

## THE EFFECT OF CARBON EMISSION DISCLOSURE ON FIRM VALUE IN BASIC MATERIALS SECTOR COMPANIES

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### **Abstrak**

Penelitian ini bertujuan untuk menganalisis pengaruh Carbon Emission Disclosure terhadap Nilai Perusahaan pada perusahaan sektor basic materials yang terdaftar di Bursa Efek Indonesia periode 2021–2024. Penelitian ini menggunakan pendekatan kuantitatif dengan data sekunder. Sampel penelitian terdiri atas 87 perusahaan (348 observasi) yang dipilih menggunakan teknik purposive sampling. Analisis data dilakukan menggunakan IBM SPSS Statistics 25 melalui analisis regresi linear sederhana yang dikoreksi dengan transformasi Ln dan prosedur Cochrane-Orcutt untuk mengatasi masalah autokorelasi. Hasil penelitian menunjukkan bahwa Carbon Emission Disclosure berpengaruh negatif dan signifikan terhadap Nilai Perusahaan (Sig. = 0,002), namun daya jelasnya sangat rendah ( $R^2 = 0,027$  atau 2,7%). Temuan ini mengindikasikan bahwa meskipun investor merespons pengungkapan emisi karbon secara negatif, faktor lain di luar Carbon Emission Disclosure jauh lebih berperan dalam menentukan Nilai Perusahaan.

Kata Kunci: Carbon Emission Disclosure, Nilai Perusahaan, Sektor Basic Materials.

### **Abstract**

*This study aims to examine the effect of Carbon Emission Disclosure on Firm Value in basic materials sector companies listed on the Indonesia Stock Exchange during the 2021–2024 period. This study employed a quantitative approach using secondary data. The sample consisted of 87 companies (348 observations) selected through purposive sampling. Data were analyzed using IBM SPSS Statistics version 25 through simple linear regression, corrected using a natural-log transformation and the Cochrane-Orcutt procedure to address autocorrelation. The results indicate that Carbon Emission Disclosure has a negative and statistically significant effect on Firm Value (Sig. = 0.002), although its explanatory power is very low ( $R^2 = 0.027$ , or 2.7%). These findings suggest that while investors respond negatively to carbon emission disclosure, factors beyond Carbon Emission Disclosure play a far greater role in determining Firm Value.*

**Keywords:** Carbon Emission Disclosure, Firm Value, Basic Materials Sector.

## 1. INTRODUCTION

Firm value is an important indicator that reflects investors' perception of a company's performance and the level of shareholder prosperity (Matsumura et al., 2014). In the basic materials sector, firm value fluctuates due to various external and internal factors (Brigham & Houston, 2018). Firm value in this sector is not only influenced by financial factors but also by non-financial factors, particularly those related to environmental issues and corporate sustainability (Hardiyansah & Agustini, 2021).

One non-financial factor that has drawn investor attention is carbon emission disclosure (Hardiyansah & Agustini, 2021). Information on carbon emission disclosure is considered important because it reflects a company's concern for environmental issues and climate-related risk (Kurnia et al., 2021). Environmental disclosure is believed to increase investor trust and strengthen firm value through the implementation of sustainability practices (Eccles et al., 2014). Companies that actively disclose carbon emission information tend to obtain greater legitimacy from their stakeholders.

Previous studies on the effect of carbon emission disclosure on firm value still show inconsistent results. Matsumura et al. (2014) and Hardiyansah & Agustini (2021) found that carbon emission disclosure has a positive effect on firm value, whereas Iskandar & Fran (2016) found a negative effect. This inconsistency indicates that a research gap still exists regarding the relationship between carbon emission disclosure and firm value, so further research is needed.

This relationship can be explained through signaling theory. Signaling theory explains that companies provide signals to investors through disclosed information in order to reduce information asymmetry and increase investor trust (Brigham & Houston, 2018). In this study, carbon emission disclosure is viewed as a signal of a company's commitment to environmental sustainability that is expected to influence firm value.

Production activities in the basic materials sector intensively use energy and natural resources, which contributes to higher greenhouse gas emissions, particularly carbon dioxide (CO<sub>2</sub>) (Hardiyansah & Agustini, 2021). The Financial Services Authority (OJK), through POJK No. 51/POJK.03/2017, requires companies to prepare sustainability reports as a form of environmental and social responsibility (OJK, 2017). In practice, however, the implementation of this policy is not yet optimal, as many companies have not fully disclosed carbon emission

information in their sustainability reports. This condition indicates a gap between regulation, corporate practice, and market response, which forms the basis for conducting this research.

Based on the background above, this study aims to examine the effect of carbon emission disclosure on firm value in basic materials sector companies listed on the Indonesia Stock Exchange during the 2021–2024 period. This study is expected to contribute to the development of environmental accounting literature by providing empirical evidence on the direct relationship between carbon emission disclosure and firm value.

**Hypothesis: Carbon emission disclosure has a significant effect on firm value.**

## 2. METHOD

This study uses a quantitative approach with a causal research design. This design is used to examine the causal relationship between carbon emission disclosure and firm value in basic materials sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2024 period.

The population of this study consists of 96 basic materials sector companies listed on the IDX. The sample was determined using a purposive sampling technique with the following criteria: (1) basic materials companies consistently listed on the IDX during 2021–2024; (2) companies that published complete annual reports throughout the observation period; and (3) companies that disclosed carbon emission information and had complete data related to firm value. Based on these criteria, 87 companies were obtained, resulting in 348 firm-year observations.

This study uses secondary data obtained from annual reports and sustainability reports accessed through the official website of the Indonesia Stock Exchange ([www.idx.co.id](http://www.idx.co.id)) and each company's official website. This research involves two variables: firm value as the dependent variable and carbon emission disclosure as the independent variable.

Firm value is measured using Tobin's Q, formulated as the ratio of the market value of equity plus total debt to total assets. A higher Tobin's Q value indicates that the company has better prospects and greater investor confidence.

Carbon emission disclosure is measured using a disclosure index adopted from Choi et al. (2013), consisting of 18 disclosure items grouped into five categories: Climate Change, Greenhouse Gas Emissions, Energy Consumption, Reduction and Cost, and Accountability of Carbon Emission. Each disclosed item is scored 1, while an undisclosed item is scored 0. The

scores are summed and divided by the total number of items (18) to obtain the Carbon Emission Disclosure Index (CED).

Data were analyzed using IBM SPSS Statistics version 25 through simple linear regression analysis. Prior to hypothesis testing, classical assumption tests were conducted, including normality, heteroscedasticity, and autocorrelation tests. Because the initial model showed a violation of the autocorrelation assumption, the dependent variable was transformed using the natural logarithm (Ln) and the model was re-estimated using the Cochrane-Orcutt procedure, consistent with the remedial approach commonly applied in panel-based accounting research. The regression model used in this study is formulated as follows:

$$Y = \alpha + \beta X + e$$

Where Y is Firm Value,  $\alpha$  is the constant,  $\beta$  is the regression coefficient, X is Carbon Emission Disclosure, and e is the error term. The hypothesis is tested through the t-test and F-test at a 5% significance level, and the coefficient of determination ( $R^2$ ) is used to measure how well the model explains the variation in firm value.

### 3. RESULTS AND DISCUSSIONS

#### Descriptive Statistics

The data used in this study consist of 348 observations from basic materials sector companies listed on the Indonesia Stock Exchange during the 2021–2024 period.

| Variable                   | N   | Minimum | Maximum | Mean   | Std. Deviation |
|----------------------------|-----|---------|---------|--------|----------------|
| Carbon Emission Disclosure | 348 | 0.00    | 0,94    | 0,4369 | 0,26717        |
| Firm Value (Tobin's Q)     | 348 | 0.20    | 7,58    | 1,2639 | 0,95864        |

Source: Processed data, 2026

Carbon Emission Disclosure has a minimum value of 0.00, a maximum value of 0,94, a mean of 0,4369, and a standard deviation of 0,26717. On average, sample companies disclosed less than half of the carbon emission indicators used in this study, indicating that carbon emission disclosure practices in the basic materials sector are still developing and have not been implemented optimally by all companies. Firm Value, measured by Tobin's Q, has a mean of 1,2639, indicating that, on average, the market value of the sample companies exceeds their book value.

#### Classical Assumption Tests

Classical assumption testing on the initial (untransformed) model shows that the residuals are not normally distributed (Kolmogorov-Smirnov statistic = 0,209, Sig. = 0,000) and that

autocorrelation is present (Durbin-Watson = 1,095, below the lower bound dL), although the model is free from heteroscedasticity (Breusch-Pagan test, Sig. = 0,335 > 0,05). Because the autocorrelation assumption was violated, the dependent variable was transformed using the natural logarithm and the model was re-estimated using the Cochrane-Orcutt procedure (estimated  $\rho = 0,570$ ). After this correction, the autocorrelation problem was resolved (Durbin-Watson = 1,930, close to 2 and within the acceptable range), while heteroscedasticity remained absent (Sig. = 0,399 > 0,05). The residual normality assumption was still not fully satisfied after transformation; with a sample size of 347 observations, the Central Limit Theorem provides reasonable justification for proceeding with OLS inference, although this remains a limitation of the study that should be interpreted with caution.

### Regression Analysis

Simple linear regression analysis was used to examine the effect of Carbon Emission Disclosure on Firm Value. Prior to correction, the initial model produced the following result.

| Variable                   | B      | Std. Error | t      | Sig.  |
|----------------------------|--------|------------|--------|-------|
| (Constant)                 | 1,421  | 0,098      | 14,439 | 0,000 |
| Carbon Emission Disclosure | -0,358 | 0,192      | -1,862 | 0,064 |

Source: Processed data, 2026

In the initial model, Carbon Emission Disclosure had a significance value of 0,064 (> 0,05), which would ordinarily be interpreted as not significant. However, because this initial model violates the autocorrelation assumption, its coefficients and significance values are not reliable and cannot be used as the basis for hypothesis testing. The corrected model (Ln-transformed, Cochrane-Orcutt) is presented below and used as the final result of this study.

| Variable                   | B      | Std. Error | t      | Sig.  |
|----------------------------|--------|------------|--------|-------|
| (Constant)                 | 0,090  | 0,031      | 2,859  | 0,005 |
| Carbon Emission Disclosure | -0,325 | 0,106      | -3,068 | 0,002 |

Source: Processed data, 2026

Based on the corrected model, the regression equation is formulated as follows:

$$\text{Ln}(Y)^* = 0.090 - 0.325X^* + e$$

(where  $Y^*$  and  $X^*$  denote the Cochrane-Orcutt transformed dependent and independent variables). The regression coefficient of Carbon Emission Disclosure is -0,325, indicating a negative relationship: a higher level of carbon emission disclosure is associated with a lower firm value.

**F-Test (Simultaneous Test)**

| Model      | df  | F     | Sig.  |
|------------|-----|-------|-------|
| Regression | 1   | 9,410 | 0,002 |
| Residual   | 345 | -     | -     |
| Total      | 346 | -     | -     |

Source: Processed data, 2026

The F-test produces an F-value of 9,410 with a significance value of 0,002 ( $< 0,05$ ), indicating that the regression model is statistically fit, even though its overall explanatory power is limited.

**t-Test and Coefficient of Determination**

The t-test on the corrected model shows that Carbon Emission Disclosure has a significance value of 0,002 ( $< 0,05$ ) with a t-value of -3,068, indicating that Carbon Emission Disclosure has a statistically significant effect on Firm Value. The negative coefficient confirms that the direction of the relationship is negative. Therefore, the hypothesis stating that Carbon Emission Disclosure has a significant effect on Firm Value is accepted. However, the coefficient of determination ( $R^2$ ) is only 0,027, meaning that Carbon Emission Disclosure alone explains merely 2.7% of the variation in Firm Value, while the remaining 97.3% is explained by other factors outside this simplified model. This is markedly lower than the explanatory power obtained when corporate governance (as a moderating variable) and firm size, leverage, and profitability (as control variables) are included in the model, which suggests that those excluded variables account for most of the variation in firm value, and that Carbon Emission Disclosure by itself is a statistically significant but practically weak predictor.

**Discussion**

Carbon Emission Disclosure has a statistically significant negative effect on Firm Value, but the relationship is weak in practical terms, explaining only a small fraction of the variation in firm value. This finding indicates that carbon emission disclosure is one piece of information investors consider when assessing a company, but it is far from the dominant factor; company-specific characteristics such as size, capital structure, and profitability, as well as governance quality, likely play a much larger role, consistent with their strong contribution in the original model that included those variables. Insofar as the effect is significant, a higher level of disclosure is followed by a decline rather than an increase in firm value, suggesting that

investors have not yet fully responded positively to carbon emission information disclosed by companies.

This condition may occur because carbon emission disclosure is still perceived as information related to increasing operational costs. In efforts to reduce carbon emissions, companies must allocate funds for various sustainability programs such as waste management, energy efficiency, and the use of more environmentally friendly technology. The costs incurred for these programs may affect short-term profit, causing some investors to view carbon emission disclosure as an additional burden that has the potential to reduce firm performance.

The characteristics of the basic materials sector also contribute to this result. Companies in this sector generally rely heavily on natural resources, resulting in relatively high carbon emissions compared to other sectors. The wider the scope of carbon emission information disclosed, the greater investor attention to the environmental risks faced by the company, such as potential regulatory sanctions, compliance costs, and other operational risks. This condition may influence investor perception of the company's prospects, thereby reducing firm value.

Referring to signaling theory, carbon emission disclosure is a form of signal that companies provide to investors regarding their commitment to sustainable business practices. However, the results of this study indicate that this signal has not been fully responded to positively by investors, who still consider the economic consequences the company must bear to be more significant than the long-term sustainability benefits.

This finding is consistent with Iskandar & Fran (2016), who found that carbon emission disclosure has a negative effect on firm value, as investors still perceive such disclosure as an indicator of environmental cost burdens. However, this result differs from Matsumura et al. (2014) and Hardiyansah & Agustini (2021), who found a positive effect. These differences are presumably caused by differences in the characteristics of the research object, observation period, capital market conditions, and investors' level of concern for environmental issues in each study.

## **4. CONCLUSIONS**

Carbon Emission Disclosure has a statistically significant negative effect on Firm Value in basic materials sector companies listed on the Indonesia Stock Exchange during the 2021–2024 period. However, when analyzed on its own, without corporate governance as a moderating variable and without firm size, leverage, and profitability as control variables,

Carbon Emission Disclosure explains only about 2.7% of the variation in Firm Value ( $R^2 = 0,027$ ). This indicates that although the direction of the relationship is consistent with the notion that investors respond to carbon emission disclosure as a signal of rising environmental and operational costs, Carbon Emission Disclosure is, by itself, a statistically significant but practically weak predictor of firm value; other factors outside this simplified model, previously captured through control and moderating variables, appear to account for most of the variation in firm value. This study is further limited to the basic materials sector and the 2021–2024 observation period, and the measurement of carbon emission disclosure depends entirely on the completeness of information published in each company's reports, so the results should be interpreted with caution and cannot be generalized to other industry sectors, other periods, or to models that include additional explanatory variables.

## **SUGGESTIONS**

Companies in the basic materials sector are encouraged to improve the quality and transparency of carbon emission disclosure in a more complete and consistent manner in their annual and sustainability reports, while also communicating the long-term benefits of environmental initiatives to investors so that disclosure is not solely perceived as an additional cost burden. Investors are advised not to rely on carbon emission disclosure alone, given its limited explanatory power on firm value, and should instead consider it together with other financial and non-financial information, such as firm size, capital structure, profitability, and governance quality, when assessing a company's long-term prospects. Future researchers are strongly encouraged to reintroduce moderating variables such as corporate governance and control variables such as firm size, leverage, and profitability, since the sharp increase in explanatory power observed when these variables are included suggests they play a substantial role that a simple bivariate model cannot capture. Expanding the research object to other industry sectors and longer observation periods, as well as addressing the residual non-normality identified in this study through alternative estimation methods, is also recommended to obtain more robust and generalizable findings.

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