The Effect of Profitability, Firm Size and Leverage on Carbon Emission Disclosure

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Abstract. This study examines the influence of profitability, company size and leverage on carbon emission disclosure in transportation & logistics sector companies and basic materials sub-sectors of the forestry sub-sector listed on the Indonesia Stock Exchange for the period 2022-2024. This study uses a quantitative approach and purposive sampling techniques. The data used in this study is secondary data in the form of annual reports and sustainability reports. The sample of this study amounted to 24 companies with sampling using the purposive sampling method. The data analysis in this study used multiple linear regression with the help of SPSS. The results of this study show that profitability does not effect on carbon emission disclosure, company size has a significant positive effect on carbon emission disclosure and leverage does not effect on carbon emission disclosure.

Keywords: Profitability, Firm Size, Leverage, Carbon Emission Disclosure

INTRODUCTION

Sustainability issues are increasingly a major concern in modern business practices, as global awareness of the environmental impacts arising from a company's operational activities increases. Global pressure on the implementation of sustainability-oriented business practices encourages companies to contribute to the achievement of the *Sustainable Development Goals* (SDGs), especially SDG 13, which emphasizes the importance of concrete action in dealing with climate change and maintaining a balance between economic growth, environmental sustainability, and community welfare. One of the company's commitments to this issue is the disclosure of carbon emissions, which contains information related to the volume of greenhouse gas emissions, mitigation strategies, and energy efficiency efforts[1].

The need to disclose carbon emissions is becoming increasingly relevant with the increase in global temperature every year. The *Copernicus Climate Change Service* (C3S) report notes that the global average temperature in 2023 will increase by 1.48°C, and in 2024 will reach 15.10°C or 1.60°C higher than the pre-industrial average temperature of 1850–1900[2]. This increase is largely due to the release of carbon dioxide (CO_2) from the burning of fossil fuels such as coal, petroleum, and natural gas[3]. Global warming has a significant impact on the environment, ranging from changes in climate patterns, species extinction, to decreased agricultural productivity[4].

Countries have responded to this threat through international agreements such as the Paris Agreement produced at COP21 in 2015, which sets a target to limit global temperature rise to below 2°C and ideally 1.5°C. This commitment was strengthened through COP26 in 2021 with the Glasgow Climate Pact which encourages the achievement of net zero emissions by 2060 [5]. Indonesia itself has set a target to reduce greenhouse gas emissions by 31.89% independently and 43.20% with international support by 2030 through *the Nationally Determined Contribution* (NDC) as stipulated in Presidential Regulation Number 98 of 2021 [6].

However, Indonesia's greenhouse gas emissions are still high. In 2021 the amount reached 1,710 million tons of CO_2e, an increase from 1,596 million tons of CO_2e in 2020 [6]. In response, the Financial Services Authority (OJK) through SEOJK No. 16 of 2021 requires public companies whose activities have a direct impact on the environment to disclose greenhouse gas emissions in their annual report or sustainability report [7].

Data for 2022–2024 shows that the average disclosure of carbon emissions by companies in the Transportation & Logistics and *Basic Materials sector* of the Forestry sub-sector on the Indonesia Stock Exchange has increased from 26% (2022) to 38% (2024). Despite the positive trend, this level of disclosure is still relatively low, so it does not reflect the company's strategic priorities in environmental transparency. In fact, these two sectors have a significant contribution to total national emissions: the transportation sector produces around 81.08 million tons of CO_2e in 2024, while the forestry sector contributes 86.5 million tons of CO_2e [8].

Research on the factors that affect the disclosure of carbon emissions shows mixed results (*research gap*). Ferdinand et al. (2021) found that profitability has an effect on the disclosure of carbon emissions, while Claudia & Halik (2024) found the opposite. The size of the company was also reported to be affected by Indah et al. (2025), but it had no effect according to Kencana et al. (2024). Similarly, leverage has been shown to be influential (Sukmawati & Henny, 2024) but it has also been found to have no effect (Fransisca & Aryanti, 2024).

Based on this phenomenon, this study aims to analyze the influence of profitability, company size, and leverage on carbon emission disclosure in companies in the Transportation & Logistics sector and *Basic Materials* sub-sector Forestry sector listed on the Indonesia Stock Exchange for the 2022–2024 period. This research is expected to contribute to the development of literature and become a reference for stakeholders in encouraging transparency and accountability of the company's environmen.

METHODS

A. Research Design

The type of research used is quantitative descriptive and influencing research. Quantitative research is research that can be completed by statistical calculations, while descriptive research is research conducted to find out the value of each variable. Influence research is a commonly used method to analyze causal relationships between two or more variables. This method aims to provide an overview of variables such as profitability, company size and leverage and their influence on carbon emissions disclosure [9].

B. Population and Sample

Population refers to the entire group consisting of objects or subjects that possess certain characteristics and qualities to be studied [10]. The population in this research consists of companies in the transportation & logistics sector and the basic materials sector (forestry sub-sector) listed on the Indonesia Stock Exchange (IDX) during the 2022–2024 period, totaling 49 companies. The research sample consists of 24 companies that meet the sampling criteria determined by the researcher. The sampling criteria are as follows:

1. Companies in the transportation & logistics sector and the basic materials sector (forestry sub-sector) listed on the IDX during the 2022–2024 period.
2. Companies in the transportation & logistics sector and the basic materials sector (forestry sub-sector) that publish Annual Reports or Sustainability Reports either on the IDX website or on the official company websites during 2022–2024
3. Companies in the transportation & logistics sector and the basic materials sector (forestry sub-sector) that recorded profits during the 2022–2024 period
4. Companies in the transportation & logistics sector and the basic materials sector (forestry sub-sector) that explicitly or implicitly disclose carbon emissions, with at least one policy related to carbon emissions during the 2022–2024 period.

C. Data Source and Type

The data used in this study are obtained from financial statements for 2022–2024 of energy sector companies listed on the IDX, accessed through the IDX official website and the companies' websites. This study uses secondary data, which refers to data collected from various written sources [11].

D. Data Collection Technique

This study applies the documentation method, which involves collecting data from documents, archives, and other written materials [12]. The data include financial statements, annual reports, journal articles, literature, and other relevant sources to support the research analysis.

E. Data Analysis Method

Multiple linear regression using SPSS, with steps including: (1) Descriptive statistics (mean, min, max, SD), (2) Classical assumption tests: normality (Kolmogorov-Smirnov), multicollinearity (VIF), autocorrelation (Durbin-

Watson), heteroscedasticity (Glejser), (3) Regression analysis to assess effects of firm size, profitability, public share ownership, and leverage on IFR disclosure, (4) Hypothesis tests: F-test, t-test, and R^2.

RESULTS AND DISCUSSION

A. Sample Overview

The study examines 49 transportation & logistics sector and the basic materials sector (forestry sub-sector) sector companies listed on the Indonesia Stock Exchange (IDX) during 2022–2024. Using purposive sampling based on criteria such as having an official website, publishing IFR-based financial information, and reporting positive net income, a total of 24 companies were selected, resulting in 72 firm-year observations.

B. Descriptive Statistics

Descriptive statistics summarize the characteristics of each variable, including profitability, firm size, leverage, and carbon emission disclosure, as presented in **Table 1**.

Tabel 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Profitabilitas	72	.00	.28	.0638	.06117
Ukuran Perusahaan	72	24.33	32.83	27.9340	2.17942
Leverage	72	.02	1.21	.4611	.24823
Pengungkapan Emisi Karbon	72	.06	.72	.3400	.16080
Valid N (listwise)	72				

C. Classical Assumption Tests

All classical assumption tests were satisfied: (1) Normality test: residuals normally distributed ($p > 0.05$), (2) Multicollinearity: no indication (Tolerance > 0.10, VIF < 10), (3) Autocorrelation: none detected (Durbin–Watson = 1.358), (4) Heteroskedasticity: none detected ($p > 0.05$ for all variables).

D. Regression Analysis

Multiple linear regression results summarize the effects of profitability, firm size, leverage, and carbon emission disclosure, as presented in **Table 2**.

Tabel 2 Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.581	.227		1	(Constant)
Model	Profitabilitas	-.122	.289	-.046	4.367	Profitabilitas
	Ukuran Perusahaan	.033	.008	.452	3.333	Ukuran Perusahaan
	Leverage	-.006	.071	-.009	2.484	Leverage
	Unstandardized Coefficients	Standardized Coefficients		t	Sig.	Model	Unstandardized Coefficients

E. Model Feasibility Test (F-Test)

The F-test was performed to assess the simultaneous significance of the independent variables in explaining carbon emission disclosure. Table 3 shows the results.

Table 3 F-Test

Model			F	Sig.
1	Regression		5952	.001[b]
	Residual			
	Total			

F. Hypothesis Testing Results

Hypothesis testing in this study was conducted using partial t-tests in the multiple linear regression model. The results show that profitability, measured using Return on Assets (ROA), obtained a t-value of 0.422 < 1.667 with a regression coefficient of -0.122 and a significance level of 0.674 > 0.05, indicating that profitability has no significant effect on carbon emission disclosure. Firm size, measured using the natural logarithm of assets, obtained a t-value of 4.187 > 1.667 with a regression coefficient of 0.033 and a significance level of 0.000 < 0.05, meaning that firm size has a positive and significant effect on carbon emission disclosure. Meanwhile, leverage, measured using the Debt to Asset Ratio (DAR), obtained a t-value of -0.084 < -1.667 with a regression coefficient of 0.103 and a significance level of 0.933 > 0.05, showing that leverage has no significant effect on carbon emission disclosure.

CONCLUSIONS

This study concludes that profitability has no significant effect on carbon emission disclosure, indicating that the level of profitability does not influence the extent of disclosure because companies that generate profits tend to focus more on maintaining financial performance stability. Firm size has a positive and significant effect on carbon emission disclosure, meaning that the larger the company, the wider the disclosure of carbon emissions. This is due to the greater involvement of stakeholders with diverse preferences related to environmental responsibility, which increases the pressure on companies to disclose carbon emissions. Meanwhile, leverage has no significant effect on carbon emission disclosure, implying that debt-based funding is generally prioritized for operational needs that directly impact financial performance rather than for sustainability activities such as carbon emission disclosure.

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