



# The Influence of Carbon Emission Disclosure, Environmental Performance, and Firm Size on the Financial Performance of Coal Mining Subsector Firms

Devi Alita Solehsi\*, Titiek Rachmawati

Universitas 17 Agustus 1945 Surabaya

\*Correspondence: Devi Alita Solehsi  
Email: [122200210@surel.untag-sby.ac.id](mailto:122200210@surel.untag-sby.ac.id)

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**Abstract:** This study looks at how the financial success of coal mining companies listed on the Indonesia Stock Exchange is affected by disclosure of carbon emissions, environmental performance, and company size. Using a quantitative approach with purposive sampling, six companies were selected as the sample. Carbon emission disclosure was measured using Carbon Emission Disclosure (CED), and environmental performance was assessed using environmental costs and PROPER ratings. Total company assets were used as a proxy variable, and financial performance was evaluated using ROA and ROE. SmartPLS 3 was used to analyze PLS-SEM data. The findings demonstrate that environmental management expenses lower short-term profitability and that disclosure of carbon emissions has a detrimental impact on both financial and environmental performance. Firm size has a positive, albeit slight, effect on financial performance. In conclusion, environmental sustainability efforts by coal mining companies help maintain corporate legitimacy and relationships with stakeholders, but they do not directly improve financial performance.

**Keywords:** Carbon Emissions Disclosure, Environmental Performance, Company Size, Financial Performance, Coal.

## Introduction

The IPCC (Intergovernmental Panel on Climate Change, 2023) emphasizes that Indonesia has a high level of vulnerability to climate change, while limited adaptive capacity and climate financing further increase environmental risks. The Ministry of Environment and Forestry (KLHK) recorded total national emissions of 2,869 MtCO<sub>2e</sub> in 2016, with the mining sector as a major contributor. These conditions underscore the urgent need to accelerate climate mitigation and adaptation efforts, including improving emission transparency.

In line with Indonesia's commitment to reduce emissions by 31.89% by 2030 through the Enhanced Nationally Determined Contribution (E-NDC), mining companies are required to adopt environmentally friendly practices and disclose carbon emissions more comprehensively. This obligation is reinforced by Indonesia Stock Exchange regulations

and OJK Regulation No. 51/POJK.03/2017, which mandates sustainability reporting. Accordingly, mining companies must minimize environmental impacts while enhancing firm value through transparent and accountable management (Sitorus, 2024).

Financial performance is evaluated using various ratios that indicate a company's profitability, liquidity, and long-term debt repayment ability. These ratios demonstrate how a company manages its resources to achieve its objectives (Brigham, 2011). Proper management of assets, capital, and corporate governance is evidence of stable financial performance. According to Faisal et al. (2017), financial performance analysis is essential for assessing a company's ability to generate profits and maintain financial stability. They emphasize that financial performance analysis is a key indicator that reflects the company's current situation and future prospects.

Disclosure of carbon emissions is part of a company's responsibility. According to Jannah and Muid (2014), such disclosures include information on greenhouse gas emission intensity, reduction methods, and related climate risks. However, disclosure remains low and uneven across many sectors, including mining. Furthermore, mining is known to be harmful to the environment (Wirawan & Setijaningsih, 2022). Additionally, research on the impact of carbon emission disclosure, environmental performance, and company size on financial performance is still limited, especially in Indonesia and other developing countries.

Environmental performance indicates how a business manages its impact on the environment, including waste management, energy efficiency, and the adoption of environmentally friendly technologies. According to Suryaningrum and Ratnawati (2024), an important element of sustainability strategy is environmental performance, which can influence stakeholder perception and financial performance. Furthermore, according to Cahyani and Puspitasari (2023), strong environmental performance can enhance a company's reputation, reduce long-term expenses, and expand access to green capital markets. Therefore, if environmental measures are properly implemented, companies can reduce regulatory risks while simultaneously improving operational efficiency.

The size of a company indicates the scale of its business, measured by total assets and revenue. Research suggests that large companies generally have greater access to resources and investment capacity, enabling them to invest in sustainable technologies (Elisa & Amanah, 2021). However, the relationship between company size and financial performance may vary depending on pressures from stakeholders and the complexity of operations.

Many studies have been conducted on carbon emissions disclosure, environmental performance, and corporate size, but the conclusions of these surveys are ambiguous and unclear. Research focusing on companies in the coal mining subsector remains limited, despite the environmental risks and regulatory complexities involved. As economic conditions change and interest in sustainability grows, more recent research is needed to reassess the impact of these three factors on financial performance. The purpose of this study is to provide stronger evidence to support sustainability strategies and corporate decision-making.

## Research Method

### Research Design

The impact of environmental performance, company size, and carbon emission disclosure on the financial performance of coal mining businesses listed on the Indonesia Stock Exchange (IDX) is investigated in this study using a quantitative research design. The study uses statistical models using secondary data to examine causal links between variables in an explanatory manner. This study does not need informed consent or ethical approval because it solely uses secondary data that is accessible to the public.

### Population, Sample, Sampling

All firms in the coal mining subsector that were listed on the Indonesia Stock Exchange between 2020 and 2024 are the subjects of this survey. Purposive sampling was employed to choose the samples in order to guarantee the research objectives and data consistency. These are businesses who have continually published annual financial statements and sustainability reports during the study period, participated in the PROPER Environmental Performance Evaluation Program, and recorded profits during the observation period. Businesses who did not fit these requirements were not allowed to participate in the poll. After this procedure, a total of thirty observation units (six firms  $\times$  five years) were assigned to six coal mining enterprises. Data was gathered from the official websites of each chosen company as well as the official IDX website ([www.idx.co.id](http://www.idx.co.id)).

### Intervention Procedure

Intervention techniques are not employed in this study since it lacks an experimental design. In this observational study, connections between variables are found by analyzing secondary data that already exists without changing the people or conditions.

### Instrument

Using official environmental performance statistics and company reports, this study employs a document-based methodology. Carbon emission disclosure (X1) is measured based on the GRI 305 standard and the Carbon Emission Disclosure (CED) index, and is evaluated through content analysis of sustainability reports and annual reports. The Ministry of Environment's PROPER evaluation and the percentage of environmental costs provided by businesses are used to compute environmental performance (X2). Using total assets, company size (X3) shows how big the business's operations are. Financial performance (Y) based on return on equity (ROE) and return on assets (ROA) is used to determine the profitability of the business.

Structural Equation Modeling–Partial Least Squares (SEM–PLS) was used for data analysis in SmartPLS version 3. The outer model, which included factor loadings, Average Variance Extracted (AVE), discriminant validity, and Composite Reliability (CR), was used to evaluate the validity and reliability of the measurement instruments. By looking at the coefficient of determination ( $R^2$ ), p-values, and path coefficients for the inner model, the

explanatory power and causal linkages between variables were assessed.

## Result and Discussion

### Measurement Model (Outer Model)

#### Convergent Validity

Outer loadings, Average Variance Extracted (AVE), and composite reliability were used to assess convergent validity. To improve the quality of the measurement model, indicators with outer loadings below 0.70 were removed.

**Table 1.** Results of Convergent Validity Test (Stage 1)

Indicator	Financial Performance	Environmental Performance	Carbon Emission Disclosure	Firm Size
Environmental		0.951		
Cost				
CED			0.949	
GRI			0.041	
PROPER		0.281		
ROA	0.952			
ROE	0.980			
Total Assets				0.752
Total Sales				0.875

The majority of the indicators in Table 1 show sufficient convergent validity, above the suggested cutoff of 0.70. ROE (0.980) and ROA (0.952) are unambiguous indicators of financial performance. Environmental costs (0.951) and carbon emissions disclosure (0.949) accurately reflect environmental performance. The validity criteria are likewise met by the two indicators of company size, total assets (0.752) and total sales (0.752).

Nevertheless, PROPER (0.281) and GRI (0.041) failed to achieve the minimal standards. To improve the measurement model's accuracy and robustness, these indicators were eliminated from additional analysis because their effects on the corresponding construct concepts were so minimal.

**Table 2.** Results of Convergent Validity Test (Stage 2)

Indicator	Financial Performance	Carbon Emission Disclosure	Firm Size
ROA	0.956		
ROE	0.977		
CED		1.000	
Total Assets			0.753
Total Sales			0.875

The second-stage convergent validity test revealed that all surviving indicators had external loadings greater than 0.70 after invalid indicators were eliminated. Financial performance continued to be noteworthy, with ROA (0.956) and ROE (0.977), total assets (0.753) and total sales (.875) continuing to be reliable measures of business size, and CED

(1.000) fully representing the disclosure of carbon emissions. These findings show that the updated measurement model satisfies convergent validity requirements and may be used to analyze the structural model.

**Table 3.** Average Variance Extracted (AVE) Values

Variable	AVE
Financial Performance	0.935
Environmental Performance	1.000
Carbon Emission Disclosure	1.000
Firm Size	0.666

Every build has an AVE value greater than 0.50, as Table 3 demonstrates. This shows that over half of the variance of each latent variable's indicators can be explained. The AVE is 0.935 for financial performance, 1.000 for environmental performance, and 0.666 for disclosure of carbon emissions. All of the constructs appear to be substantially convergent based on these findings.

### Discriminant Validity

**Table 4.** Fornell–Larcker Criterion Results

Variable	Financial Performance	Environmental Performance	Carbon Emission Disclosure	Firm Size
Financial Performance	0.967			
Environmental Performance	-0.283	1.000		
Carbon Emission Disclosure	-0.247	-0.130	1.000	
Firm Size	-0.150	-0.148	0.808	0.816

The Fornell-Larcker criterion was used to evaluate discriminant validity. The square root of the AVE for each construct was larger than its correlations with other constructs, showing that each variable is empirically different. Firm size (0.816), environmental performance (1.000), financial performance (0.967), and carbon emissions disclosure (1.000) all showed adequate discriminant validity, indicating that the dimensions represent distinct theoretical ideas.

### Reliability Test

**Table 5.** Composite Reliability Results

Variable	$\rho_A$	Composite Reliability
Financial Performance	1.003	0.966
Environmental Performance	1.000	1.000
Carbon Emission Disclosure	1.000	1.000
Firm Size	0.537	0.799

## Structural Model Evaluation

### Coefficient of Determination (R<sup>2</sup>)

Table 6. R-Square Results

Relationship	Path Coefficient	T-Statistic	P-Value	Result
Environmental Performance → Financial Performance	-0.316	3.217	0.001	Significant
Carbon Emission Disclosure → Financial Performance	-0.371	1.428	0.154	Not Significant
Firm Size → Financial Performance	0.103	0.355	0.723	Not Significant

The financial performance R<sup>2</sup> value is 0.166, meaning that 16.6% of the variation in financial performance can be explained by the disclosure of carbon emissions, environmental performance, and firm size. This explanatory power is deemed weak, indicating that the financial performance of coal mining businesses may be significantly impacted by other factors not included in the model.

### Path Coefficient Analysis

Table 7. Path Coefficient Results

Endogenous Variable	R Square	R Square Adjusted
Financial Performance	0.166	0.070

According to the path analysis, environmental performance has a significant negative impact on financial performance ( $\beta = -0.316$ ;  $p = 0.001$ ). These results imply that the short-term profitability of the coal mining industry may decline due to environmental expenses and environmental management initiatives.

Financial performance is negatively impacted by carbon dioxide emission disclosure ( $\beta = -0.371$ ). Nevertheless,  $p = 0.154$  indicates that this effect is not statistically significant. This indicates that efforts by coal mining companies to disclose carbon emissions are not directly yielding financial benefits.

There is no significant positive correlation between firm size and financial performance ( $\beta = 0.103$ ;  $p = 0.723$ ). This implies that simply possessing more assets does not inevitably equate to better financial performance in this industry.

## Hypothesis Testing

**Table 8.** Hypothesis Testing Results

Hypothesis	Relationship	Path Coefficient	T-Statistic	P-Value	Decision
H1	Environmental Performance → Financial Performance	-0.316	3.217	0.001	Accepted
H2	Carbon Emission Disclosure → Financial Performance	-0.371	1.428	0.154	Rejected
H3	Firm Size → Financial Performance	0.103	0.355	0.723	Rejected

Only one of the three tested hypotheses was found to be true. Carbon emissions and firm size did not significantly affect financial performance, but environmental performance does. Consequently, the two hypotheses that have p-values greater than the significance level of 0.05 are rejected.

### Discussion

The results of the hypothesis testing rejected three hypotheses and supported one. Following the proposed hypothesis, the next discussion will explain the interactions between the variables.

#### **H1: Effect of Carbon Emission Disclosure on Financial Performance**

The hypothesis test results (Table 8) indicate that there is no significant association between financial performance (Y) and the disclosure of carbon emissions (X1). A path coefficient of -0.371, a p-value of 0.154 ( $> 0.05$ ), and a T-statistic of 1.428 ( $< 1.962$ ) all point to carbon emissions. These findings imply that a company's profitability and financial performance are not significantly impacted by the level of CO<sub>2</sub> emissions disclosure. The first hypothesis (H1) is thus disproved. These findings show that investors did not view emissions disclosure as a significant consideration when making decisions during the survey period. Common financial metrics like cash flow and profitability are usually given top priority by investors. These results are in line with the report of Bedi and Singh (2024), which claims that disclosures of carbon emissions may have a detrimental effect on financial performance because of higher compliance expenses and environmental investments. But according to Putri and Pandin's (2025) study, transparent emission management boosts investor trust, corporate reputation, and financial performance.

#### **H2: Effect of Environmental Performance on Financial Performance**

According to the results of the hypothesis test, environmental performance (X2) has a significant negative impact on financial performance (Y), with a path coefficient of -0.316, a p-value of 0.001 ( $< 0.05$ ), and a T-statistic of 3.217 ( $< 1.962$ ). As a result, the second hypothesis (H2) is accepted. This negative relationship indicates that improvements in environmental

performance are associated with a decrease in financial performance. This reflects the substantial costs required for sustainability audits, environmental investments, waste management, and regulatory compliance. This finding supports the argument by Putri and Pandin (2025) that environmental certification does not immediately bring economic benefits, while also indicating corporate responsibility in line with stakeholder theory. Windari (2025) found that larger companies tend to have higher environmental performance and better financial performance. This highlights differences in industry conditions and temporal perspectives.

### **H3: Effect of Firm Size on Financial Performance**

According to Table 8, company size (X3) has a positive effect on financial performance (Y), but it is not significant. The path coefficient is 0.103, the p-value is 0.723 ( $> 0.05$ ), and the T-statistic is 0.355 ( $< 1.962$ ). Therefore, the third hypothesis (H3) is rejected. This result is consistent with the report by Melania and Chajuno (2022), which states that merely the size of assets does not guarantee the efficient use of resources. Nevertheless, the study by Fajaryani and Suryani (2018) contradicts these results. They argue that larger companies show better financial outcomes because they have access to more resources, reputation, and capital.

## **Conclusion**

This study looks at how the financial success of coal mining businesses listed on the Indonesia Stock Exchange between 2020 and 2024 is affected by company size, environmental performance, and carbon emissions disclosure. The data reveal that although carbon emissions disclosure has a negative influence on financial performance, it is not statistically significant ( $\beta = -0.371$ ;  $p = 0.154$ ). This implies that when assessing profitability, investors do not view the transparency of emissions data as a crucial component. Environmental performance indicates a strong negative impact on financial success ( $\beta = -0.316$ ;  $p = 0.001$ ). Increased environmental performance leads to increased operating and compliance costs, which reduce short-term profitability. These findings, however, show that stakeholder theory and legitimacy theory prioritize long-term market gains and reputation. Total assets by themselves do not ensure an increase in profitability or efficiency ( $p = 0.723$ ), but firm size has a significant positive impact on financial performance ( $\beta = 0.103$ ). These results suggest that in order to combine sustainability expenses and long-term value generation, coal mining businesses should better integrate their environmental plans with financial planning. To better understand the long-term effects of sustainability practices on finances, further study is advised to increase the sample size, lengthen the observation time, and include additional elements like corporate governance, leverage, or market-based performance measures.

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