

Determining Carbon Emissions Disclosure in Indonesian Companies

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ABSTRACT

Countries worldwide are collaborating to reduce carbon emissions and achieve zero emissions, recognizing that the earth cannot naturally absorb the current amount of emissions. Indonesia, among other countries, is actively engaged in these efforts. A research study has been conducted to assess if companies have implemented activities to reduce greenhouse gases, with the aim of examining disclosure. The study utilized purposive sampling and collected data through documentation techniques and literature review. Quantitative data analysis, specifically multiple linear regression, was employed for data analysis. The results indicate that the variables of profitability, leverage, environmental performance, and company size do not have a significant impact on the disclosure of corporate carbon emissions. The government aims to reduce carbon emissions and promote a green economy by making the carbon emission disclosure policy mandatory. This policy is intended to demonstrate the government's commitment to reducing carbon emissions. This research highlights the need to explore additional factors that may influence disclosure in order to enhance efforts in reducing carbon emissions effectively.

Keywords: Carbon emissions determination, Disclosure, Sustainability

INTRODUCTION

Carbon emission is a reaction of carbon dioxide into the atmosphere that is formed naturally or can also arise due to human activities such as electricity consumption, deforestation, and industrial activities. In the first industrial revolution, humans produced over 2,000 gigatons of carbon dioxide emissions that formed a greenhouse-like envelope that kept heat out of the earth. The effect of this caused global warming (Nestle, 2022).

Based on data shown by the (Indonesia & Bumi, n.d.) said that the producer industry is the largest category of emission supporters with a share of 43.83%. At present, the total carbon emissions produced have reached a level that cannot be absorbed naturally by the earth. Therefore, countries around the world are working together to reduce carbon emissions and achieve zero emissions by 2050. Indonesia is one of the countries committed to reducing carbon emissions in order to maintain global temperatures. The Minister of Energy and Mineral Resources (ESDM) affirmed the target of reducing carbon emissions by 32% or equal to 912 million tons of CO₂ in 2030 from the previous 29% or equal to 835 million tons of CO₂ (Indonesia & Bumi, n.d.).

Indonesia's commitment to reducing Carbon Emission Disclosure (CED) is evidenced by the existence of Perpes No. 61 of 2011, companies participate in efforts to reduce greenhouse gas emissions, which can be seen from the disclosure of carbon emissions. Carbon Emission Disclosure (CED) in a company can be influenced by several factors including environmental performance, profitability, company size, leverage, and corporate governance (Widiyani & Meidawati, 2021).

Disclosure of carbon emissions by companies is still relatively rare because disclosure is voluntary. The purpose of this study is to find out from these disclosures whether the company has carried out activities from efforts to reduce greenhouse gases. This research is the result of a replica of (Yusuf, 2021) with the difference in previous research being the object used.

The data population used in this study is the 2021 sustainability report on companies in Indonesia listed on Kontan IDX 80 (Kontan IDX 80, 2023) and other information through the

annual report of the company under study in disclosing carbon emissions. Researchers hope that the results of the research that has been carried out can be useful for companies that are trying to reduce the use of greenhouse gases. The research problem formulation is as follows: Does the disclosure of carbon emissions affect the sustainability of the company?

LITERATURE STUDY

Legitimacy Theory

Legitimacy theory was first coined by Dowling and Pfeffer in 1975, where this theory explains the relationship between companies and society (Widiyani & Meidawati, 2021). Activities carried out by companies create both positive and negative influences, to avoid negative influences, companies carry out environmental and social disclosures. In this study, disclosure of carbon emissions is included in the company's efforts to avoid social conflicts between communities.

Stakeholder Theory

Stakeholder theory states that a company is an entity that does not just operate for its own needs but must also provide benefits to its stakeholders (Handoko, 2021). The intended stakeholders include shareholders, consumers, suppliers, creditors, communities, governments and other interested parties.

Carbon Emission

According to Tri Cahya (2016), Carbon Emission Disclosure is a disclosure in assessing carbon emissions for a company or organization, and determining targets to reduce carbon emissions.

Profitability

Profitability is the ability in a company to earn profits in a certain period. In the calculation, profitability can be calculated in various ways according to the profit and assets or capital that will be compared.

Leverage

Leverage is a term used in the investment discussion environment and the business environment. Where leverage contains capital borrowing carried out for business development purposes. (Himma, 2022)

Environmental Performance

According to Purwanto (2000) environmental performance is a result that can be measured from an environmental management system, which is related to the control of its environmental aspects. (K, 2020)

Company size

According to Machfoedz (1994) company size is a comparison that can divide large and small in a company based on calculations or factors, namely total assets, log size, share value and others. (Abdhul, 2021)

Effect of Profitability on Carbon Emission Disclosure

According to Nastiti & Hardiningsih's (2021) research, profitability has a positive influence on carbon emission disclosure. This finding is consistent with the results of Apriliana et al.'s (2019) and N. A. Putri et al.'s (2022) studies, which suggest that financially stable companies are more likely to disclose environmental information. The company aims to enhance stakeholder trust by making environmental disclosures, including Carbon Emission Disclosure. However, research by Pratiwi (2018) suggests that profitability does not affect carbon emission disclosure, and Widiyi's (2018) research also supports this finding.

The study cites research from Widiyani and Meidawati (2021) and Sekarini and Setiadi (2022) to support the argument that companies should not wait for high profitability to recognize Carbon Emission Disclosure (CED). In fact, low profitability companies tend to recognize CED to attract investors and gain legitimacy from the community. Companies do not need to wait for high profitability to recognize CED while low profitability companies tend to recognize CED which aims to attract investors and gain legitimacy from the community. So based on the explanation above, the hypotheses in this study are:

H1: Profitability has a positive influence on Carbon Emission Disclosure.

Effect of Leverage on Carbon Emission Disclosure

According to research by Putra and Gantino (2021), as well as studies conducted by Novianti et al. (2020) and Abdullah et al. (2020), it has been found that leverage has a positive impact on Carbon Emission Disclosure. The research findings of Widiyani and Meidawati (2021) indicate a negative correlation between leverage and carbon emission disclosure. This is consistent with the results of studies conducted by Nastiti and Hardiningsih (2021) and Sekarini and Setiadi (2022). Therefore, it can be concluded that higher levels of leverage in a company lead to lower levels of disclosure. The hypotheses of this study are based on this explanation.

H2: Leverage has a positive influence on Carbon Emission Disclosure

Effect of Environmental Performance on Carbon Emission Disclosure

Based on research conducted on companies listed on the IDX from 2012-2016, it was found that Environmental Performance has a positive influence on Carbon Emission Disclosure.

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H3: Environmental Performance has a positive influence on Carbon Emission Disclosure

Effect of Company Size on Carbon Emission Disclosure

Based on the results of research (Aryati & Titik, 2015) company size has a positive effect on Carbon Emission Disclosure. Some studies also found a positive correlation between company size and carbon emission disclosure. The positive impact of company size on carbon emission disclosure has been studied by Widiyani and Meidawati (2021), and Sekarini and Setiadi (2022). According to research by Pratiwi (2018) and Wiratno & Muaziz (2020), company size has no effect on the disclosure of carbon emissions. Therefore, the hypothesis in this study is H4: Company size does not have a positive influence on Carbon Emission Disclosure.

H4: Company Size has a positive influence on Carbon Emission Disclosure

METHOD

Population and Sample

The data population used in this study is the 2021 sustainability report on companies in Indonesia listed on IDX80. The sample selection technique was worked out using a purposive sampling method with a total population taken of 51 companies in Indonesia, which aims to obtain a sample that matches the predetermined criteria. The predetermined criteria are:

1. The company is listed on IDX80 in 2021.
2. The company received a PROPER rating organized by the Ministry of Environment of the Republic of Indonesia.
3. The company obtained a PROPER rating organized by the Ministry of Environment of the Republic of Indonesia.
4. Companies that issue carbon emission disclosures related to greenhouse gas policies.
5. Publish sustainability report and annual report

Data Collection Methods

The data collection techniques used in this study used documentation techniques, and literature studies. The documentation technique is obtained from data distributed by the company regarding information contained in the annual report and sustainability report. Literature study can be

obtained by searching, understanding, and using reading lists such as journals, papers, articles that are still related to the topic of this research.

Research Variables

Carbon Emission Disclosure

The following is presented in table 1 of the environmental disclosure index used in this study:

Table 1. Carbon Emission Disclosure Criteria

Category	Item
1. Climate Change: risks and opportunities	CC1 - Assessment/description of risks associated with climate change and actions taken to address risks.
	CC2 - Assessment/description of current (and future) and financial implications, business implications and opportunities of climate change.
2. GHG emissions calculation	GHG1 - Description of the methodology used to calculate GHG emissions.
	GHG2 - Existence of external verification of GHG emission measurements
	GHG3 - Total amount of GHG emissions produced
	GHG4 - Disclosure of scope 1, 2 or scope 3 GHG emissions
	GHG5 - GHG emission source disclosure
	GHG6 - Facility or segment disclosure of GHGs
	GHG7 - Comparison of GHG emissions with the previous year
3. Energy consumption	EC1 - Total energy consumed
	EC2 - Quantification of energy used from renewable sources
	EC3 - Disclosure by type, facility or segment
4. GHG costs and reductions	RC1 - Detailed plan or strategy for reducing GHG emissions
	RC2 - Specification of targets/levels and years
	RC3 - Emission reductions and costs or savings achieved to date as a result of the carbon emission reduction plan.
	RC4 - Cost of future emissions costs factored into capital expenditure planning.
5. Carbon Emissions Accountability	ACC1 - Indication of the board committee responsible for actions related to climate change.
	ACC2 - Description of the mechanism by which the board reviews the company's progress on climate change.

Source: Yusuf, 2021

Analysis Tool

The formula for multiple linear regression equations is as follows

$$CED = \frac{\sum di}{M}$$

For each category of carbon emissions that is disclosed, the value is 1, and for those that are not disclosed, the value is 0.

Description:

- CED = Carbon Emission Disclosure
- $\sum di$ = Total score 1 obtained by the company
- M = Maximum number of categories that can be expressed (18 categories) calculated using

Profitability

Profitability is the company's ability to generate profits in a certain period at the level of sales, share capital, and sales. The profitability variable is calculated using ROE (*return on equity*), the calculation is used to interpret the company's ability to earn profits based on total assets.

$$ROE = \frac{\text{Total Profit After Tax}}{\text{Shareholder's Equity}}$$

Leverage

Leverage is borrowing capital for business development purposes to obtain maximum profit. The *leverage* variable is calculated by comparing the amount of debt with the amount of assets.

$$Leverage = \frac{\text{Total Debts}}{\text{Liabilities}}$$

Environmental Performance

Environmental performance is the company's relationship with the environment regarding the environmental impact of the resources applied, which has an effect on the environment, the good impact caused as a form of corporate responsibility and concern for the environment. Variables in environmental performance can be assessed using PROPER. There are 5 categories in it, namely colors: gold, green, blue, red and black. The 5 colors have their own ranking, which symbolizes the company's concern for the environment. PROPER ratings are as follows:

Table 2. PROPER Rating

Scale	Meaning	Color
0	Very Bad	Black
1	Bad	Red
2	Good	Blue
3	Very good	Green
4	Very Good	Gold

Source: Data Processed, 2023

Company Size

Company size is a ratio that can be divided by the size of a company with several calculations. The calculation formula is as follows:

$$\text{Size} = \ln (\text{Total Asset})$$

Analysis Tool

Data analysis was carried out using quantitative data analysis techniques, namely multiple linear regression. The following is the formula for multiple linear regression equations:

$$CED = \alpha + \beta_1 ROE + \beta_2 DAR + \beta_3 KL + \beta_4 \text{Size} + e$$

Description:

CED	= Carbon Emission Disclosure
α	= Constant
$\beta_1 - \beta_5$	= Regression Coefficient
ROE	= Return On Equity
DAR	= Leverage
KL	= Environmental performance measurement (PROPER)
Size	= Company Size
e	= Error

Multiple linear regression tests are carried out after conducting a classical assumption test to obtain information about the presence or absence of data storage before the regression test is carried out. Included in the classical test are normality test, heteroscedasticity test, and multicollinearity test.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 3. Descriptive Statistical Test Results

	N	Minimum	Maximum	Mean	Std.Deviation
CED	51	0.00	0.55	0.1822	0.15191
ROE	51	1.00	3261.00	535.8235	724.47321
DER	51	0.00	6.14	0.7923	1.45528
KL	51	0.00	4.00	0.7451	1.27817
SIZE	51	20.54	35.08	29.1053	4.38772
VALID N(listwise)	51				

Source: Processed secondary data, 2023

The descriptive statistics table above indicates that the range of CED (Carbon Emission Disclosure) values is from 0.00 to 0.55. The average level of carbon emission disclosure (CED) produced by companies is 18.2% of the disclosure criteria, with a standard deviation of 0.152. This indicates that the distribution of CED is even and the data deviation is low. The profitability (ROE) ranges from 1.00 to 3261.00 with an average of 535.824 and a standard deviation of 724.473. The high standard deviation suggests an uneven distribution of profitability. The leverage variable (DER) ranges from 0.00 to 6.14. The average value and standard deviation are 0.792 and 1.455, respectively. The higher standard deviation suggests a significant deviation in the data, indicating an uneven distribution of leverage. The PROPER variable for Environmental Performance ranges from 0.00 to 4.00. The average and standard deviation values are 0.745 and 1.278, respectively. The smaller standard deviation value compared to the average indicates high data deviation, suggesting uneven distribution of environmental performance. The variable SIZE represents the size of the company and has a range from 20.54 to 35.08 with an average of 29.105 and a standard deviation of 4.388.

Kolmogorov-Smirnov Test Results

Table 4. Kolmogorov-Smirnov Test Results

		Unstandardized Residual
N		51
Normal Parameters ^{a,b}	Mean	Normal Parameters ^{a,b}
	Std.Deviation	
Most Extreme Differences	Absolute	Most Extreme Differences
	Positive	
	Negative	
Kolmogorov-Smirnov Z		0.646
Asymp. Sig. (2-tailed)		0.798

Source: Processed secondary data, 2023

The results of the Kolmogorov-Smirnov test indicate that the data is normally distributed, as the significance value of 0.798 is greater than 0.005.

Multicollinearity Test

Table 5. Multicollinearity Test Results

Multicollinearity Test	Collinearity Statistics	
	Tolerance	VIF
ROE	0.721	1.387
DER	0.836	1.196
KL	0.798	1.254
SIZE	0.822	1.216

Source: Processed secondary data, 2023

Based on the multicollinearity test results, it shows that the independent variables above do not experience multicollinearity because the tolerance value ≥ 0.10 and the VIF value ≤ 10 .

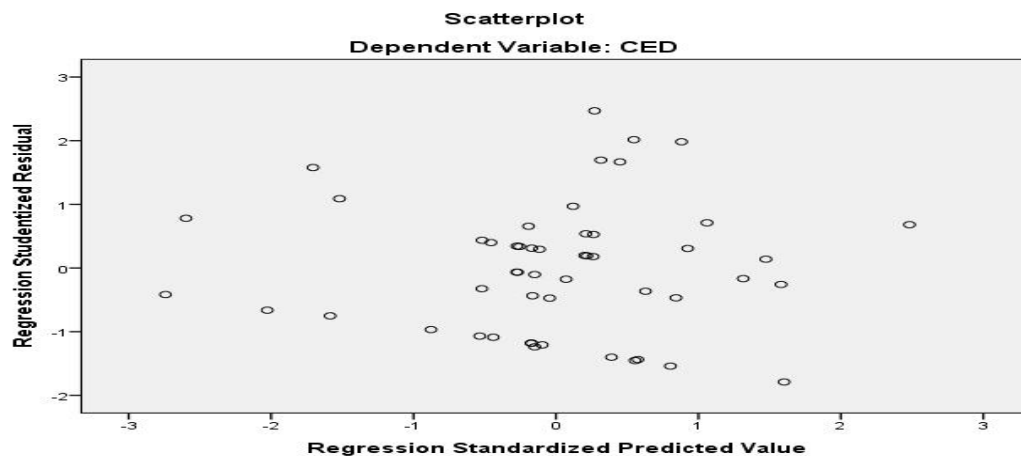


Figure 1. Multicollinearity test

Source: Processed secondary data, 2023

The graph above indicates that the points are randomly spread across the Y axis, both above and below zero. Therefore, it can be concluded that there is no heteroscedasticity in the regression model.

Multiple Linear Regression Analysis

Table 6. Multiple Linear Regression Test Results

T test	Unstandardized Coefficients		Standardized Coefficients	T	Sig
	B	Std. Error	Beta		
(Constant)	0.249	0.152		1.645	0.107
ROE	0.2.157E-005	0.000	0.103	0.622	0.537
DER	-0.022	0.016	-0.207	-1.350	0.184
KL	0.017	0.019	0.142	0.901	0.372
SIZE	-0.003	0.005	-0.074	-0.475	0.637

Source: Processed secondary data, 2023

$$CED = 0.249 + 0.2.157 (ROE) + -0.022 (DER) + 0.017 (PROPER) + -0.003 (SIZE) + e$$

1. The coefficient β_1 (ROE) = 0.2.157 shows a positive sign which means that if profitability increases by 1% while other variables are constant, then GHG will increase by 21.57%.

2. The coefficient β_2 (DER) = -0.022 shows a negative sign which means that if leverage increases

by 1% while other variables are constant, GHG will decrease by 2.2%.

3. The coefficient β_3 (PROPER) = 0.017 shows a positive sign which means that if Environmental Performance increases by 1% while the other variables are constant, then Greenhouse Gases will increase by 1.7%.

4. The coefficient β_4 (SIZE) = -0.003 shows a negative sign which means that if Company Size increases by 1% while the other variables are constant, then Greenhouse Gas will decrease by 0.3%.

Model Inverse Test

Coefficient of Determination

Table 7. Determination Coefficient Test Results

Determination Coefficient Test	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin Watson
	0.251	0.063	0.023	0.13128	1.868

Source: Processed secondary data, 2023

According to the regression calculation results in the table above, the adjusted coefficient of determination (Adjusted R Square) is 0.023. This indicates that only 2.3% of the variation in the dependent variable Carbon Emission Disclosure (CED) can be explained by the independent variables proposed in this research model, namely Profitability (ROE), Leverage (DER), Environmental Performance (PROPER), and Company Size (SIZE). The remaining 97.7% is explained by other independent variables not included in this model.

Table 8. Autocorrelation Test Results

Determination Coefficient Test	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin Watson
	0.251	0.063	0.023	0.13128	1.868

Source: Processed secondary data, 2023

The table above displays the Durbin Watson test value of 1.868 for a sample size of 51 with 4 independent variables (k). When compared to the table value using a 5% degree, the dL value is 1.3855 and the dU value is 1.7218, resulting in a 4-dU value of 2.2782. Based on the results of the autocorrelation test, it can be concluded that the data used in this study are suitable for further research. The values obtained ($1.3929 < 1.868 < 2.2777$) indicate that there is no autocorrelation.

Partial Test Results (t-test)

Table 9. Results of the t-test

T test	Predicted Direction	Unstandardized Coefficients		T	Sig	Conclusion
		B	Std. Error			
(Constant)		0.249	0.152	1.645	0.107	
ROE	Ha (X1 has a positive effect on Y)	0.2.157E-005	0.000	0.622	0.537	Ha rejected
DER	Ha (X2 has a positive effect on Y)	-0.022	0.016	-1.350	0.184	Ha rejected
KL	Ha (X3 has a positive effect on Y)	0.017	0.019	0.901	0.372	Ha rejected
SIZE	Ha (X4 has a positive effect on Y)	-0.003	0.005	-0.475	0.637	Ha rejected

Source: Processed secondary data, 2023



Based on the table above, the t-test results above are explained as follows; Variable Profitability (ROE)/X1 amounted to $0.622 < 1.675$ t table and a significance level of $0.537 > 0.05$, the t test results show that the profitability variable has a coefficient value of 0.2,157, then H0 and H1 are rejected so that Profitability (ROE) has no influence on carbon *emission disclosure*. The Leverage (DER)/X2 variable is $-1.350 < 1.675$ t table and the significance level is $0.184 > 0.05$, the t test results show that the profitability variable has a coefficient value of -0.022 then H0 is accepted and H2 is rejected so that Leverage (DER) has no influence on *carbon emission disclosure*. Environmental Performance (PROPER)/X3 variable of $0.901 < 1.675$ t table and a significance level of $0.372 > 0.05$, the t test results show that the profitability variable has a coefficient value of 0.017 then H0 is accepted and H3 is rejected so that Environmental Performance (PROPER) has no influence on *carbon emission disclosure*. The variable Company Size (SIZE)/X4 is $-0.475 < 1.675$ t table and the significance level is $0.637 > 0.05$, the t test results show that the profitability variable has a coefficient value of -0.003 then H0 is accepted and H0 is rejected so that Company Size (SIZE) has no influence on *carbon emission disclosure*.

Discussion

Effect of profitability on carbon emission disclosure

Profitability is measured by calculating the return on equity (ROE) using the total profit after tax and shareholders' equity for the 2021 period. The data was processed using multiple linear regression tests, which resulted in a regression coefficient value of 0.2,157 and a significance value of 0.537. This indicates that companies with higher ROE values are more likely to disclose their carbon emission data. However, this study found insignificance because the Sig. value is above the 5% significance level (0.05). The results indicate that profitability has no effect on CED disclosure. Therefore, it can be concluded that higher profitability levels correspond to lower levels of carbon emission disclosure by the company. The study's findings contradict legitimacy theory, which suggests that companies disclose environmental information to legitimize their operations. The test results align with Ardita Widiyani's (2021) research, which states that companies voluntarily disclose their carbon emissions and that it is not a requirement for listing on the IDX. As a result, companies often ignore complete reporting of their carbon emissions and only disclose them as they are. Presidential Regulation No. 61 of 2011 regarding the National Action Plan for Reducing Greenhouse Gas Emissions is also a factor in companies disclosing their carbon emissions as is. In addition, a company's good financial performance cannot be used as a benchmark in disclosing carbon emissions. This can happen because companies with high profitability tend not to report activities that are considered to interfere with the company's financial information.

Effect of Leverage on Carbon Emission Disclosure:

The regression test results for the leverage variable (DER), obtained using the ratio of total debt to liabilities, show a negative and insignificant effect. The regression coefficient value is -0.022 with a significance value of 0.184. Therefore, the initial hypothesis is rejected. The research findings using multiple linear regression indicate that leverage does not have an effect on carbon emission disclosure. These results are consistent with the research conducted by Ardita Widiyani (2021) and Yusuf (2021), which also found that leverage has no impact on carbon emission disclosure. This is likely due to the fact that the average leverage is 79.23%, which does not vary. Based on the test results, it can be concluded that disclosing carbon emissions does not affect a company's leverage value, whether high or low. This is because increased disclosure of carbon emissions also increases the company's responsibility for the use of large funds, which can pose a threat to its continuity. As a result, companies are more cautious in disclosing their carbon emissions to reduce operational costs and prioritize using company funds to enhance their operations.

Effect of Environmental Performance on Carbon Emission Disclosure

The impact of environmental performance on carbon emission disclosure was analyzed using data from the PROPER rating system. The multiple linear regression test yielded a regression



coefficient of 0.017 and a significance value of 0.372. The significance value of the environmental performance variable is greater than the significance level of 0.05, indicating a negative effect on CED disclosure. Therefore, the third hypothesis (H3) is rejected. The results of this study contradict legitimacy theory, which posits that companies will always strive to comply with prevailing societal norms in order to gain legitimacy and support from the community. However, companies that score high on PROPER tend to feel that they no longer need to disclose carbon emissions. However, companies with high PROPER scores may feel that they do not need to disclose carbon emissions because their PROPER score is already good. Conversely, companies with low PROPER scores may try to show their credibility by disclosing carbon emissions and attempting to reduce them to gain public trust. Additionally, PROPER's ranking places greater emphasis on natural resource conservation, environmental management systems, and the implementation of CSR. This is one reason why environmental performance does not have an effect on carbon emissions. However, this study's results align with research conducted by Dewayani, Ni Putu Eka Dawayani (2021); Putri et al. (2022); and Rinaldi Tama Ramadhan, Husnah Nur Laela Ermaya (2021), which show that environmental performance does not affect CED disclosure. Therefore, it can be concluded that companies prioritize their operational activities over the environment.

Effect of Company Size on Carbon Emission Disclosure.

The variable for company size (SIZE) is calculated as the logarithm of the company's total assets. The results of the multiple linear regression test show a regression coefficient value of -0.003 and a significance value of 0.637. This indicates that the company size variable has a negative effect, as the significance value is above 0.05, leading to the acceptance of H0 and the rejection of H4. Testing the effect of company size on carbon emission disclosure reveals that larger companies tend to disclose less. However, it is important to note that smaller companies are also required to disclose their carbon emissions. Presidential Regulation number 61 of 2011 requires all companies, regardless of size, to reduce carbon emissions (2011, 2011). This study's findings are reinforced by research conducted by Desy Nur (2018) and Wiratno & Muaziz (2020).

CONCLUSION

The study utilized multiple linear analysis to examine the relationship between profitability, leverage, environmental performance, company size, and Carbon Emission Disclosure. The research was conducted using a purposive sampling method on IDX80, resulting in 51 samples from the 2021 period. The data collected included sustainability reports and annual reports. The analysis indicates that variables such as profitability, leverage, environmental performance, and company size do not have an impact on a company's decision to disclose carbon emissions, particularly when the company is performing well and has proper recognition. This is likely due to concerns about potential interference with the company's financial performance. Furthermore, companies recognized by PROPER are trusted by the public to have implemented and complied with applicable norms, including corporate social responsibility. It is important to note that the disclosure of carbon emissions is voluntary and not a requirement for listing on the IDX, regardless of the company's size. Furthermore, disclosing carbon emissions does not necessarily enhance a company's sustainability. Companies with low profitability, leverage, and environmental performance are more likely to disclose carbon emissions to gain public legitimacy and support, in contrast to those that do not. The government aims to reduce carbon emissions and promote a green economy by making the carbon emission disclosure policy mandatory. This policy is intended to demonstrate the government's commitment to reducing carbon emissions. To achieve this goal, companies can utilize energy diversity to reduce energy consumption through real actions rather than just policy. The study's limitations include the inability to test the coefficient of determination effectively, as all independent variables in this study can only explain 2.3% of the dependent variable, which is a small percentage. Future researchers should consider adding variables such as corporate governance to improve the explanatory power of the model.



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