. This analysis provides information on the minimum, maximum, mean, and standard deviation values of each variable used in the study. The variables analyzed consist of renewable energy, eco-efficiency, carbon emission disclosure, and firm value. The results of the descriptive statistical test processed using SPSS are presented in Table 1.

Table 1. Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Renewable Energy	143	0.0000	0.6509	0.072159	0.1477243
Eco-efficiency	143	1.0000	2.0000	1.503497	0.5017452
Carbon Emission Disclosure	143	0.0000	1.0000	0.656950	0.2592577
Firm Value	143	0.3700	1.7100	0.922168	0.2793280
Valid N (listwise)	143				

Table 1 presents the descriptive statistical results of this study. After the removal of outlier data, the study consists of 143 observations. The Renewable Energy variable has a minimum value of 0.0000 (PT Emdeki Utama Tbk, 2024) and a maximum value of 0.6509 (PT Kirana Megatara Tbk, 2024), with a mean of 0.072159 and a standard deviation of 0.1477243, indicating considerable variation among companies. The eco-efficiency variable ranges from 1.0000 (PT Merdeka Copper Gold Tbk, 2023) to 2.0000 (PT Vale Indonesia Tbk, 2024), with a mean of 1.503497 and a standard deviation of 0.5017452, reflecting moderate differences in environmental efficiency practices. The carbon emission disclosure variable has a minimum value of 0.0000 (PT Gunung Raja Paksi Tbk, 2025) and a maximum value of 1.0000 (PT Indocement Tungal Prakarsa Tbk, 2023), with a mean of 0.656950 and a standard deviation of 0.2592577, indicating relatively balanced disclosure levels despite variations among companies. Meanwhile, firm value ranges from 0.3700 (PT Polychem Indonesia Tbk, 2022) to 1.7100 (PT Aneka Tambang Tbk, 2022), with a mean of 0.922168 and a standard deviation of 0.2793280, suggesting relatively stable firm value among the sampled companies.

The initial step in the regression analysis involved conducting an outlier test to detect extreme data that could affect the accuracy of the regression results. Data identified as outliers were then removed from the research sample to ensure that the regression analysis results were more accurate and not influenced by extreme values. From the initial 195 observations obtained, 52 observations were identified as outliers. To maintain the quality and accuracy of the analysis results, these outlier

data were excluded from the study, resulting in a final total of 143 observations used in the analysis.

Table 2. Outlier Data

No	Company	Year	Z-Score
1	Aneka Tambang Tbk.	2021	-0.29413
2		2025	-0.68183
3	Asiaplast Industries Tbk.	2023	0.34386
4		2024	0.24190
5	Berlina Tbk.	2023	-0.00451
6		2025	-0.92872
7	Barito Pacific Tbk.	2025	-0.66586
8	Citra Tubindo Tbk.	2021	-0.23177
9		2025	-0.04125
10	Fajar Surya Wisesa Tbk.	2021	0.05328
11		2022	0.04542
12		2023	-0.19144
13		2024	-0.22124
14		2025	-0.09732
15	Lotte Chemical Titan Tbk.	2024	-1.00135
16		2025	0.07320
17	Gunawan Dianjaya Steel Tbk.	2024	-0.83325
18	Vale Indonesia Tbk.	2022	-0.45387
19		2022	-1.37053
20	Indah Kiat Pulp & Paper Tbk.	2023	-1.26367
21		2024	-1.49838
22	Indocement Tunggul Prakarsa Tbk.	2021	-0.52496
23	Merdeka Copper Gold Tbk.	2021	2.60320
24		2022	0.09718
25	Pelat Timah Nusantara Tbk.	2023	-1.11768
26	Semen Baturaja (Persero) Tbk.	2021	-0.28399
27	Solusi Bangun Indonesia Tbk.	2025	-0.39058
28		2022	-1.17743
29		2025	-0.43217
30	Timah Tbk.	2021	0.00695
31		2022	0.52464
32		2023	2.42274
33		2024	3.88162
34	Chandra Asri Pacific Tbk.	2025	0.34430
35		2021	0.29065
36		2022	0.10687
37		2023	-0.49021
38		2024	-0.35785
39	Waskita Beton Precast Tbk.	2025	-0.17287
40		2021	0.21705
41	Satyamitra Kemas Lestari Tbk.	2021	0.21705
42		2021	-0.16436
43	Archi Indonesia Tbk.	2025	0.44369
44		2021	-0.12121
45		2022	-0.24732
46		2023	-0.25056
47		2024	-0.32811
48	Cemindo Gemilang Tbk.	2025	-0.40339
49		2021	2.62297
50		2022	1.12033
51		2023	0.45454
52	Avia Avian Tbk.	2024	0.02340
		2025	0.44187

Table 2 presents the outlier data identification based on the Z-Score test. The results show that several observations were identified as potential outliers due to extreme values compared to other observations. These outliers were found across several companies and years, indicating variations in financial and sustainability-related indicators among sampled firms. The highest positive Z-Score values were observed in Chandra Asri Pacific Tbk. (2024), Merdeka Copper Gold Tbk. (2021), and Avia Avian Tbk. (2021), while the lowest values were recorded in Indah Kiat Pulp & Paper Tbk. (2024).

Table 3. Normality Test

Parameter	Value
N	143
Mean	0.0000000
Std. Deviation	0.26062533
Most Extreme Differences (Absolute)	0.051
Most Extreme Differences (Positive)	0.051
Most Extreme Differences (Negative)	-0.041
Test Statistic	0.051
Asymp. Sig. (2-tailed)	0.200
Monte Carlo Sig. (2-tailed)	0.479
99% CI Lower Bound	0.466
99% CI Upper Bound	0.492

Based on Table 3, the normality test was conducted to determine whether the residuals in the regression model were normally distributed. This assumption was assessed using the One-Sample Kolmogorov–Smirnov (K–S) Test. A significance value greater than 0.05 indicates that the data follow a normal distribution. Based on the test results presented in the table above, the Asymp. Sig. (2-tailed) value was 0.200, which is higher than the significance level of 0.05. Therefore, it can be concluded that the residuals are normally distributed, indicating that the normality assumption of the regression model has been satisfied.

Table 4. Multicollinearity and Heteroscedasticity Test

Variable	Tolerance	VIF	Sig.	Conclusion
Renewable Energy	0.978	1.022	0.208	No Multicollinearity & Heteroscedasticity Detected
Eco-Efficiency	0.913	1.095	0.239	
Carbon Emission Disclosure	0.902	1.108	0.358	

Table 4 presents the results of the multicollinearity and heteroscedasticity tests. The multicollinearity test was conducted to identify whether there is a strong correlation among the independent variables in the regression model. The results show that all variables have Tolerance values above 0.10 and VIF values below 10, indicating that the independent variables are free from multicollinearity. Furthermore, the heteroscedasticity test using the Glejser method was performed to examine whether the residual variance is constant across observations. The significance values of all independent variables are greater than 0.05, indicating that the regression model does not experience heteroscedasticity. Therefore, the model meets the assumptions of both multicollinearity and homoscedasticity, making it appropriate for further analysis.

Table 5. Autocorrelation Test

Information	Value
Durbin–Watson Statistic (DW)	1.821
dU (n = 143, k = 3)	1.774
4 – dU	2.226

Table 5 presents the results of the autocorrelation test using the Durbin–Watson (DW) statistic to determine whether there is a correlation among the residuals in the regression model. The results show a DW value of 1.821, which lies between the upper critical value ($dU = 1.774$) and its complementary value ($4 - dU = 2.226$), satisfying the criterion of $1.774 < 1.821 < 2.226$. Therefore, the regression model is free from both positive and negative autocorrelation, indicating that the assumption of residual independence has been satisfied.

Table 6. Coefficient Determination

Information	Value
Model	Firm Value
R	0.360
R Square	0.129
Adjusted R-Square	0.111

Table 6 presents the coefficient of determination (R^2) results. The model produces an R value of 0.360, indicating a moderate relationship between the independent variables and firm value. The Adjusted R^2 value of 0.111 indicates that renewable energy, eco-efficiency, and carbon emission disclosure collectively explain 11.1% of the variation in firm value. The remaining 88.9% of the variation is explained by other variables outside the scope of this study, suggesting that additional factors may also influence firm value.

Table 7. F-Test

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.434	3	0.478	6.888	<.001
Residual	9.645	139	0.069		
Total	11.079	142			

The F-test is conducted to examine whether all independent variables in the regression model simultaneously affect the dependent variable. The results of this test are used to determine whether the regression model is appropriate for explaining the relationships among the research variables. Based on Table 7, the calculated F-value is 6.888 and is positive, with a significance value of < 0.001 , which is lower than the 0.05 significance level. These results indicate that the independent variables renewable energy, eco-efficiency, and carbon emission disclosure jointly have a significant effect on firm value. Therefore, the regression model is considered statistically significant and suitable for explaining the variation in firm value.

Table 8. T-Test Results

Variable	B	Std. Error	Beta	t-statistics	Sig.
Constant	0.594	0.080		7.452	<0.001
Renewable Energy	0.173	0.151	0.092	1.145	0.254
Eco-Efficiency	0.098	0.046	0.176	2.121	0.036
Carbon Emission Disclosure	0.257	0.090	0.239	2.864	0.005

Table 8 presents the results of the hypothesis testing. The findings indicate that renewable energy does not have a significant effect on firm value, as shown by a regression coefficient of 0.173 with a significance value of 0.254 (> 0.05). Therefore, the first hypothesis is rejected, indicating that renewable energy has not directly contributed to increasing firm value. This condition may be attributed to the relatively high initial investment costs and the long-term realization of economic benefits, causing investors to focus more on short-term financial performance and profitability in assessing companies.

Meanwhile, eco-efficiency and carbon emission disclosure have a positive and significant effect on firm value. Eco-efficiency shows a regression coefficient of 0.098 with a significance value of 0.036 (< 0.05), while carbon emission disclosure has a regression coefficient of 0.257 with a significance value of 0.005 (< 0.05). These results indicate that companies with better resource management efficiency and greater transparency in carbon emission disclosure tend to achieve higher firm value. Eco-efficiency enhances operational effectiveness and productivity, whereas carbon emission disclosure acts as a positive signal of the company's commitment to sustainability, thereby strengthening investor confidence, corporate reputation, and market value.

5. Discussion

Based on the hypothesis testing results, renewable energy does not significantly affect firm value ($\beta = 0.173$; $p = 0.254 > 0.05$), so the first hypothesis is rejected. Although the relationship is positive, renewable energy implementation has not yet become a major consideration in investor valuation. From the perspective of Stakeholder Theory, sustainable practices are expected to enhance firm value. However, investors may still prioritize short-term financial performance, while the benefits of renewable energy require substantial initial investment and are realized over the long term, particularly in the chemical manufacturing sector. These findings are inconsistent with Yahaya (2026), who reported a significant positive effect, and Honesty (2025), who found a significant negative effect.

The hypothesis testing results show that eco-efficiency has a positive and significant effect on firm value ($\beta = 0.098$; $p = 0.036 < 0.05$), supporting the second hypothesis. This indicates that greater eco-efficiency enhances firm value through more efficient resource utilization, lower operational costs, and reduced environmental impacts. Measured using PROPER ratings and ISO 14001 certification, eco-efficiency reflects a firm's commitment to environmental management. Consistent with Signaling Theory, these practices provide positive signals to investors by reducing information asymmetry and strengthening confidence in the firm's long-term competitiveness and sustainability (Connelly et al., 2011).

The results of this study align with Marini and Herawaty (2024) and Atiningsih and Setiyono (2023), who found that eco-efficiency positively impacts firm value. However, these results differ from those of Kurniasari and Cahyono (2025) and Fitriyani et al. (2025), who found that eco-efficiency did not affect firm value. This difference indicates that the influence of eco-efficiency still depends on the sector, period, sample characteristics, and investor response to environmental information. In this study, eco-efficiency was proven to be a factor that increases firm value because it provides positive signals related to operational efficiency and sustainability, making it increasingly relevant in investor assessments of the company.

Based on the results of the hypothesis testing, carbon emission disclosure has a positive and significant effect on company value with a regression coefficient of 0.257 and a significance value of 0.005 (< 0.05); thus, the third hypothesis is accepted. This means that the higher the level of carbon emission disclosure, the higher the company value. Carbon emission disclosure reflects the company's accountability in conveying information related to environmental impacts, including the amount of emissions, emission sources, and reduction and sustainability strategies. In this study, measurements were conducted using the carbon emission disclosure checklist by Choi et al. (2013) based on the Carbon Disclosure Project, where a higher index indicates more complete information disclosed. According to Stakeholder Theory, this disclosure demonstrates the company's responsibility to various stakeholders, such as investors, the government, and the community, thereby increasing trust,

reputation, and positive perceptions of the company, which ultimately has an impact on increasing company value.

These results align with Rahmasari and Irwansyah (2024) and Kurniasari and Cahyono (2025), who stated that carbon emission disclosure has a positive effect on firm value. However, these results differ from those of Adrizky et al. (2025), who found a negative and significant effect. This difference indicates that the impact of carbon emission disclosure can vary depending on the industry sector, the research period, and stakeholder interpretations. In this study, carbon emission disclosure is perceived as a form of transparency and sustainability commitment that increases investor confidence. Thus, carbon emission disclosure is proven to be an important factor in increasing firm value through increased accountability, reputation, and stakeholder trust.

6. Conclusion

This study finds that renewable energy does not significantly affect company value, indicating that investors may not yet consider such investments a key determinant of firm valuation because their benefits are generally realized over the long term. In contrast, eco-efficiency and carbon emission disclosure have positive and significant effects on company value, suggesting that efficient resource management and transparent environmental reporting enhance investor confidence and market valuation. Simultaneously, the three variables significantly influence company value, although the model explains only a limited proportion of the variation (Adjusted $R^2 = 11.1\%$), indicating that other determinants remain important.

The findings contribute to sustainability accounting literature by demonstrating that different sustainability dimensions have varying impacts on firm value. Practically, companies should strengthen eco-efficiency initiatives and improve the quality of carbon emission disclosure to enhance market value, while regulators are encouraged to reinforce sustainability reporting standards to improve transparency and comparability. Investors should also incorporate environmental performance alongside traditional financial indicators when evaluating firms.

This study is limited to basic materials manufacturing companies listed on the Indonesia Stock Exchange during 2021–2025. It relies on the availability of complete sustainability-related disclosures, reducing the final sample after outlier removal. Moreover, the relatively low explanatory power suggests that many additional factors beyond the variables examined influence company value. Future research should extend the analysis to other industries and longer observation periods to capture the long-term effects of sustainability initiatives. Further studies are also encouraged to incorporate additional variables, such as profitability, leverage, firm size, corporate governance, green innovation, CSR, ESG disclosure, and financial performance, to provide a more comprehensive explanation of company value.

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