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FACTORS AFFECTING CARBON EMISSION DISCLOSURE AND ITS IMPACT ON COMPANY FINANCIAL PERFORMANCE (Study of Energy Sector Companies Listed on the IDX in 2020-2022)

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KEYWORDS:
carbon performance, environmental costs, green product innovation, financial performance, and carbon emissions disclosure.

ABSTRACT

This research aims to determine the influence of carbon performance, environmental costs, and green product innovation on carbon emission disclosure and its impact on financial performance (a case study of Energy Sector Companies Listed on the IDX in 2020-2022). The population in the research is energy sector companies listed on the BEI in 2020-2022. The research sample was selected using a purposive sampling technique, namely a sample determination technique using predetermined criteria, so that a total sample of 54 research samples was obtained. This research method uses quantitative methods. This research uses secondary data obtained through the publication of financial reports, annual reports and sustainability reports for each energy sector company listed on the Indonesia Stock Exchange (BEI). The research results show that carbon performance and green product innovation have a positive and significant effect on carbon emissions disclosure. Environmental costs have a negative but not significant effect on carbon emissions disclosure. Carbon performance has a negative and significant effect on financial performance. Environmental costs have a positive and significant effect on financial performance. Green product innovation has a negative but not significant effect on financial performance. Disclosure of carbon emissions has a positive and significant effect on financial performance. Carbon performance and green product innovation have a positive and significant effect on financial performance through carbon emission disclosure. Environmental costs have a negative but insignificant effect on financial performance through carbon emission disclosure.

INTRODUCTION

Climate change is an interesting issue and the center of world attention. It causes global warming, which results in environmental damage and pollution (Nursulistyo et al., 2022). Indonesia produces approximately 15-20 million tons of carbon emissions per day (Andrian & Kevin, 2021). The Global Carbon Project shows that Indonesia ranks as the tenth largest carbon emitting country in the world (Global Carbon Atlas, 2022).

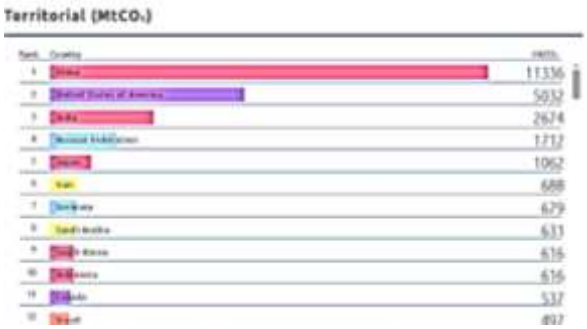

Figure 1
Ranking of Countries with Carbon Dioxide Emissions Production in the World in 2022
Source: Global Carbon Project, 2023

Figure 1 illustrates that Indonesia's carbon emissions production reached 616 million tons of carbon dioxide. The main sources of these emissions are coal use, gas flaring, oil and gas activities, and cement production. Although Indonesia is considered the lungs of the world, the country plays a significant role in climate change. China, the United States and India are the top three countries in terms of carbon production. More surprisingly, seven of the ten countries with the highest carbon emissions are from Asia.

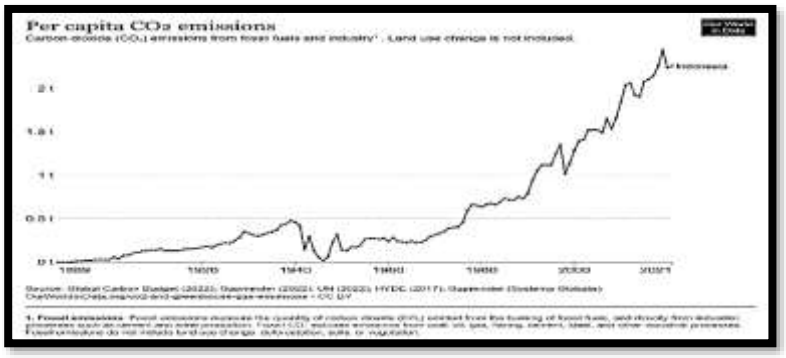

Figure 2
Indonesia's Carbon Dioxide Emissions Production
Source: Global Carbon Project, 2023

Figure 2 explains that the trend of Indonesia's CO2 emissions (metric tons per capita) from 1989 to 2022 is increasing from year to year. The peak was in 2021 and decreased until 2022. This downward trend is likely due to the government's increasing pressure to reduce carbon emissions by encouraging companies engaged in industries that contribute the highest carbon emissions to intensify carbon emissions management practices and disclose carbon emissions to the public (Nasih et al., 2019).

The Indonesian government encourages companies to pay attention to the impact of their operational activities on sustainability reporting obligations through POJK Number 51/POJK.03/2017 Article 10 paragraph 1 which indicates that the obligation to prepare sustainability reports applies to financial services institutions, issuers, and public companies. Referring to POJK Number 51/POJK.03/2017, public companies are required to start

publishing their sustainability reports for the reporting period starting January 1 to December 31, 2020. Furthermore, SEOJK Number 16 /SEOJK.04/2021 was issued to complement POJK 51/POJK.03/2017, which regulates the sustainability report of Financial Services Institutions, Issuers, or Public Companies. A Sustainability Report is a publicly published document that includes an evaluation of the financial, social, economic and environmental performance of an entity such as financial institutions, listed companies and public companies, in the context of conducting business in a sustainable manner.

Climate Reporting in ASEAN (2022) issued by GRI ASEAN, it is known that the assessment of climate change-related reporting in Indonesian companies is only 44% where the assessment is carried out on 7 aspects, namely the reporting framework, materiality, risks and opportunities, governance, strategy, targets, and performance (Putri & Arieftiara, 2023).

Based on data released by Climate Transparency, the majority of greenhouse gas (GHG) emissions in Indonesia come from burning fossil fuels, mainly in the form of carbon dioxide (CO2) emissions.

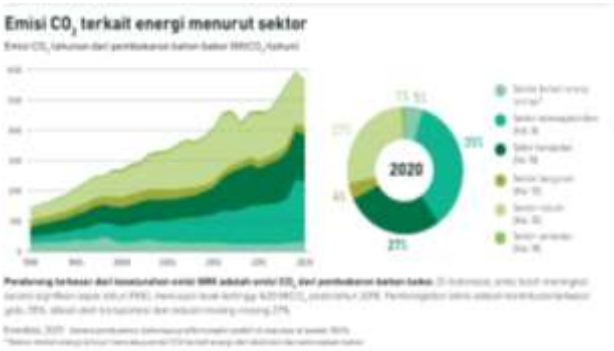

Figure 3
graph of annual CO2 emissions in Indonesia by sector
Source: Climate Transparency (2023)

Figure 3 illustrates the upward trend of emissions in Indonesia from 1990 to its peak in 2018, reaching a level of 620 million tons of carbon dioxide (MtCO2). In 2020, the power sector became the largest contributor to CO2 emissions with 35%, mainly due to the expansion of coal power plant construction supported by government subsidies. The transportation and industrial sectors each accounted for 27% of total emissions, with increased vehicle use and industrial activity resulting in excessive use of fossil fuels. The low level of disclosure in sustainability reports by companies leads to a mismatch of emissions generated with sustainable practices.

Kalu et al. (2016) showed that there are several factors that can influence the level of carbon emissions disclosure by companies. These factors include financial market dynamics, social considerations, economic pressures, and corporate ownership structure.

Research on the effect of carbon performance on disclosure of carbon emissions has been carried out in Indonesia, while the results of research by Ladista (2023) and Datt (2019) indicate that carbon performance affects the disclosure of carbon emissions and is inversely proportional to research conducted by Bui et al (2020).

Companies that implement green product innovation will reduce the amount of carbon emissions generated during the production process (Wei et al., 2020). So that companies will

tend to disclose carbon emissions. Research conducted by Li et al. (2016) revealed that green product innovation affects the disclosure of carbon emissions which is inversely proportional to research conducted by Ladista (Ladista et al., 2023).

A study on how carbon emissions disclosure affects financial performance, using Return on Assets (ROA) as a measurement indicator conducted by Borghei et al. (2018) revealed that disclosure of carbon emissions affects financial performance which is inversely proportional to research conducted by Siddique et al. (2021) which reveals that disclosure of carbon emissions has no effect on financial performance.

This study aims to determine how the influence of carbon performance, environmental costs and green product innovation on financial performance through disclosure of carbon emissions.

RESEARCH METHODS

The type of data used in this study is secondary data. The data source used is the publication of financial statements, annual reports and sustainability reports of each energy sector company listed on the Indonesia Stock Exchange (IDX). The data was obtained through the Indonesia Stock Exchange website, namely www.idx.co.id. The data collection techniques used in this research are the documentation method and the literature study method. The population used in this study are energy sector companies listed on the Indonesia Stock Exchange (IDX) in 2020-2022. The sampling used is purposive sampling, with the following criteria:

a. Energy sector companies listed on the Indonesia Stock Exchange in 2020-2022
b. Companies that publish financial statements, annual reports and sustainability reports for the reporting year from 2020-2022
c. The company presents complete data in accordance with the variables studied

The following are the final sample stages with predetermined criteria :

Table 1
Research sample criteria

Criteria	Total
Number of energy sector companies listed on the Indonesia Stock Exchange 2020-2022	82
Number of Companies that do not publish financial statements, annual reports, and sustainability reports for the reporting year from 2020-2022	(18)
Number of companies that do not present complete data by the variables studied	(46)
Sample Quantity	18
Total Observations (Years)	3
Total number of observations during the study period	54

Source: Processed data, 2024

Research Variables

An exogenous variable is a variable that affects or has an impact on other variables, usually based on the chronology of events first. The exogenous variables in this study are as

follows:

a. Carbon Performance

Carbon performance refers to the ability of a company to reduce carbon emissions in ways such as reducing carbon emissions per product, replacing or minimizing the use of materials with high carbon content, and reducing energy consumption (Ladista et al., 2023). This study uses a measurement for carbon performance, namely the natural logarithm of the ratio between the value of carbon-producing assets and total carbon emissions. The first carbon performance calculation adapts the research conducted by Ladista et al (2023) with the following formula:

Carbon Performance =(Carbon Generating Assets)/(Total Carbon Emissions)

The second measurement for carbon performance is measured using the proxy carbon emission intensity, which is the natural logarithm of the ratio of total carbon emissions divided by total company sales. The second carbon performance calculation adapts the research conducted by Sadira Ashia Priliana & Ermaya (2023) with the following formula:

Carbon Performance = (Total Carbon Emissions)/(Total Sales)

b. Environmental Costs

Environmental costs are economic expenditures incurred by companies to avoid potential environmental degradation or repair environmental damage caused by their activities (Ladista et al., 2023). Environmental cost data is obtained from the sustainability report or annual report of each company. The first environmental cost calculation adapts to research conducted by Ladista et al (2023) with the following formula:

Environmental Costs = (Environmental Costs x 100%)/(Total Company Operating Costs) The second environmental cost calculation adapts to research conducted by Saputr (2023) with the following formula:

Environmental Cost = (Environmental Cost x 100%)/(Net Profit After Tax)

c. Green Product Innovation

Green product innovation in this study follows the approach adopted from the research of Ladista et al. (2023) by counting green patents containing keywords:

1) Energy-saving products
2) Raw material-saving products
3) Products are easy to recycle

Each element is worth 1 point if included in the company's sustainability report to achieve a maximum green product innovation score of 3.

Intervening variables are intermediate variables used to mediate the relationship between exogenous variables and endogenous variables. The intervening variable in this study is the disclosure of Carbon Emissions. Disclosure of carbon emissions contains information related to the measurement, recognition, and presentation of carbon emissions, which is the same as research conducted by Ladista (2023) which uses the criteria for disclosing carbon emissions by Choi (Choi et al., 2013).

Table 2
Carbon Emissions Disclosure Criteria are as follows:

Category	Item	Description
Climate change: Risks and opportunities	CC1	An evaluation or description of the risks (whether regulatory, physical or general) associated with climate change, and the steps that have been or will be taken to manage these risks.
	CC2	An evaluation or description of the current (and future) financial consequences, business impacts, and opportunities associated with climate change.
Carbon Emissions	GHG1	Explanation of the method used to calculate GHG Emissions
	GHG2	Whether there is an external check on the amount of GHG emissions - if so, by which party and on what basis.
	GHG3	Total GHG emissions
	GHG4	Presentation of scopes 1 and 2, or GHG emissions
	GHG5	Disclosure of GHG Emissions by source
	GHG6	GHG emissions disclosure by facility or segment level
	GHG7	Comparison of GHG emissions with previous years
Energy Consumption (EC)	EC1	Total energy consumed
	EC2	Quantification of energy used from renewable sources
	EC3	Disclosure of energy consumption by type, facility or segment
Greenhouse Gas Reduction and Cost (RC/Reduction and Cost)	RC1	Details of plans or strategies to reduce GHG emissions
	RC2	Specification of GHG emission reduction target levels and target years
	RC3	Emission reductions and associated costs or savings achieved to date as a result of a reduction plan
	RC4	Projected future emission costs considered in capital expenditure planning.
Akuntabilitas Emisi Karbon (AEC/Accountability of Emission Carbon)	ACC1	Indication of the board committee (or other executive body) with overall responsibility for actions related to climate change.
	ACC2	A description of the way in which the board (or other executive body) reviews the company's progress on climate change.

Source: Choi et al. (2013)

If all indicators have been disclosed, the maximum value obtained is 18. The scoring approach is incremental and each object is equally weighted.

Carbon Emissions Disclosure=(Σn x 100%)/N

Description :

η = number of scores that fit the criteria

N = the number of criteria is 18 criteria

Endogenous variables are variables that are influenced or are the result of the existence of these exogenous variables. The endogenous variable of this study is the company's financial performance. One method of evaluating financial performance is to use financial ratios such as profitability. It shows how far companies can go if they manage their operations properly and in accordance with financial regulations (Fahmi., 2017).

The ratios used in this study are as follows:

ROA=(Net profit after tax)/(Total Assets)

ROE=(Net profit after tax)/(Total Equity)

NPM=(Net profit after tax)/(Net Sales)

Data Analysis Method

a. Descriptive Analysis

Ghozali (Ghozali, 2016) explains that descriptive statistics provide an overview or description of data seen from Minimum, maximum, sum, average value (mean), standard deviation, variance, range, kurtosis and skewness (distribution skewness).

b. Statistical Analysis of Data

The data in this study were processed using smartPLS SEM (Partial Least Square - Structural Equation Modeling) software. PLS-SEM analysis generally consists of two submodels, namely the measurement model which is often referred to as the outer model and the structural model which is often referred to as the inner model.

In statistical analysis of data using the SEM PLS method. The following is the PLS method analysis technique:

c. Outer Model Analysis

Hussein (2015) conducted an outer model analysis to verify that the measurements used were feasible as indicators (valid and reliable). Some of the calculations performed in this analysis include:

1. Convergent Validity: This is assessed by the factor loading on the latent variable with its indicators. The expected value is greater than 0.7.
2. Discriminant Validity: This involves factor crossloading to ensure that the constructs have adequate discriminants. This is done by comparing the value of the construct of interest with the values of other constructs.
3. Composite Reliability: This measures the reliability of the construct by checking if its reliability value is greater than 0.7, signaling high reliability.
4. Average Variance Extraction (AVE): This is the average of the variance explained by the indicators that are part of the construct, which should be at least 0.5.

d. Inner Model Analysis

This model analysis is to test the relationship between latent constructs. The

calculations in this analysis are as follows:

1. R Square is the coefficient of determination on endogenous constructs. Chin (1998) in (Ghozali & Latan, 2015) explains "the criteria for limiting the R square value in three classifications, namely 0.67 as substantial; 0.33 as moderate and 0.19 as weak".

e. Hypothesis Testing

Husaein (2015) revealed that hypothesis testing involves evaluating the t-statistic value and the probability value. In hypothesis testing using statistical values, for an alpha of 5%, the relevant t-statistic value is 1.96. Therefore, the criterion for accepting or rejecting a hypothesis is if the t-statistic value > 1.96. In the context of using probability to reject or accept a hypothesis, the hypothesis will be rejected if the p value is <0.05.

RESULTS AND DISCUSSION

Table 3
Descriptive Statistical Analysis

	Mean	Min	Max	Standard Deviation	Excess Kurtosis	Skewness
Carbon Emissions Disclosure	0.863	0.167	1	0.232	3.362	-2.084
Carbon Performance 1	7.933	-6.935	18.127	3.978	3.457	-0.185
Carbon Performance 2	-8.956	-19.245	-4.315	3.461	1.869	-1.561
Environmental Cost 1	0.057	0	0.442	0.099	6.052	2.517
Environmental Cost 2	-0.013	-1.414	0.245	0.198	47.958	-6.693
Green Product Innovation	0.778	0	2	0.629	-0.563	0.216
ROA	0.097	-0.384	0.618	0.177	2.139	0.763
ROE	0.117	-2.543	1.249	0.597	9.585	-2.332
NPM	0.094	-1.63	0.813	0.343	11.664	-2.611

Table 2 of the descriptive analysis explains the results as follows:

a) Carbon Emissions Disclosure

The disclosure of carbon emissions obtained an average value of 0.863 with a standard deviation of 0.232 (below average), which means that the disclosure of carbon emissions has a low level of data variation. The highest value of the carbon emission disclosure variable is 1 while the lowest value is 0.167.

b) Carbon Performance 1

The first carbon performance obtained an average value of 7.933 with a standard deviation of 3.978 (below average), which means that the first carbon performance has a low level of data variation. The highest value of the first carbon performance variable is 18,127 while the lowest value is -6,935.

c) Carbon 2 Performance

The second carbon performance obtained an average value of -8,956 with a standard deviation of 3,461 (above average) which means that the second carbon performance has a high level of data variation. The highest value of the second carbon performance variable is -4,315 while the lowest value is -19,245.

d) Environmental Cost 1

The first environmental cost obtained an average value of 0.057 with a standard deviation of 0.099 (above average), which means that the first environmental cost has a high level of data variation. The highest value of the first environmental cost variable is 0.442 while the lowest value is 0.

e) Environmental Cost 2

The second environmental cost obtained an average of -0.013 with a standard deviation of 0.198 (above average), which means that the second environmental cost has a high level of data variation. The highest value of the second environmental cost variable is 0.245 while the lowest value is -1.414.

f) Green Product Innovation

Green Product Innovation obtained an average of 0.778 with a standard deviation of 0.629 (below average), which means that green product innovation has a low level of data variation. The highest value of the green product innovation variable is 2 while the lowest value is 0.

g) Return On Asset (ROA)

Return On Asset (ROA) obtained an average of 0.097 with a standard deviation of 0.177 (above average), which means that ROA has a high level of data variation. The highest value of the ROA variable is 0.618 while the lowest value is -0.384.

h) Return On Equity (ROE)

Return On Equity (ROE) obtained an average of 0.117 with a standard deviation of 0.597 (above average), which means that ROE has a high level of data variation. The highest value of the ROE variable is 1,249 while the lowest value is -2,543.

i) Net Profit Margin (NPM)

Net Profit Margin (NPM) obtained an average of 0.094 with a standard deviation of 0.343 (above average), which means that NPM has a high level of data variation. The highest value of the NPM variable is 0.813 while the lowest value is -1.63.

Outer Model Analysis

The outer model analysis defines how each indicator relates to its latent variable.

a. Corvergent Validity Test

An indicator is considered valid if its loading factor exceeds 0.70, so if there is a loading factor below 0.70, the indicator will be removed from the model. The validity of reflective indicators is tested by examining the correlation between the item score and the construct score. Measurement using reflective indicators indicates that there is a change in an indicator in a construct if there is a change in another indicator in the same construct (or if the indicator is removed from the model).

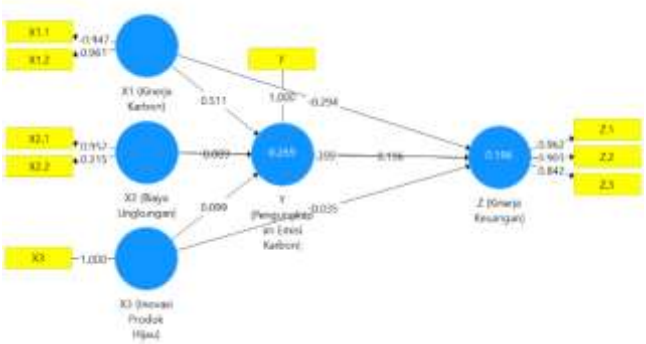

Figure 4
Initial Structural Model

Table 4
Initial Outer Loading

Indicator/Variable	Factor loading	Description
X1 (Carbon Performance)		
X1.1	-0,947	Invalid
X1.2	0,961	Valid
X2 (Environmental Cost)		
X2.1	0,952	Valid
X2.2	0,315	Valid
X3 (Green Product Innovation)		
X3.1	1,000	Valid
Y (Carbon Emissions Disclosure)		
Y	1,000	Valid
Z (Kinerja Keuangan)		
Z1	0,962	Valid
Z2	0,903	Valid
Z3	0,842	Valid

Source: Data Processed with SmartPLS, 2024

Table 4 shows that there are several variables that have been valid because the loading factor value is above 0.70. However, there are 2 invalid items because they have a loading factor value below 0.70, namely the first carbon performance variable and the second environmental cost variable. Furthermore, it is necessary to eliminate items to eliminate invalid items.

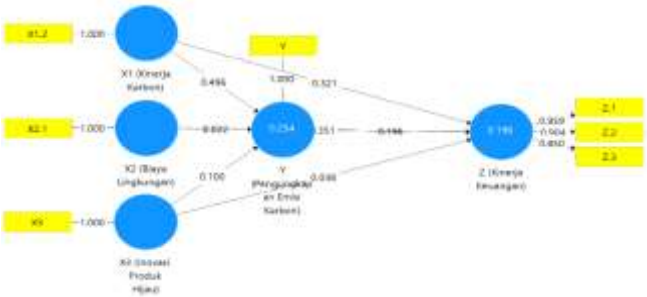

Figure 5
Final Structural Model

Table 5
Final Loading Factor

Indicator/Variable	Factor loading	Description
X1 (Carbon Performance)		
X1.2	1,000	Valid
X2 (Environmental Costs)		
X2.1	1,000	Valid
X3 (Green Product Innovation)		
X3	1,000	Valid
Y (Carbon Emissions Disclosure)		
Y	1,000	Valid
Z (Financial Performance)		
Z1	0,959	Valid
Z2	0,904	Valid
Z3	0,850	Valid

Source: Data Processed with SmartPLS, 2024

Table 4 above shows the results after the elimination process, where all variable items have proven valid. This is due to the loading factor value that exceeds 0.70. In addition to the loading factor value, the validity analysis of the research data can also be carried out using the Average Variance Extracted (AVE) value. The following are the results of the validity test using the AVE value.

Table 6
AVE Testing Results

	Average Variance Extracted (AVE)
X1 (Carbon Performance)	1,000
X2 (Environmental Cost)	1,000
X3 (Green Product Innovation)	1,000
Y (Carbon Emissions Disclosure)	1,000
Z (Financial Performance)	0,820

Source: Data Processed with SmartPLS, 2024

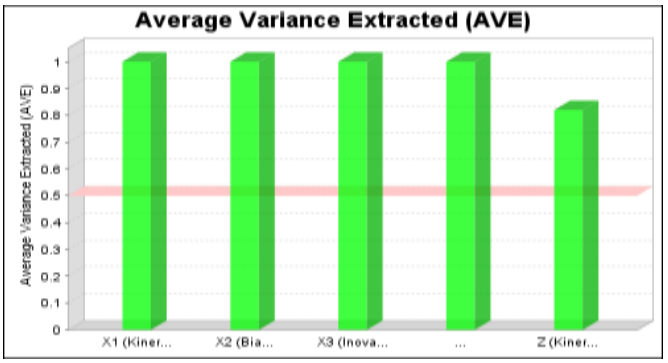

Figure 6
Average Variance Extracted (AVE)

Table 6 and Figure 6 above show that all research variables are valid. This is because the AVE value is above the requirement of 0.50.

a. Discriminant Validity Test

Discriminant validity tests can be carried out using the Fornell-Lacker criteria. In the

Fornell-Lacker criterion, discriminant validity is evaluated by comparing the correlation between variables with the Average Variance Extracted (AVE) of these variables. The discriminant validity measurement model is considered good if the AVE value of the variable itself is greater than the correlation between the variable and other variables. The overall AVE value can be found in the following table:

Table 7
Fornell Lacker

	X1 (Carbon Performance)	X2 (Environmental Cost)	X3 (Green Product Innovation)	Y (Carbon Emissions Disclosure)	Z (Financial Performance)
X1 (Carbon Performance)	**1,000**				
X2 (Environmental Cost)	0,006	**1,000**			
X3 (Green Product Innovation)	-0,016	0,191	**1,000**		
Y (Carbon Emissions Disclosure)	0,494	0,000	0,088	**1,000**	
Z (Financial Performance)	-0,221	0,342	0,051	0,034	**0,905**

Source: Data Processed with SmartPLS, 2024

Table 7 above shows that the variable correlation value is greater than the correlation of other variables, therefore it is concluded that all variables are valid for use. In addition to testing with the Fornell-Lacker criterion, discriminant validity can also be tested by looking at the Cross Loading value. An indicator is considered to meet discriminant validity if the cross loading value on its dimension on that variable is the highest compared to other variables. The following are the results of the cross loading value.

Table 8
Results of Cross Loading Value

	X1	X2	X3	Y	Z
X1.2	**1.000**	0.006	-0.016	0.494	-0.221
X2.1	0.006	**1.000**	0.191	0.000	0.342
X3	-0.016	0.191	**1.000**	0.088	0.051
Y	0.494	0.000	0.088	**1.000**	0.034
Z.1	-0.240	0.470	0.037	0.021	**0.959**
Z.2	-0.168	0.134	-0.005	0.043	**0.904**
Z.3	-0.154	0.134	0.129	0.044	**0.850**

Source: Data Processed with SmartPLS, 2024

a. Reliability Test

Reliability reflects the level of accuracy, consistency, and reliability of the measuring device in making measurements. If a study is considered reliable, then the research data has

proven to be reliable and consistent. In Partial Least Squares (PLS) analysis, reliability testing can be done using two methods, namely Cronbach's alpha and Composite reliability.

Table 9
Composite Reliability Test Results

	Composite Reliability
X1 (Carbon Performance)	1,000
X2 (Environmental Cost)	1,000
X3 (Green Product Innovation)	1,000
Y (Carbon Emissions Disclosure)	1,000
Z (Financial Performance)	0,932

Source: Data Processed with SmartPLS, 2024

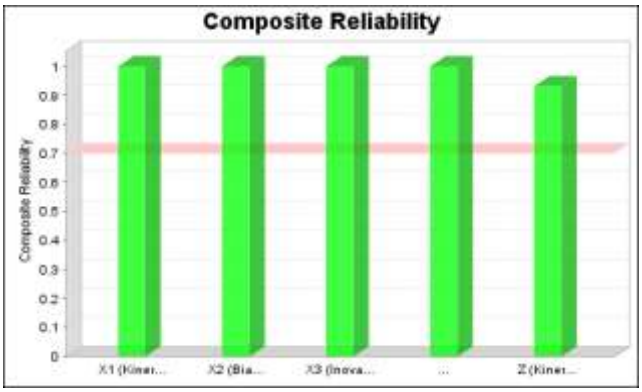

Figure 7
Composite Reliability

Table 8 and Figure 7 above show that all constructs in the study are declared reliable because the Composite Reliability value for each construct exceeds 0.70.

Table 10
Cronbach Alpha Test Results

	Cronbach's Alpha
X1 (Carbon Performance)	1,000
X2 (Environmental Cost)	1,000
X3 (Green Product Innovation)	1,000
Y (Carbon Emissions Disclosure)	1,000
Z (Financial Performance)	0,901

Source: Data Processed with SmartPLS, 2024

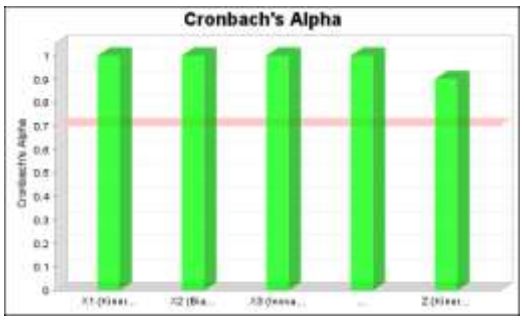

Figure 8
Cronbach Alpha

Table 10 and figure 8 above show that all constructs in the study are declared reliable because the Cronbach's Alpha value for each construct exceeds 0.70.

a. Inner Model Analysis

Test Coefficient of Determination (R2)

After the estimated model meets the requirements on the Outer Model, the next step is testing the Structural Model (Inner Model) by the researcher, the following is the R-Square (R2) value on the research construct:

Table 11
Determination Coefficient Test

	R Square	R Square Adjusted
Y (Carbon Emissions Disclosure)	0,254	0,209
Z (Financial Performance)	0,196	0,130

Source: Data Processed with SmartPLS, 2024

Table 10 above shows that the R-Square value for the carbon emission disclosure construct is 0.254, indicating that this model has a good level of goodness-fit model. This also means that the variability of carbon emission disclosure can be explained by the three variables in the model, namely carbon performance, environmental costs and green product innovation by 25.4%.

The R-Square value for the carbon emission disclosure construct of 0.196 indicates that this model has a good level of goodness-fit model. This also means that the variability of financial performance can be explained by the four variables in the model, namely carbon performance, environmental costs of green product innovation and disclosure of carbon emissions by 19.6%.

Hypothesis Testing

a. Significance Test t

To see the significance results of the parameter coefficients, it can be calculated from the valid variable dimensions. To determine whether there is a positive or negative effect as well as statistical significance, it is measured through P Values that must be less than 0.05 and t-statistics that are at least greater than or equal to 1.96. If the t-statistic exceeds the specified value (1.96), then the correlation between the two constructs is considered significant; whereas if the t-statistic is lower than the specified value (1.96), the correlation

is considered insignificant.

Table 12
Significance Test of Direct Effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
X1 (Carbon Performance) -> Y (Carbon Emissions Disclosure)	0,496	0,494	0,069	7,182	**0,000**
X2 (Environmental Costs) -> Y (Carbon Emissions Disclosure)	-0,022	-0,023	0,063	0,344	**0,731**
X3 (Green Product Innovation) -> Y (Carbon Emissions Disclosure)	0,100	0,100	0,048	2,073	**0,039**
X1 (Carbon Performance) -> Z (Financial Performance)	-0,321	-0,322	0,047	6,782	**0,000**
X2 (Environmental Cost) -> Z (Financial Performance)	0,351	0,358	0,072	4,903	**0,000**
X3 (Green Product Innovation) -> Z (Financial Performance)	-0,038	-0,038	0,060	0,640	**0,522**
Y (Carbon Emissions Disclosure) -> Z (Financial Performance)	0,196	0,198	0,055	3,555	**0,000**

Source: Data Processed with SmartPLS, 2024

Table 12 above shows the results for the research hypothesis are as follows:

a. Carbon Performance on Carbon Emissions Disclosure

Table 11 shows that the original sample estimate value of the carbon performance variable on the carbon emission disclosure variable is positive at 0.496. In addition, the t statistic of 7.182 ≥ 1.96 and pValues of 0.000 < 0.05 so that it can be said to have a significant effect. Thus, the hypothesis in this study is accepted. In conclusion, carbon performance has a positive and significant effect on carbon emission disclosure.

The results showed that carbon performance has a positive effect on carbon emission disclosure. This means that companies with good carbon performance are motivated to disclose carbon emissions more widely.

Companies that demonstrate consistently good carbon performance have been shown to increase their carbon emissions disclosure levels. This is due to their motivation to communicate the steps they have taken to improve their carbon performance, as well as to differentiate themselves from companies with low carbon performance.

b. Environmental Costs on Carbon Emissions Disclosure

Table 11 shows that the original sample estimate value of the carbon performance variable on the carbon emission disclosure variable is negative at -0.022. Then, it can be seen that the t statistic is 0.344 < 1.96 and pValues of 0.731 > 0.05 so that it can be said that it has no significant effect. Thus, the hypothesis in this study is rejected. In conclusion, environmental costs have a negative but insignificant effect on the disclosure of carbon emissions.

The amount of environmental costs incurred by companies has not yet had an impact that encourages companies to disclose carbon emissions. This situation could be due to a lack of resources for companies to integrate carbon emissions disclosures into their sustainability reports. In addition, companies may already feel that the information on environmental costs they convey is sufficient so that companies do not disclose carbon emissions.

c. Green Product Innovation on Carbon Emissions Disclosure

Table 11 shows that the original sample estimate value of the green product innovation variable on the carbon emission disclosure variable is positive at 0.100. Then, it can be seen that the t statistic of 2.073 ≥ 1.96 and pValues of 0.039 < 0.05 so that it can be said to have a significant effect. Thus, Hypothesis H3 in this study is accepted. The conclusion is that green product innovation has a positive and significant effect on carbon emission disclosure.

The findings suggest that the adoption of green product innovations by companies can be a motivation for companies to disclose carbon emissions. Green products are made with attention to energy efficiency, efficient use of raw materials, and easy recycling. This more efficient use of resources can reduce the costs that must be incurred by the company. The adoption of green product innovation by companies not only aims to improve the efficiency and financial performance of the company, but also gives serious attention to environmental issues.

d. Carbon Performance on Financial Performance

Table 11 shows that the original sample estimate value of the carbon performance variable on the financial performance variable is negative at -0.321. Then, it can be seen that the t statistic is 6.782 ≥ 1.96 and pValues of 0.000 < 0.05 so that it can be said to have a significant effect. Thus, Hypothesis H4 in this study is accepted. The conclusion is that carbon performance has a negative and significant effect on financial performance.

Improved carbon performance contributes to improved financial performance of the company. It shows that companies can achieve low levels of carbon emissions while still maintaining high levels of sales. Companies that have low carbon emissions are considered to be able to manage their assets efficiently and conduct business in an environmentally friendly manner.

e. Environmental Costs on Financial Performance

Table 11 shows that the original sample estimate value of the carbon performance variable on the financial performance variable is positive at 0.351. Then, it can be seen that the t statistic is 4.903 ≥ 1.96 and pValues of 0.000 < 0.05 so that it can be said to have a significant effect. Thus, Hypothesis H5 in this study is accepted. The conclusion is that environmental costs have a positive and significant effect on financial performance.

Allocating costs to environmental management shows the consistency of the company's concern for the environment, thus strengthening public trust in corporate social responsibility. These environmental costs can be considered as a long-term investment, because the money spent now can provide a good reputation for the company, thus increasing stakeholder confidence in the company.

f. Green Product Innovation on Financial Performance

Table 11 shows that the original sample estimate value of the green product innovation variable on the financial performance variable is negative at -0.038. Then, it can be seen that the t statistic is 0.640 < 1.96 and the pValues are 0.522> 0.05 so it can be said that it has no significant effect. Thus, Hypothesis H6 in this study is accepted. The conclusion is that green product innovation has a negative but insignificant effect on financial performance.

The findings suggest that firms' adoption of green product innovation does not result in improved financial performance. This indicates that while firms may integrate green product innovation into their products, it does not necessarily provide significant value in the eyes of investors. This suggests that environmentally friendly products are not necessarily a factor that drives wealth creation or increased profitability.

g. Disclosure of Carbon Emissions on Financial Performance

Table 11 shows that the original sample estimate value of the carbon emission disclosure variable on the financial performance variable is positive at 0.196. Then, it can be seen that the t statistic is 3.555 ≥ 1.96 and pValues of 0.000 < 0.05 so that it can be said to have a significant effect. Thus, Hypothesis H7 in this study is accepted. In conclusion, the disclosure of carbon emissions has a positive and significant effect on financial performance.

This finding provides support for signaling theory, which states that disclosure of carbon emissions can send a positive signal to consumers that the company is involved in climate change mitigation efforts. This can be attractive to consumers and potentially improve the company's financial performance. Therefore, companies have the opportunity to strengthen stakeholder trust.

Table 13
Significance Test of Indirect Effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
X1 (Carbon Performance) -> Y (Carbon Emissions Disclosure) -> Z (Financial Performance)	0,097	0,100	0,036	2,663	**0,008**
X2 (Environmental Costs) -> Y (Carbon Emissions Disclosure) -> Z (Financial Performance)	-0,004	-0,006	0,013	0,317	**0,751**
X3 (Green Product Innovation) -> Y (Carbon Emissions Disclosure) -> Z (Financial Performance)	0,020	0,019	0,010	1,976	**0,049**

Source: Data Processed with SmartPLS, 2024

Table 12 above shows the results for the research hypothesis are as follows:

a. Carbon Performance on Financial Performance through Disclosure of Carbon Emissions

Table 12 shows that the original sample estimate value of the carbon performance variable on the financial performance variable through the carbon emission disclosure variable is positive at 0.097. Then, it can be seen that the t statistic of 2.663 ≥ 1.96 and pValues of 0.008 < 0.05 so that it can be said to have a significant effect. Thus, Hypothesis H8 in this study is accepted. The conclusion is that carbon performance has a positive and significant effect on financial performance through the disclosure of carbon emissions.

The results indicate that the disclosure of carbon emissions is able to strengthen the relationship between carbon performance and corporate financial performance. With the disclosure of carbon emissions, the improvement of the company's carbon performance can be accounted for so that it will improve the company's financial performance.

b. Environmental Costs on Financial Performance through Carbon Emissions Disclosure

Table 12 shows that the original sample estimate value of the environmental cost variable on the financial performance variable through the carbon emission disclosure variable is negative at -0.004. Then, it can be seen that the t statistic is 0.317 < 1.96 and pValues of 0.751 > 0.05 so that it can be said that it has no significant effect. Thus, Hypothesis H9 in this study is rejected. The conclusion is that environmental costs have a negative but insignificant effect on financial performance through the disclosure of carbon emissions.

The results indicate that the disclosure of carbon emissions is not able to strengthen the relationship between environmental costs and corporate financial performance. This suggests that environmental costs have a direct influence on financial performance.

c. Green Product Innovation on Financial Performance through Carbon Emissions Disclosure

Table 12 shows that the original sample estimate value of the green product innovation variable on the financial performance variable through the carbon emission disclosure variable is positive at 0.020. Then, it can be seen that the t statistic is 1.976 ≥ 1.96 and pValues of 0.049> 0.05 so that it can be said to have a significant effect. Thus, Hypothesis H10 in this study is accepted. The conclusion is that green product innovation has a positive and significant effect on financial performance through disclosure of carbon emissions.

The results indicate that disclosure of carbon emissions can strengthen the relationship between green product innovation and corporate financial performance. The implementation of green product innovation can help companies improve their financial performance through high product sales.

CONCLUSION

The results showed that carbon performance and green product innovation have a positive and significant effect on carbon emission disclosure. Environmental costs have a negative but insignificant effect on the disclosure of carbon emissions. Carbon performance has a negative and significant effect on financial performance. Environmental costs have a positive and significant effect on financial performance. Green product innovation has a negative but insignificant effect on financial performance. Disclosure of carbon emissions has a positive

and significant effect on financial performance. Carbon performance and green product innovation have a positive and significant effect on financial performance through disclosure of carbon emissions. Environmental costs have a negative but insignificant effect on financial performance through disclosure of carbon emissions.

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