The Influence of Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital on Firm Value in Coal Mining Companies in Indonesia

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ABSTRACT

This study aims to analyze the significant effects of carbon emission disclosure, corporate social responsibility, and intellectual capital on firm value. The research uses quantitative approach based on secondary data. The population consists of 32 coal companies listed on the Indonesia Stock Exchange. The sampling method uses purposive sampling, which reduced the number of companies studied from 32 to 11 based on predetermined criteria. Data testing was carried out with IBM SPSS Statistics 25 through descriptive statistics, multiple regression analysis, classical assumption tests, simultaneous (F test) and partial (T test) hypothesis testing, and determination coefficient test. The analysis reveals that carbon emission disclosure plays a significant role in determining firm value, with a t-value of 2.023 > t-table of 2.00665. Meanwhile, the corporate social responsibility variable also has a significant effect on firm value, with a t-value of 2.445 > t-table of 2.00665. The intellectual capital variable has a significant effect on firm value, with a t-value of 2.166 > t-table of 2.00665. Simultaneously, the variables of Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital have significant effect on Firm Value, with an F-value of 8.793 > F-table of 2.79 and a significance value of 0.000 < 0.05, with a regression coefficient of 30.2%.

Keywords: carbon emission disclosure, coal mining companies, corporate social responsibility, firm value, intellectual capital.

INTRODUCTION

Particularly, mining companies aim to increase firm value through improved operational performance. However, several efforts often contribute to climate change. Climate change is a major challenge that affects human life (Doğan et al., 2021) and poses a threat to the sustainability of human society (Tol, 2009). The Global Carbon Budget report states that in 2024, countries around the world emitted approximately 37.4 billion metric tons of CO_2 from fossil fuels, an increase of 0.8% compared to 2023 (Global Carbon Budget, 2024). The coal industry is the largest contributor to climate change, accounting for 41 percent of total global emissions annually, according to the Carbon Brief report (Hausfather, 2024). Operational efficiency, long-term sustainability strategies, and increased attention to carbon emissions are driving investors to consider sustainability factors when assessing a company's prospects. Therefore, Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital have the potential to affect firm value (Friedlingstein et al., 2024).

Firm value is often used by investors as a benchmark for assessing the success of a business entity. There are various factors that can influence a company's value (Wahyuni & Silaban, 2022). In the transition era toward a Green Economy, the factors affecting firm value have become more diverse, including demands for environmental accountability. Earlier studies have examined the influence of Carbon Emission

Disclosure, Corporate Social Responsibility, and Intellectual Capital on firm value. However, the results of these studies remain inconclusive.

Among the factors that may shape firm value is carbon emission disclosure. According to Damas et al (2021), Carbon Emission Disclosure has a significant effect on firm value. Transparency through carbon emission reporting increases investor and public trust, generating a positive response toward the company's valuation. However, according to Hariadi & Nurwanda (2024), Carbon Emission Disclosure does not have a significant effect on firm value. Carbon reporting is often viewed as a burden, it requires investment in environmental management and reporting technologies, which can suppress profitability and reduce firm value.

Another factor that may affect firm value is the disclosure of Corporate Social Responsibility. A study conducted by Purnama et al (2020) states that Corporate Social Responsibility disclosure can affect firm value. According to investors, companies that disclose information about their Corporate Social Responsibility activities are perceived to have added value, as it demonstrates their awareness and responsibility for the negative impacts of their operations. However, different results were found in a study by Tenriwaru & Nasaruddin (2020), which concluded that Corporate Social Responsibility disclosure does not affect firm value. This is because these activities and reporting require significant costs, which may reduce the amount of dividends distributed to shareholders.

Last but not least, intellectual capital affects firm value. According to Rega et al (2020), intellectual capital can affect firm value. Increased intellectual capital is considered competitive advantage for companies today as well as an indicator of future growth potential by investors. As result, investors typically attribute greater value to the company's shares, thereby raising the overall firm value. However, contrasting finding was reported by Tarigan et al (2019), in the manufacturing sector studied, company operations still heavily depend on fixed assets. As a result, large expenditures on intangible assets such as intellectual capital tend to be viewed unfavorably by investors and the market, leading to decreased investment interest and lower market valuations of the company.

LITERATURE REVIEW

Carbon Emission Disclosure
Carbon disclosure is defined as a collection of quantitative and qualitative information related to a company's past and projected levels of carbon emissions (Zuhrufiyah & Anggraeni, 2019). The indicators of carbon emission disclosure consist of 18 checklist items Choi et al (2013) that are used as a tool to measure the level of corporate transparency regarding environmental issues. The carbon emission disclosure indicator is expressed in the following equation (Damas et al., 2021):

$$\text{Carbon Emission Disclosure} = \frac{\text{Number of disclosed items}}{\text{Total number of disclosure items}} \times 100\%$$

Corporate Social Responsibility

Corporate Social Responsibility refers to the social responsibilities undertaken by a company toward the public and the surrounding environment, aimed at advancing the economy, improving the community's quality of life, and preserving the environment (Meliawati et al., 2021). The indicators are based on the GRI G4 framework, consisting 91 items, including 9 economic items, 34 environmental items, 16 social items, 12 human rights items, 11 community items, and 9 product responsibility items. Corporate Social Responsibility measurement is carried out by assessing each item disclosed in the company's sustainability report. If an item is disclosed, it is assigned a value of 1; if not disclosed, it is assigned a value of 0. The extent of Corporate Social Responsibility disclosure can be assessed using the following formula (Haniffa & Cooke, 2005):

$$\text{Corporate Social Disclosure Index} = \frac{\sum_{t=1}^{nj} Xij}{nj}$$

Intellectual Capital

Intellectual capital represents the knowledge and intangible skills owned by a company's human resources, which are intangible and can enhance the company's competitiveness and performance. This is based on the knowledge and experience owned, systems and processes, work culture, and management philosophy within the organization (Putra & Fitriasuri, 2023). The measurement involves assessing physical capital, human capital, and structural capital, and can be calculated using the following formula (Pulic, 2000):

$$\text{Value Added Intellectual Coefficient} = VACA + VAHU + STVA$$

VACA = Value Added Capital Coefficient
VAHU = Value Added Human Capital Coefficient
STVA = Structural Capital Value Added

Firm Value

Firm value serves as an indicator of the company's long-term performance and is observable through its stock price, which is determined by supply and demand in the capital market (Putra & Fitriasuri, 2023). Firm value can be assessed through the following equation (Febriani & Munawaroh, 2022):
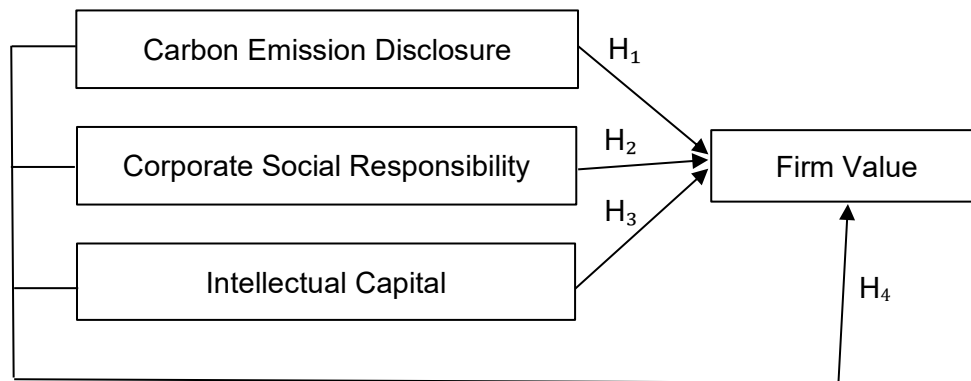
$$Q = \frac{(MVS+D)}{TA}$$

Information:
Q   = Firm Value
MVS   = Market Value of all outstanding Stock
D   = Total Liability
TA   = Total Asset

Figure 1. Conceptual Framework

H_1:   Carbon Emission Disclosure has significant effect on the firm value of coal mining companies in Indonesia.

H_2:   Corporate Social Responsibility has significant effect on the firm value of coal mining companies in Indonesia.

H_3:   Intellectual Capital has significant effect on the firm value of coal mining companies in Indonesia.

H_4:   Carbon Emission Disclosure, Corporate Social Responsibility and Intellectual Capital have significant effect on the firm value of coal mining companies in Indonesia.

RESEARCH METHOD

The data for this study were obtained from the Indonesia Stock Exchange (www.idx.co.id) website and official websites of the sampled companies, which provide the data used in this research. The study was conducted over the period from 2020 to 2024. The data used are quantitative secondary data. The population is the entire research object, while the sample refers to a selected subset of the overall population (Sinaga, 2014). The population in this study comprises 32 coal mining companies subsector listed on the Indonesia Stock Exchange in 2024. This research uses purposive sampling technique, where the sample is selected based on specific criteria (Wahyuni & Silaban, 2022), resulting in a sample size of 11 companies.

Table 1. Sampling Criteria

Informasi	Sum
Coal mining companies listed on the Indonesia Stock Exchange for the period 2020 - 2024	32
Coal mining companies that do not present complete financial reports during the period 2020 - 2024	(6)
Coal mining companies that do not present sustainability reports during the period 2020 - 2024	15
Number of companies selected as research samples	11
Total research samples (11 x 5)	55

The data analysis testing process includes:
1. Descriptive Statistical Test
2. Classical Assumption Tests
    a. Normality Test
    b. Heteroscedasticity Test

     c. Multicollinearity Test
     d. Autocorrelation Test
3. Multiple Linear Regression Analysis
4. Hypothesis Testing
     a. T-Test
     b. F-Test
     c. Coefficient of Determination Test

RESULTS

Descriptive Statistics

Descriptive statistics serves as an important method for describing and analyzing the primary features of the data in a structured manner (Subhaktiyasa et al., 2025).

Table 2. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Carbon Emission Disclosure	55	0.28	0.89	0.7095	0.15747
Corporate Social Responsibility	55	0.19	0.73	0.5584	0.13867
Intellectual Capital	55	-15.84	48.15	4.4935	9.59780
Company Value	55	0.23	2.77	1.2455	0.61772

Source: Processed data results, 2025

The analysis results show that the dataset consists of 55 coal mining companies listed on the Indonesia Stock Exchange during the period from 2020 to 2024. The Carbon Emission Disclosure variable has a standard deviation of 0.15747 and an average value of 0.7095, with a minimum value of 0.28 and a maximum value of 0.89. The Corporate Social Responsibility variable has a standard deviation of 0.13867 and an average value of 0.5584, with a minimum value of 0.19 and a maximum value of 0.73. The Intellectual Capital variable has a standard deviation of 9.59780 and the average value of 4.4935, with the minimum value of -15.84 and the maximum value of 48.15. Meanwhile, the Firm Value variable has standard deviation of 0.61772 and the average value of 1.2455, with the minimum value of 0.23 and the maximum value of 2.77.

Normality Test

The normality test is conducted to determine whether the disturbance or residual variables in the regression model follow a normal distribution (Ghozali, 2016).
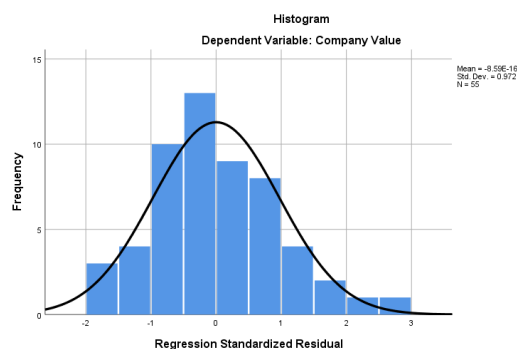
Figure 2. Histogram

Source: Processed data results, 2025

Based on Figure 2 above, The findings show that the data form a curve that is roughly symmetrical about the mean (U). The test indicates that the dataset is normally distributed.
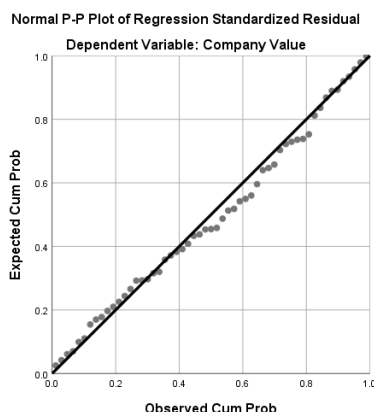
Figure 3. P-Plots
Source: Processed data results, 2025

Based on Figure 3, it can be interpreted that the data points are distributed around the diagonal line and align with its direction. The results confirm that the data exhibit a normal distribution, which is consistent with the results of the histogram test showing that the data follows a normal distribution.

Table 3. Kolmogorov Smirnov

		Unstandardized Residual
N		55
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.50124877
Most Extreme Differences	Absolute	.074
	Positive	.074
	Negative	-.038
Test Statistic		.074
Asymp. Sig. (2-tailed)		.200 [c,d]

Source: Processed data results, 2025

Based on Table 2 above, the results show that the Asymp. Sig. (2-tailed) value is above 0.05, specifically 0.200. This test result indicates that the data is normally distributed.

Heteroscedasticity Test
The heteroscedasticity test seeks to identify whether the regression model's residuals display inconsistent variance across observations. (Ghozali, 2016).
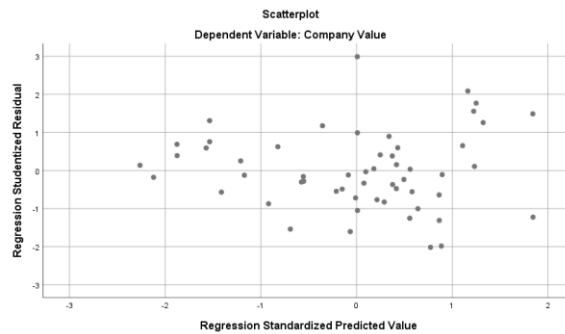
Figure 4. Heteroscedasticity
Source: Processed data results, 2025

Based on Figure 4, The data points appear to spread out on both sides of the Y-axis origin (zero) and do not show any specific pattern. This test result indicates that heteroscedasticity does not occur, meaning homoscedasticity is present.

Multicollinearity Test
A multicollinearity test is used to check whether the independent variables in the model are related to one another (Ghozali, 2016). To identify multicollinearity, the analysis utilizes tolerance values and Variance Inflation Factor (VIF) measurements. Multicollinearity is identified if the tolerance value is ≤ 0.10 and VIF value is ≥ 10.

Table 4. Multicollinearity

Variable	Collinearity Statistics	
	Tolerance	VIF
Carbon Emission Disclosure	0.774	1.292
Corporate Social Responsibility	0.824	1.213
Intellectual Capital	0.932	1.072

Source: Processed data results, 2025

The tolerance values (α) for the variables Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital are greater than 0.10, specifically 0.774, 0.824, and 0.932, respectively. The Variance Inflation Factor (VIF) values for these variables are less than 10, with values of 1.292, 1.213, and 1.072, respectively. These test results indicate that the independent variables do not experience multicollinearity.

Autocorrelation Test
The autocorrelation test is to determine whether the disturbance errors at time t have a relationship with those from the previous period (t–1) in the regression model. (Ghozali, 2016).

Table 5. Autocorrelation Test

Model	Durbin-Watson
1	1.741

Source: Processed data results, 2025

The research results show that the Durbin-Watson (d) value is 1.741. Based on the Durbin-Watson table, the upper bound (dU) is 1.6815 and the lower bound (dL) is 1.4523. Thus, the relationship between d, dL, and dU meets the fifth criterion, which is dU < d < 4 – dU, or 1.6815 < 1.741 < 2.3185. This test finding indicates that there is no positive or negative autocorrelation.

Multiple Linear Regression Analysis

Multiple linear regression analysis is employed to test hypotheses concerning the joint relationship between two or more independent variables and a single dependent variable. (Ghozali, 2016). The following is the multiple linear regression equation used in this study:

Table 6. Multiple Linear Regression Analysis

Type		Unstandardized Coefficients		Standardized Coefficient
		B	Std. Error	Beta
1	(Constant)	-0.321	0.386	
	Carbon Emission Disclosure	1.025	0.507	0.261
	Corporate Social Responsibility	1.363	0.558	0.306
	Intellectual Capital	0.016	0.008	0.255

Source: Processed data results, 2025

Y = a+b1X1+b2X2+b3X3+e

Information:
Y	= Firm Value
X1	= Carbon Emission Disclosure
X2	= Corporate Social Responsibility
X3	= Intellectual Capital
a	= Constant
b1, b2, b3	= Regression Coefficient
e	= Error Rate

Based on Table 5 above, the multiple linear regression analysis equation in this study can be expressed as follows:

Firm Value = -0.321 + 1.025 Carbon Emission Disclosure + 1.363 Corporate Social Responsibility + 0.016 Intellectual Capital + e

The above equation can be explained as follows:
1. The constant (α) of -0.321 indicates that if the values of the variables Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital are 0 (zero) or absent, then the Firm Value variable will decrease by 0.321 units.
2. The regression coefficient (β) for the Carbon Emission Disclosure variable is 1.025, indicating that if the other independent variables remain at 0 (zero) or constant, and Carbon Emission Disclosure increases by 1 unit, the Firm Value variable will increase by 1.025 units.
3. The regression coefficient (β) for the Corporate Social Responsibility variable is 1.363, indicating that if the other independent variables remain at 0 (zero) or constant, and Corporate Social Responsibility increases by 1 unit, the Firm Value variable will increase by 1.363 units.
4. The regression coefficient (β) for the Intellectual Capital variable is 0.016, indicating that if the other independent variables remain at 0 (zero) or constant, and Intellectual Capital increases by 1 unit, the Firm Value variable will increase by 0.016 units.

T-Test

The t-test (partial test) essentially indicates the extent to which an individual explanatory or independent variable affects the variation in the dependent variable (Ghozali, 2016).

Table 7. T-Test

Type		t	Sig.
1	(Constant)	-0.875	0.386
	Carbon Emission Disclosure	2.023	0.048
	Corporate Social Responsibility	2.445	0.018
	Intellectual Capital	2.166	0.035

Source: Processed data results, 2025

In the partial test, the degrees of freedom (df) = sample size (N) – number of independent variables (k) = 55 – 3 = 52, resulting in a t-table value for 55 samples at α = 0.05 of 2.00665. Based on Table 6 above, it can be seen that Carbon Emission Disclosure variable has significant effect on firm value, with t-count value of 2.023, which is greater than the t-table value of 2.00665, and significance value of 0.048, which is less than 0.05. The Corporate Social Responsibility variable also has a significant effect on firm value, as evidenced by a t-count value of 2.445, greater than the t-table value of 2.00665, and significance value of 0.018, less than 0.05. The Intellectual Capital variable also has significant effect on firm value, proven by t-count value of 2.166, greater than the t-table value of 2.00665, and significance value of 0.035, which is less than 0.05.

F-Test

The F-test is employed to assess whether the independent variables collectively exert a significant influence on the dependent variable. (Ghozali, 2016).

Table 8. F-Test

Type		F	Sig.
1	Regression	8.793	0.000[b]
	Residual		
	Total		

Source: Processed data results, 2025

In the F-test, using the degrees of freedom (df) formula = sample size (N) - total number of variables (k) = 55 - 4 = 51, the F-table value for 55 samples at α = 0.05 is 2.79. Based on Table 6 above, it can be seen that the variables Carbon Emission Disclosure, Corporate Social Responsibility, Intellectual Capital simultaneously have significant effect on Firm Value. The calculated F-value is 8.793, which is greater than the F-table value of 2.79, with a significance value of 0.000, which is less than 0.05.

Coefficient of Determination Test

The coefficient of determination essentially shows how much of the variation in the dependent variable is explained by the independent variable (Ghozali, 2016).

Table 9. Coefficient of Determination Test

Type	R	R Square	Adjusted R Square

| 1 | 0.584[a] | 0.341 | 0.302 |

Source: Processed data results, 2025

Based on Table 8 above, the Adjusted R Square value is 0.302 or 30.2%. This means that 30.2% of the variation in Firm Value can be explained by the variables Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital. The remaining 69.8% of the variation in firm value is attributable to other factors not included in this study, such as Eco-efficiency, Green Innovation, Green Investment and Governance Mechanisms.

DISCUSSION

Carbon Emission Disclosure on Firm Value
Based on the partial test results, it shows that Carbon Emission Disclosure has significant effect on firm value. Accordingly, H1 is considered to be accepted. This result is consistent with the previous study by Damas et al (2021), which found that Carbon Emission Disclosure has a significant effect on firm value. Transparency through Carbon Emission Disclosure enhances investor and public trust, thereby generating a positive response toward firm value.

Corporate Social Responsibility on Firm Value
Based on the partial test results, it shows that Corporate Social Responsibility has significant effect on firm value. Accordingly, H2 is considered to be accepted.This result is consistent with the previous study by Purnama et al (2020), which stated that the disclosure of Corporate Social Responsibility can influence firm value. According to investors, companies that disclose information regarding Corporate Social Responsibility activities are perceived as having added firm value.

Intellectual Capital on Firm Value
Based on the partial test results, it shows that Intellectual Capital has significant effect on firm value in coal mining companies in Indonesia. Accordingly, H3 is considered to be accepted. This result is consistent with the previous study by Rega et al (2020), which found that Intellectual Capital can influence firm value.

Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital on Firm Value
The results of this study indicate that Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital have significant effect on firm value. Based on the simultaneous test results of the three variables, it can be concluded that H4 is accepted. These findings are consistent with previous studies, which state that the combination of Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital plays an important role in enhancing firm value (Adawiyah & Sari, 2025; Azhari & Hasibuan, 2023; Febriani & Munawaroh, 2022; Gantino & Alam, 2020; Purnama et al., 2020; Yuliandhari et al., 2023).

CONCLUSION

The results of the study show that Carbon Emission Disclosure has significant effect on firm value, the Corporate Social Responsibility has significant effect on firm value, and the Intellectual Capital also has significant effect on firm value. Simultaneously, Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital have a significant effect on the firm value of coal mining companies in Indonesia. The results of the coefficient of determination test indicate that the relationship between firm value and the variables of Carbon Emission Disclosure, Corporate Social Responsibility, and Intellectual Capital can be explained. Furthermore, there are other factors not addressed

in this study, such as eco-efficiency, green innovation, green investment, and governance mechanisms, which may also play a role in influencing firm value.

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