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Greenhouse Gas Emission Disclosure and Firm Size on Operational Performance

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Abstract

This study examines the impact of greenhouse gas emissions (GHG) and firm size on operational performance. The sample was selected using purposive sampling, focusing on manufacturing companies that disclose their GHG emissions. Data was analyzed from 37 companies over a three-year period, specifically from 2019 to 2021. Multiple regression analysis was performed using SPSS version 26. The findings indicate that disclosing greenhouse gas emissions does not significantly affect operational performance; however, the size of the company does have an impact. This study contributes to the existing literature and provides valuable insights for stakeholders making decisions based on these findings.

Keywords: Greenhouse Gas Emissions (GHG), Gross Margin (GM), Firm Size (FS)

INTRODUCTION

Climate change is increasingly evident, with the UNEP report noting an annual rise in the Earth's temperature of 1.5 degrees Celsius (Bedi & Singh, 2024). This warming is causing significant changes to the environment. One contributing factor to global warming is the thinning of the ozone layer, which reduces its ability to block harmful ultraviolet rays. The release of hazardous substances, especially greenhouse gas emissions, is a major cause of this thinning. These emissions primarily originate from manufacturing industries and activities such as forest burning.

Indonesian companies, particularly those in the manufacturing sector, have started to disclose their greenhouse gas emissions as a sign of environmental concern. However, during 2019 many companies still had not disclosed this information; research indicated

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that only 37 companies had reported their greenhouse gas emissions. Since the introduction of sustainable reporting, there has been an increase in this type of disclosure. Environmental awareness continues to grow, reflecting the concept of the triple bottom line, where companies are expected not only to pursue profit but also to care for society (people) and the environment (planet). Elkington, (2013)

Researchers have extensively studied the disclosure of greenhouse gas emissions, particularly to its impact on profitability and financial performance. . (J. H. Lee & Cho, 2021;Siddique et al., 2021; Al-Mari & Mardini, 2024) A positive relationship between carbon emission disclosure and financial performance suggests that companies can reap economic benefits, such as enhanced reputation, increased customer loyalty, reduced regulatory risk, and a broader investor base.Busch & Lewandowski, (2018) In contrast, research conducted in India has shown that the disclosure of greenhouse gas emissions can have a significant negative effect on financial performance.Desai et al., (2021)

Nevertheless, there is a scarcity of research linking greenhouse gas emissions disclosure with profitability in terms of sales or operational performance. According to Van Horne & Wachowicz (2008), profitability can be assessed based on investment and sales. Profitability derived from sales reflects operational performance. Additionally, company size can significantly impact operational performance. A larger company with substantial assets has greater negotiating power with suppliers, allowing it to secure goods and services needed for its manufacturing process at lower costs, which enhances operational performance.

While most studies confirm a link between company size and financial performance, very few focus on operational performance. Therefore, this study aims to investigate the relationship between greenhouse gas emissions disclosure, firm size, and operational performance.

THEORY REVIEW AND METHODOLOGY

Stakeholder Theory

Stakeholder Theory emphasizes a company's responsibility to its stakeholders. Stakeholders have a vested interest in the disclosure of greenhouse gas emissions, particularly in terms of environmental sustainability and the impact on the global community. Epstein & Freedman 1994; Davila, 2024) They can also play a supervisory role or intervene to prevent negative corporate behavior. For instance, investors may choose not to invest in companies lacking environmental awareness, creditors may

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refuse to provide loans, governments may withhold operating permits, consumers may decline to purchase products, and suppliers may opt not to provide raw materials.

Greenhouse Gas Emissions Disclosure.

The disclosure of greenhouse gas emissions is founded on the triple bottom line concept, which states that companies should focus not only on maximizing profits but also on their responsibilities to society (people) and the environment (planet). This approach was highlighted in the Kyoto Protocol of 1997. In this study, CDP uses three scopes for emissions reporting: Scope 1 pertains to direct emissions, while Scope 2 and Scope 3 refer to indirect emissions. Scope 2 accounts for indirect emissions from purchased electricity, and Scope 3 includes all other indirect emissions. The CDP categorizes these disclosures into five areas, encompassing a total of 18 specific indicators. Bae Choi et al., (2013) For more details, please refer to Attachment 1.

Size Firm

The size of a company is determined by its total assets, calculated using the natural logarithm of total assets.(Ferris et al., 2013).

Company Operational Performance

Gross Margin is a profitability ratio that measures the percentage of revenue that remains after deducting the cost of goods sold (COGS). COGS refers to the direct production costs and does not include operating expenses, interest, or taxes (Stobierski, _2020**),** Subramanyam & Wild, (2009)

Hypothesis

H1: The disclosure of greenhouse gas emissions has a significant impact on gross margins.

H2: The size of a firm has a positive and significant impact on its gross margin.

METHODOLOGY RESEARCH

The research conducted is associative, aiming to determine the extent to which the disclosure of greenhouse gas (GHG) emissions and company size influence a company's operational performance. The study utilizes data from manufacturing companies listed on the Indonesia Stock Exchange (IDX) during this period from 2019 to 2021. Data was collected from the websites www.idx.go.id and Osiris.

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An elimination process was undertaken to exclude companies with incomplete data, resulting in a sample of 37 companies, which provided a total of 111 observations. The independent variables in this study are the disclosure of GHG emissions and firm size. The measurement of GHG emission disclosure involves evaluating each item reported in the company's annual and sustainability reports.

Formulation GHG Index

GHGIj=(∑Xij)nj

Where:

GHGIj : GHG Index by category

nj: Total GHG disclosure items for the company, amounti to 18 items.

Xij : : each item us assigned =1 if disclosed, and 0 if not disclosed.

The dependent variable used in this study is operating performance, which is proxied by gross margin.

Multiple Regression Formula Used:

$GM_{it} = \alpha_0 + \beta_1 GHG_{it} + \beta_2 Size_{it} + \varepsilon_j$

Where:

α: Intercept

β: Regression Coefficient

GM: Gross Margin of year t

Size: Firm size

e: Error

RESEARCH AND RESULTS

Descriptive Statistics

The following is a descriptive statistics table

Data source processed 2023

Table 1 Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
GM	111	8.15	73.57	32.2486	15.03636
GHG	111	.06	1.00	.5397	.36829
SIZE	111	11.60	26.63	19.8400	4.70627
Valid N (listwise)	111				

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Based on Table 1 above, the descriptive statistical test shows that the number of samples (N) used is 111 data obtained from 2019-2021. The results of the statistical test in the table above show that the greenhouse gas emission (GHG) ion variable has a minimum value of 0.06, this score was obtained by PT Bentoel Biru Tbk. The maximum value of 1 was produced by PT Austindo Indonesia. The mean value is 0.5397, with a standard deviation of 0.36829. The mean value of GHG is greater than its standard deviation; this means that the mean value can represent the value of all GHG variable data.

The Gros margin (GM) variable has a minimum value of 8.15, owned by PT Sat Nusa Persada Tbk, a maximum value of 73.57, owned by PT Delta Djakarta Tbk, and a mean value of 32.2486 with a standard deviation of 15.03636. A mean value that is greater than the standard deviation means that The mean value can present the value of all GM variable data.

The firm size (SIZE) variable has a minimum value of 11.60 for Perusahaan PT Resouces Alam Tbk, a maximum value of 26.63 for PT Astra International Tbk, and a mean value of 19.8400 with a standard deviation of 4.70627. A mean value that is greater than the standard deviation means that the mean value can represent the value of the entire Size variable data.

Model Regression Test

The panel data analysis was conducted using SPSS 26 software with an Ordinary Least Squares (OLS) approach. The regression results, along with the classical assumption tests, are presented in Table 2. The classical assumption tests indicate that the model has successfully passed the tests for multicollinearity, heteroscedasticity, and autocorrelation.

According to Gujarati (2004), the Central Limit Theorem (CLT) suggests that if there is a large number of independent and identically distributed random variables, the distribution will tend to be normal as the number of variables increases, with a few exceptions. Furthermore, with 111 research observations, the data can be considered normally distributed.

Table 2 Regression test results

Variable	Unstandardized Coefisint	T hitting	Sig	information
Constanta GM	13,988			
Constanta GHG	-1.261	-0,335	0,738	not significant

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Constanta Size	0,9555	3,245	0.002	Significant
R square	0,89			
F	5,270		0.007	The regression model can be used because the probability is significant, 0.007<0.05
Multicollinearity test	1.005 (GHG) 1,005 (Size)			Passed multicollinear test because VIF <10
heteroscedasticity test	scattered image pattern			See in attachment
Autocorrelation test	0,858			So, is free from Autocorrelation

Source: Data processed 2023

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Partial Test Results (t-Statistic)

Test Hypothesis 1

The variable for disclosing greenhouse gas emissions (GHG) has a significance level greater than 0.05, with a p-value of 0.738. Ghozali (2018:102).The test results indicate that this variable does not have a significant effect on the company's operational performance (GM). As a result, the findings did not support the alternative hypothesis (H1).

Test Hypothesis 2

The results of this test supported hypothesis 2, indicating that firm size can influence the company's operational performance with a positive significance level of t less than α=0.05, specifically 0.002. Ghozali (2018:102)

Simultaneous Test (F statistic test)

The ANOVA test, or F-test, yielded a calculated F value of 5.270, with a probability of 0.007, which is less than the 0.05 significance level. This indicates that the regression model is valid for use, .

Regarding the regression coefficients, the analysis produced an R^2 value of 0.089. This means that only 8.9% of the company's operational performance (GM) can be explained by greenhouse gas emissions and firm size, while the remaining 91.1% is influenced by other variables not included in the model. An R^2 of 0.089 suggests that the impact of greenhouse gas emissions on company performance is very weak.. Ghozali (2018:101)

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DISCUSSION

The Effect of Greenhouse Gas Emissions on Operational Performance

After testing sample company data, it was determined that the independent variable, greenhouse gas (GHG) emissions, was not significant and had a negative effect. This indicates that GHG emissions did not have a meaningful impact on operational performance, as measured by gross margin, in manufacturing companies listed on the IDX from 2019 to 2021. These findings are consistent with previous research, including studies by Downar et al. (2021) and McKinsey (2009).

In particular, companies that disclose their greenhouse gas emissions often experience significant increases in production costs, primarily due to adopting environmentally friendly production processes. For instance, utilizing eco-friendly raw materials and production tools can lead to higher production expenses. However, any rise in costs associated with substantial greenhouse gas emissions reduction efforts can be partially offset by increased sales. This increase in revenue may reflect pricing power that enables companies to pass on their higher production costs to customers.

Furthermore, in line with the concept of "stakeholder pressure," the rise in differential sales may indicate that companies reporting reductions in greenhouse gas emissions in their annual reports enjoy greater customer loyalty. This is supported by the findings of Downar et al. (2021) and McKinsey (2009).

The Impact of Firm Size on Operational Performance

Tests conducted on the company's samples indicated that firm size has a positive and significant influence on the performance of companies listed on the IDX from 2019 to 2021. The results of this study show that larger firms tend to have better operational performance. Specifically, a larger firm size greatly enhances a company's ability to manage its assets effectively, leading to substantial operating profits. Additionally, when a company has a significant amount of cash, it can easily purchase raw materials or services as needed. This flexibility is particularly advantageous for companies dealing with seasonal goods, as they can stock up on inventory or choose more reliable suppliers compared to their competitors.

CONCLUSION

The study aimed to investigate the impact of greenhouse gas (GHG) emissions on the operational performance of companies. Based on the findings, data analysis, and discussions, it can be concluded that GHG emissions do not significantly affect

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operational performance, as measured by gross profit margin, in manufacturing companies listed on the IDX from 2019 to 2021. Conversely, the size of the company has a strong positive and significant impact, indicating that larger companies tend to perform better.

This study has several limitations. Firstly, it primarily focuses on manufacturing companies, but it could also include other sectors, such as plantation companies (e.g., palm oil) and transportation companies, which are significant contributors to greenhouse gas emissions. Additionally, while the study uses the natural logarithm of total assets as a measure of company size, other metrics could also be considered. In terms of operational performance measurement, alternatives to Gross Margin (GM) could include Overall Equipment Effectiveness (OEE), lead time, cycle time, and so on. Despite these limitations, the researcher hopes that the findings will contribute to individuals and groups dedicated to enhancing the environment and promoting the well-being of humanity.

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