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Research Article

The Effect of Green Innovation, Enviromental, Social and Governance Disclosure, Financial Performance on Value of Corporate with Carbon Tax as A Moderating Variable in Energy Companies Listed on the Indonesia Stock Exchange

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Abstract. In the industrial world, especially energy companies are very vulnerable to increasing carbon emissions. Based on the graph managed by the Ministry of Environment and Forestry, it shows that the greenhouse gas emissions that contribute most are the forestry and energy sectors. So that in 2021 Indonesia has officially adopted a carbon tax policy by issuing Law no. 7 of 2021. The purpose of this study is to test and analyze the significant effect of Green innovation, Environmental, Social and Governance Disclosure and financial performance on the Value of corporations with carbon tax as a moderating variable and applying carbon performance as an intervening variable. The method in this study is to take samples by purposive sampling in the form of secondary data, namely financial statements and sustainability reports in 2021 to 2024 on the Indonesian stock exchange, with a sample of 27 companies. To determine the significance of results between variables, researchers use SEM-PLS 3 software. The results of this study are that financial performance has a positive and significant relationship to carbon performance with a t-statistic value of 3.497> 1.96, namely that increasing financial performance can affect carbon performance in reducing greenhouse gas emissions. for the next variable, carbon performance has a positive and significant relationship to company value by showing a t-statistic value of 2.596> 1.96 with the assumption that increasing carbon performance in reducing greenhouse gas emissions will increase the company's value and be trusted by investors and the public. And the last is that financial performance has a negative and significant relationship to company value with carbon performance as an intervening variable, this shows a t-statistic value of 1.994> 1.96, with increasing financial performance can affect carbon performance so that greenhouse gas emissions can be reduced and the company's value increases

Keywords : Green innovation, Environmental, Social, Financial performance, Carbon performance.

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1. INTRODUCTION

Indonesia has set a commitment to reduce Greenhouse Gas (GHG) emissions through the Nationally Determined Contribution (NDC) with an emission reduction target of 29% unconditionally (with its own efforts) and 41% conditionally (with international support) by 2030. In 2022, the emission reduction target was revised to 31.89% unconditionally and 43.20% conditionally through the Enhanced Nationally Determined Contribution (ENDC) with the vision of achieving Net Zero Emissions (NZE) by 2060 or sooner (UNFCC, 2022). At the Annual Indonesia Green Industry Summit (AIGIS) on September 19, 2024, Minister of Industry Agus Gumiwang Kartasasmita stated that the Ministry of Industry (Kemenperin) is targeting Net Zero Emission (NZE) in the industrial sector to be achieved in 2050 or 10 years earlier than the national NZE target in 2060. The level of GHG emissions in the industrial sector in Indonesia throughout 2015-2022 was 8-20% compared to the total national GHG emissions. The composition of the largest emission sources in the manufacturing sector in 2022 is industrial energy (64%), industrial waste (24%), and industrial process and product use at 12% (Hakim in Meilani Hilma, 2024).

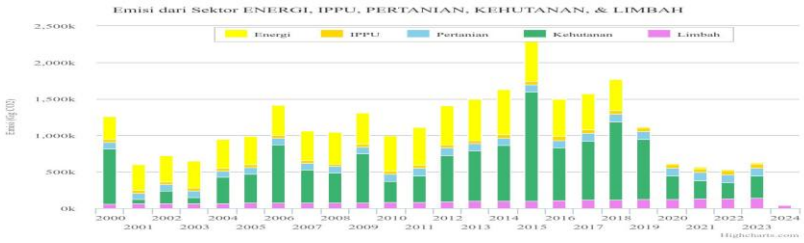

Figure 1. of Environment and Forestry

Source: smart sign (national GHG inventory application) by KLHK

Based on the graph managed by the Ministry of Environment and Forestry (KLHK) above, it shows that the greenhouse gas emissions that contribute the most are the forestry and energy sectors. So that in 2021 Indonesia has officially adopted a carbon tax policy by issuing Law no. 7 of 2021 concerning the harmonization of tax regulations and presidential regulation (PP) number 98 of 2021 concerning the implementation of carbon economic values. According to Joko Tri Haryanto as a researcher at the Ministry of Finance's BKF, the planning for the implementation of the carbon tax was originally effective on April 1, 2022, but this was postponed due to the invasion of Russia and Ukraine and several foreign conflicts that delayed the implementation of the carbon tax.

The phenomenon that occurred in Indonesia was an increase and decrease in the energy company sector that occurred in the period 2021 to 2024, namely with the lowest value of 51.72 in 2021 and the highest value in 2022 57.23. so this can be an indication of a lack of disclosure of ESG disclosure, an increase in quality related to green innovation, carbon performance that is not properly accommodated so that carbon emissions increase and companies have to spend a lot of money on processing the waste produced so that the company's profitability decreases due to a lack of trust from investors and the public. This can be seen from the picture:

Figure 2. Value Graph

Source: data processed by researchers, 2025

In this study, the influence of *green innovation* , with the approach of *Environmental, Social and Governance disclosure* , and financial performance on *the value of corporation* . This aims to determine how the impact of company operations on the environment, if a company's energy consumption increases so that it has a negative impact on the environment, and how the company contributes to the affected community, maintaining good relations with customers and suppliers. With *green innovation,* companies can manage waste into products that have economic value and can increase profitability.

According to (Habib et al., 2025) by integrating Environmental, Social and Governance disclosure, corporate green finance can manage financial resources efficiently with environmentally friendly advantages. So that in his research green finance and Environmental, Social and Governance disclosure are positively and significantly related. So that in further research it is revealed that the company's competitive advantage in terms of financing moderates the relationship between green finance, Environmental, Social and Governance disclosure and corporate performance.

According to (Zhao et al., 2024) in their research revealed that manufacturing companies are very polluting. This study has a variable of the impact of environmental taxes on technological innovation and company performance. The results of this study are that company performance and quantity of innovation are positively influenced by environmental taxes. The average impact of environmental taxes on company performance and quantity of innovation is 1.28 & 0.19.

However, environmental taxes do not have a significant impact on the quality of innovation. So that the mechanism of innovation quantity becomes a significant partial mediation and has a positive impact on environmental taxes on company performance.

Opinion (Subhani et al., 2025) who conducted a study on the impact of Environmental, Social and Governance disclosure investment on corporate debt financing in BRICS countries (Brazil, Russia, India, China and South Africa throughout 2010 to 2022. The main aspect is to reveal the company's competitive advantage in terms of financing moderates the relationship between green finance, Environmental, Social and Governance disclosure, and corporate performance. The findings in this study are the generalized method of moment shows a negative correlation between Environmental, Social and Governance disclosure investment and CDF, by showing an increase in Environmental, Social and Governance disclosure commitments that previously limited debt financing. A strong financial sector offers substantial funds with loose requirements. The results show that sustainable practices can strengthen competitive advantage and financial performance, highlighting the importance of advancing FSD and incorporating Environmental, Social and Governance disclosure factors into corporate finance.

Based on the description of several studies above, it shows that there is an inconsistent influence between *green innovation* , *environmental, social and governance disclosure* and financial performance. So this study adds variables, carbon performance, *corporate value* with carbon tax as a moderation is ***a research gap*** . **novelty** in this study is to add the latest moderation variables, namely carbon tax and carbon performance and *corporate value* . With the latest policy related to carbon tax in Indonesia as evidence of the company's contribution to the development of *green innovation* with minimal risk of significant environmental damage so that investors can assess the company from the sustainability report. In every innovation and review of renewable energy requires more costs in the development process. So in this study using several indicators that support all variables. The application of *green innovation* with *Environmental, Social and Governance disclosure* and financial performance as variables that influence a company so that impact on the carbon produced so that it does not exceed the threshold which will result in higher carbon tax costs.

Based on ***the novelty*** above, this study is important to be studied because it is expected to provide theoretical and practical contributions. so that investors can provide significant assessments and decision-making by considering several variables, namely *green innovation* , *Environmental, Social and Governance disclosure* , financial performance, and carbon tax as a moderation between carbon performance and *corporate value* with the object of the energy sector company where the data collection for study is from secondary data on the Indonesian stock exchange and *sustainability reports* in 2020 to 2024.

Problem formulation

1. Does *green innovation* have a significant impact on carbon performance in energy companies listed on the Indonesia Stock Exchange?
2. Does *green innovation* have a significant effect on *corporate value* in energy companies listed on the Indonesia Stock Exchange?
3. Does *Environmental, Social and Governance disclosure* have a significant effect on carbon performance in Energy companies listed on the Indonesia Stock Exchange?
4. Does *Environmental, Social and Governance disclosure* have a significant effect on *corporate value* in energy companies listed on the Indonesia Stock Exchange?
5. Does financial performance have a significant effect on carbon performance in energy companies listed on the Indonesia Stock Exchange?
6. Does financial performance have a significant effect on *corporate value* in energy companies listed on the Indonesia Stock Exchange?
7. Does carbon performance have a significant effect on *corporate value* in energy companies listed on the Indonesia Stock Exchange?
8. Does carbon tax moderate the relationship between carbon performance and *corporate value* in energy companies listed on the Indonesia Stock Exchange?

2. METHOD

The essence of the research method is a scientific way to obtain data/information as it is and not as it should be with certain goals and uses. There are 4 keys in the research method, namely the scientific way, data, goals and certain uses (Sugiyono, 2006). The data obtained through this research is valid, reliable and objective empirical data.

Quantitative methods are also called traditional positivistic methods. Scientific, and discovery methods. so this method is often used in research. Quantitative research itself is a systematic scientific study of parts and phenomena and their supporting variables. Quantitative research is a research design that focuses on design problems, measurements and planning that are clearly detailed before sample collection and data analysis (sutinah, 2007).

The researcher took a population with the criteria of companies that reported sustainability reports on the company website and financial statements on the Indonesian Stock Exchange from 2019 to 2024 in the energy sector, as many as 90 companies.

Sample is a part of population members taken using sampling technique (Husain and Purnomo, 2001). is a data collection technique with purposive sampling method that is specifically selected in the basic material and energy sector listed on the Indonesian stock exchange, which will be used as a reference for drawing conclusions according to the criteria desired by the researcher. The sample to be used in this study is 27 samples from 90 populations.

Table 1. Selection Selection

Number of research population	90
Sampling criteria: 1. Not publishing financial reports and incomplete financial reports during the 2021 – 2024 research period 2. Not publishing a complete sustainability report during the 2021 – 2024 research period 3. The recording date occurred during the 2021 – 2024 research period so the data is not complete each year.	(20) (20) (23)
Number of research observations	27
Multiplied by the year of research (x 4 years)	108
Number of research samples used	108

Source: researcher's processing

Table 1. Sample Energy Sector Companies

No	Kode	Nama Perusahaan	Tanggal Pencatatan	Saham	Papan Pencatatan
1	ABMM	ABM Investama Tbk.	06 Des 2011	2.753.165.000	Utama
2	ADRO	Alamtri Resources Indonesia Tb	16 Jul 2008	30.758.665.900	Utama
3	AKRA	AKR Corporindo Tbk.	03 Okt 1994	20.073.474.600	Utama
4	BUMI	Bumi Resources Tbk.	30 Jul 1990	371.335.392.068	Utama
5	BYAN	Bayan Resources Tbk.	12 Agt 2008	33.333.335.000	Utama
6	DEWA	Darma Henwa Tbk	26 Sep 2007	40.687.434.244	Utama
7	DSSA	Dian Swastatika Sentosa Tbk	10 Des 2009	7.705.523.200	Utama
8	ENRG	Energi Mega Persada Tbk.	07 Jun 2004	24.821.230.250	Utama
9	GEMS	Golden Energy Mines Tbk.	17 Nov 2011	5.882.353.000	Utama
10	HRUM	Harum Energy Tbk.	06 Okt 2010	13.518.100.000	Utama
11	INDY	Indika Energy Tbk.	11 Jun 2008	5.210.192.000	Utama
12	MBAP	Mitrabara Adiperdana Tbk.	10 Jul 2014	1.227.271.952	Pengembangan
13	MBSS	Mitrabahtera Segara Sejati Tbk	06 Apr 2011	1.750.026.639	Utama
14	MEDC	Medco Energi Internasional Tbk	12 Okt 1994	25.136.231.252	Utama
15	MYOH	Samindo Resources Tbk.	27 Jul 2000	2.206.312.500	Utama
16	PGAS	Perusahaan Gas Negara Tbk.	15 Des 2003	24.241.508.196	Utama
17	PTBA	Bukit Asam Tbk.	23 Des 2002	11.520.659.250	Utama
18	PTRO	Petrosea Tbk.	21 Mei 1990	10.086.050.000	Utama
19	RAJA	Rukun Raharja Tbk.	19 Apr 2006	4.227.082.500	Utama
20	RUIS	Radiant Utama Interinsco Tbk.	12 Jul 2006	770.000.000	Pengembangan
21	SMMT	Golden Eagle Energy Tbk.	01 Des 1997	3.425.000.000	Pengembangan
22	TOBA	TBS Energi Utama Tbk.	06 Jul 2012	8.167.826.970	Utama
23	WINS	Wintermar Offshore Marine Tbk.	29 Nov 2010	4.364.837.057	Utama
24	SHIP	Sillo Maritime Perdana Tbk.	16 Jun 2016	2.719.790.000	Utama
25	TCPI	Transcoal Pacific Tbk.	06 Jul 2018	5.000.000.000	Pengembangan
26	TEBE	Dana Brata Luhur Tbk.	18 Nov 2019	1.285.000.000	Utama
27	MCOL	Prima Andalan Mandiri Tbk.	07 Sep 2021	3.555.560.000	Utama

Source: Indonesian Stock Exchange

Variable Indicator

1. Green innovation (X1)

Green process innovation

1. Reduce consumption and increase resource & energy efficiency
2. Using recycling techniques, recycled materials, and environmental technologies
3. Hold environmental campaigns
4. Using equipment to control pollution
5. Adopt pollution control technologies & projects

Green product innovation

The measurement of green *innovation* in this study was carried out in three ways, namely disclosing environmentally friendly green product innovation items, modifying products to increase energy efficiency and changing product design to minimize carbon emissions referring to research by Xie *et al* (2019).

Measurement can be done by using the content analysis method and giving a score of 0 for each item that is not disclosed 1 for each item disclosed in the form of a descriptive narrative and 2 for each item disclosed in the form of a descriptive narrative along with supporting quantitative data by the company in the annual report, then the value of each item disclosed by the company is added up and divided by the number of disclosure items. The formula for the green process innovation indicator is

$$\text{Inovasi Hijau} = \frac{\sum \mathbf{X}}{\text{N}}$$

2. *Environmental, Social and Governance disclosure* (X2)

This is based on 3 factors in the disclosure of *Environmental, Social and Governance Disclosure* , namely those related to:

Environment

(1) Greenhouse gas emissions *Environmental, Social and Governance disclosure*

With the amount of CO2 produced scope 1 & 2 (2) *Environmental, Social and Governance disclosure of energy use* with the total energy consumed, both renewable and non-renewable *(3) Environmental, Social and Governance disclosure* of water use with volume of water consumed (4) *Environmental, Social and Governance waste* management *disclosure* with the amount of solid and liquid waste *(5) Environmental, Social and Governance disclosure* energy efficiency initiatives with descriptions of energy consumption reductions

Social

(1) Training and development of human resources, *environmental, social and governance Disclosure* with average training hours per employee per year (2) Occupational health and safety, *Environmental, Social and Governance* Disclosure of the number of work accidents and prevention initiatives (3) Diversity and inclusion *Environmental, Social and Governance Disclosure* with gender and age composition in management (4) *Environmental, Social and Governance disclosure* with community empowerment culture (5) Freedom of association *Environmental, Social and Governance disclosure* with percentage of employees who are members of unions

Governance

(1) Composition of the board of directors and commissioners *Environmental, Social and Governance disclosure* with the number of board members, gender ratio (2) Remuneration structure *Environmental, Social and Governance disclosure* with transparent information on the payroll system (3) Anti-corruption mechanism *Environmental, Social and Governance disclosure* with the number of anti-corruption training or case reports (4) Internal and external audits *Environmental, Social and Governance Disclosure* with reports of independent external audit results (5) Code of ethics and governance *Environmental, Social and Governance disclosure* with description of the company's code of ethics and sanctions.

The formula used for this research is:

$$\text{Index ESG} = \frac{\textbf{\textit{ESG Disclosure} Indicator Score}}{\textbf{Maximum number of scores}} \text{ X } 100\%$$

The value for the disclosure item is 1 if the disclosure is in the form of a narrative, 2 if the data disclosure is in the form of a narrative and quantitative data and if the company does not disclose the item, the value is 0. Where each indicator has a different assessment point, including: environmental indicators for each disclosure value multiplied by 5 points, social indicators for each disclosure value multiplied by 3 points and governance indicators for each disclosure value multiplied by 3 points. This is used to determine how high the *Environmental, Social and Governance disclosure* is carried out by the company in *the sustainability report* .

3. Financial performance (X3)

Financial performance is an analysis carried out to see to what extent the company has implemented financial implementation regulations properly and correctly (Hutabarat, F. 2020:2).

According to Lukas Setia Atmaja, Ph.D (2008:417), there are 4 types of profitability ratios, namely ROA, ROE, NPM and BEP. Meanwhile, according to Hanafi and Abdul Halim (2016:81), there are 3 types of profitability ratios, namely ROA, ROE and PM.

$$\text{ROA} = \frac{\text{Net profit}}{\text{Total Assets}}$$

$$\text{ROE} = \frac{\text{Net profit}}{\text{Total Equity}}$$

$$\text{NPM} = \frac{\text{Net profit}}{\text{Income}}$$

4. Carbon Performance (Z)

Total GHG Emissions = Scope 1 + Scope 2 + Scope 3

Scope 1 = Direct GHG emissions

Scope 2 = Indirect GHG emissions

Scope 3 = Other indirect GHG emissions

$$\text{Kinerja Karbon} = \frac{\sum \text{Total GHG Emissions}}{\text{Net income}}$$

5. Carbon tax (M)

Carbon tax is a tax imposed on the use of carbon dioxide. carbon-based fuel. In accordance with Law no. 7 of 2021 concerning tax harmonization and Presidential Regulation 98 of 2021 concerning the implementation of net carbon emissions. The rates are regulated through PMK regulations regularly through a consultation process with the DPR, in Law no. 7 of 2021 concerning HPP, namely the minimum carbon tax rate is IDR 30,000 per kilogram of carbon dioxide equivalent (CO2e) or equivalent unit.

BPK = Carbon Tax Rate X Total CO $_{2\ \text{Emissions}}$

$$\text{PCT} = \frac{\text{BPK}}{\text{Total Emisi } CO_2}$$

6. *Value of Corporate* (company value) (Y)

$$\text{Tobin's Q} = \frac{\text{Market value of shares outstanding + Total } \textit{Liabilities}}{\text{Total Company Assets}}$$

Data Analysis Techniques

1. Structural Equation Modeling (SEM)

Structural Equation Modeling (SEM) is one of the multivariate analysis techniques that is widely used in research in the fields of social sciences, business, management and marketing according

to Juniarty, Wijayanti Anna Cynthia (2025) . This study aims to test and analyze the causal relationship between variables while examining the validity and reliability of the research as a whole. The analysis used is PLS SEM. The model in this study is structural PLS by describing the relationship of influence between research variables or research hypotheses that are built.

Model Identification

A. Collinearity test

Collinearity between independent / exogenous variables, if inner VIF > 5 then there is a suspicion of multicollinearity. So it is better if VIF < 5 there will be no multicollinearity problem.

B. Significance Test (Hypothesis)

- **T-Value value** for testing 2 directions, namely 1.65 (significant level = 10%), 1.96 (significant level = 5%) and 2.58 (significant level = 1%)
- P-Value if < 0.05 then the variables are significant

C. Reliability Test

1. Convergent Validity

Convergent Validity Test is based on the outer loading and AVE values. The provisions used are the outer loading value ≥ 0.5 so that an item is declared valid and the AVE value is ≥0.5 so that the research variable is declared valid.

2. Discriminant Validity

- The Fornell Larcker approach shows a discriminant validity test if the square root of AVE of each research variable is greater than the correlation of the square root of AVE with other variables.
- Heterotrait-Monotrait Ration (HTMT) approach, if the discriminant validity test shows that each variable produces a value ≤0.85, then it meets the requirements.

3. Construct Reliability

This test is conducted to test the reliability of the variants in the research model. Where the construct test can be seen from the composite reliability value and Croncbach's alpha with a value greater than 0.7, it is stated that all variables are reliable based on composite reliability.

D. Model Quality Evaluation

- R-Square Test

- The R-Square test is used to show how much the independent variable is able to explain the dependent variable.

- An R-Square value of 0.75 means a high substance influence, 0.50 moderate and 0.25 weak according to (Hair et al 2019)

- The R-Square value of 0.67 means 0.67 (high), 0.33 (moderate) and 0.19 (weak) according to (Chin 1998)

- Q-Square Test

- The Q-Square test is used to test how much accuracy the model has *predictive relevance* . If the Q square is greater than 0, it indicates that the exogenous variable has *predictive relevance* to the endogenous variable. Based on the *blindfolding procedure*

- The Q – Square value is 0 (low), 0.25 (moderate) and 0.50 (high) in *predictive accuracy*

3. RESULTS

The variables in this study include:

- *Green innovation* (X1) as a latent variable with green product and green process indicators.
- *Environmental, Social and Governance disclosure* (X2) as a latent variable with environmental, social and governance indicators.
- Financial performance (X3) as a latent variable with ROA, ROE and NPM indicators
- *Value of corporate* (Y) as a manifest variable

- Carbon tax (M) as a manifest variable
- Carbon performance (Z) as a manifest variable

Validity test with convergent validity (outer loading)

Validity test according to Rizkia et al (165:2023) Convergent Validity Test is based on the outer loading value. The provision used is the outer loading value ≥ 0.5 for an item to be declared valid. and the following is the output of the outer model with SMART-PLS 3:

Outer Model

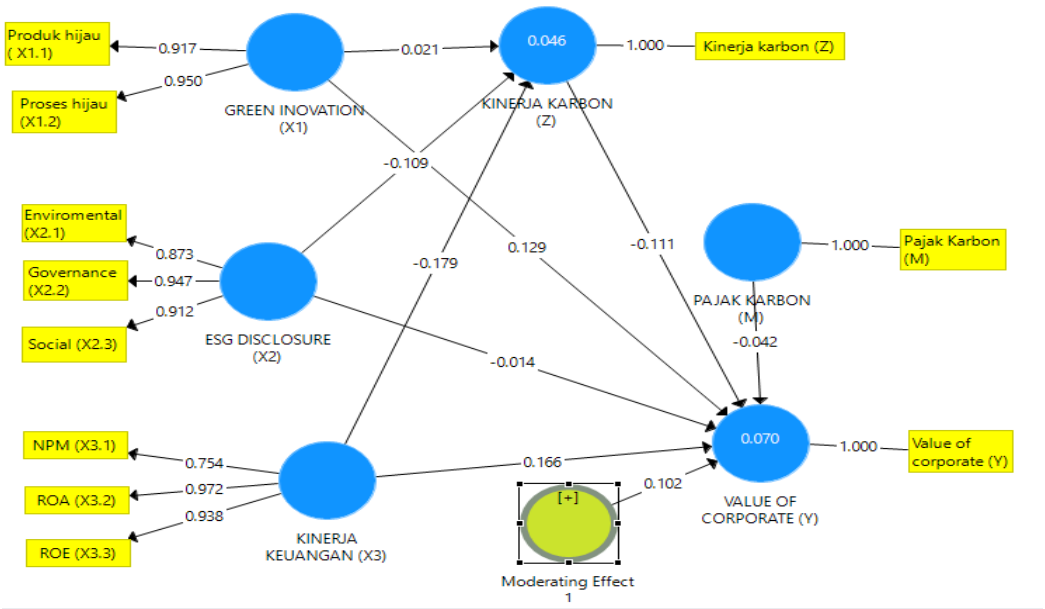

Figure 1

Source: Appendix 4 data processing: 201, 2025

The output that explains the relationship between latent variables and their indicators is as follows:

Table 3

Outer Model (Outer Loading)

	ESG DISCLOSURE (X2)	GREEN INOVATION (X1)	KINERJA KARBON (Z)	KINERJA KEUANGAN (X3)	PAJAK KARBON (M)	VALUE OF CORPORATE (Y)
Enviromental_(X2.1)	0.873					
Governance _(X2.2)	0.947					
Kinerja karbon (Z)			1.000			
NPM (X3.1)				0.754		
Pajak Karbon_(M)					1.000	
Produk hijau _(X1.1)		0.917				
Proses hijau_(X1.2)		0.950				
ROA (X3.2)				0.972		
ROE (X3.3)				0.938		
Social (X2.3)	0.912					
Value of_corporate (Y)						1.000

Source: Appendix 4 data processing: 202, 2025

a. X1.1 Green products have a relationship of 0.917 with X1 *(Green innovation)*

b. X1.2 Green process has a relationship of 0.950 with X1 *(Green innovation)*

c. X2.1 *Environmental* has a relationship of 0.873 with X2 *(Environmental, Social and Governance disclosure)*

d. X2.2 *Governance* has a relationship of 0.947 with X2 *(Environmental, Social and Governance disclosure)*

e. X2.3 *Social* (social) has a relationship of 0.912 with X2 *(Environmental, Social and Governance disclosure)*

f. X3.1 NPM *(Net profit margin)* has a relationship of 0.754 with X3 financial performance.

g. X3.2 ROA *(Return on Asset)* has a relationship of 0.972 with X3 financial performance.

h. X3.1 ROE *(Return on Equity)* has a relationship of 0.938 with X3 financial performance.

i. Carbon performance is a manifest variable that only has 1 relationship indicator of 1,000.

j. Carbon tax is a manifest variable that only has 1 relationship indicator of 1,000.

k. Corporate value is a manifest variable that only has 1 relationship indicator of 1,000. Based on the interpretation above, it can be analyzed as follows:

- *Green innovation* has 2 indicators, namely green products and green processes, which have loading values, namely green products 0.917 and green processes 0.950. In accordance with the minimum value of *convergent validity* is >0.5 so that all indicators meet the criteria.

- *Environmental, Social and Governance disclosure* has 3 indicators, namely *Environmental* (environment) has a loading value of 0.873, *Governance* (governance) has a loading value of 0.947 & *Social* (social) has a loading value of 0.912. in accordance with the minimum value of *convergent validity* is >0.5 so that all indicators meet the criteria

- Financial Performance has 3 indicators including NPM *(Net profit margin)* which has a loading value of 0.754, ROA *(Return on Asset)* which has a loading value of 0.972 and ROE *(Return on Equity)* which has a loading value of 0.938. In accordance with the minimum value of *convergent validity* is >0.5 so that all indicators meet the criteria

- Carbon performance is a manifest variable that has 1 indicator with a strong loading value, namely 1,000 or 100% so that it is able to influence the latent variable of carbon performance according to the minimum *convergent validity value* of >0.5 so that all indicators meet the criteria.

- Carbon tax is a manifest variable that has 1 indicator with a strong loading value, namely 1,000 or 100% so that it is able to influence the latent variable of carbon tax according to the minimum *convergent validity value* of >0.5 so that all indicators meet the criteria.

- Company value is a manifest variable that has 1 indicator with a strong loading value of 1,000 or 100% so that it can influence the latent variable of company value according to the minimum *convergent validity value* of >0.5 so that all indicators meet the criteria. With the explanation above, it can be concluded that the indicators that fall into the *convergent validity criteria* have a value of >0.5, the conclusion table is as follows.

Measurement of Convergent Validity Criteria

Table 4

No	Notasi	Indikator	Nilai loading factor	Kriteria Convergent Validity	Keterangan
1	X1.1	Produk hijau	0.917	>0.5	Valid
2	X1.2	Proses hijau	0.950		Valid
3	X2.1	Enviromental	0.873		Valid
4	X2.2	Governance	0.947		Valid
5	X2.3	Social	0.912		Valid
6	X3.1	NPM	0.754		Valid
7	X3.2	ROA	0.972		Valid
8	X3.3	ROE	0.938		Valid
9	Z	Kinerja karbon	1.000		Valid
10	M	Pajak Karbon	1.000		Valid
11	Y	Value of_corporate	1.000		Valid

Source: Appendix 4 data processing: 202, 2025

Validity test with convergent validity (AVE)

The next evaluation is to see and compare Convergent Validity with *the square root of average extracted* (AVE). Validity test according to Rizkia et al (165:2023) Convergent Validity Test is based on the AVE value of ≥0.5 so that the research variable is declared valid.

Table 5. Measurement with AVE Criteria

VARIABEL	AVE
GREEN INOVATION (X1)	0.831
ESG DISCLOSURE (X2)	0.871
KINERJA KEUANGAN (X3)	1.000
KINERJA KARBON (Z)	0.798
PAJAK KARBON (M)	1.000
VALUE OF CORPORATE (Y)	1.000

Source: Appendix 4 data processing: 202, 2025

From the measurement results above, it can be seen that 6 variables have met the AVE criteria by having an outer loading> 0.5. However, in the PLS 3.2.7 standard, data will be declared valid if all constructs are green and have an outer loading value> 0.7. In this study, all AVE constructs have a value> 0.7. So it can be continued to the next test with the assumption that there is no elimination of variables or indicators. The following indicators meet the validity test criteria as follows:

Validity test with discriminant validity

According to Rizkia et al (165:2023) the Fornell Larcker approach shows a discriminant validity test if the square root of the AVE of each research variable is greater than the correlation of the square root of the AVE with other variables.

Discriminant Validity

Table 6

	ESG DISCLOSURE (X2)	GREEN INOVATION (X1)	KINERJA KARBON (Z)	KINERJA KEUANGAN (X3)	Moderating Effect 1	PAJAK KARBON (M)	VALUE OF CORPORATE (Y)
ESG DISCLOSURE (X2)	0.911						
GREEN INOVATION (X1)	0.055	0.933					
KINERJA KARBON (Z)	-0.121	-0.007	1.000				
KINERJA KEUANGAN (X3)	0.075	0.123	-0.185	0.893			
Moderating Effect 1	-0.052	-0.004	0.000	0.033	1.000		
PAJAK KARBON (M)	0.014	-0.067	-0.070	0.005	0.000	1.000	
VALUE OF CORPORATE (Y)	0.018	0.152	-0.138	0.202	0.021	-0.042	1.000

Source: Appendix 4 data processing: 203, 2025

All constructs in the model have met the discriminant validity requirements based on the fornell-larcker approach. This is indicated by the value of the square root of AVE which is greater than the correlation between other constructs in the same row or column. This means that each construct represents its own variable more than other variables.

Reliability Test with Composite Reliability

According to Rizkia et al (165:2023) Construct Reliability This test is carried out to test the reliability of variables in the research model. where the construct test can be seen with a composite reliability value with a value greater than 0.7, then it is stated that all variables are reliable based on composite reliability.

Measurement with Composite Reliability Criteria

Table 7

VARIABEL	Composite Reliability
GREEN INOVATION (X1)	0.936
ESG DISCLOSURE (X2)	0.931
KINERJA KEUANGAN (X3)	1.000
KINERJA KARBON (Z)	0.921
PAJAK KARBON (M)	1.000
VALUE OF CORPORATE (Y)	1.000

Source: Appendix 4 data processing: 203, 2025

From the measurement results above, it can be seen that 6 variables have met the Composite Reliability criteria with a value of >0.7 which is quite reliable. So that the dependent latent variable is appropriate and feasible to be tested to determine its effect on the dependent latent variable, namely the value of corporate.

Reliability Test with and Croncbach's alpha

According to Rizkia et al (165:2023) Construct Reliability This test is carried out to test the

reliability of variables in the research model. where the construct test can be seen from the Croncbach's alpha value with a value greater than 0.7, it is stated that all variables are reliable based on composite reliability.

Measurement with Cronbach's Alpha Criteria

Table 8

VARIABEL	Cronbach's Alpha
GREEN INOVATION (X1)	0.901
ESG DISCLOSURE (X2)	0.854
KINERJA KEUANGAN (X3)	1.000
KINERJA KARBON (Z)	0.870
PAJAK KARBON (M)	1.000
VALUE OF CORPORATE (Y)	1.000

Source: Appendix 4 Data processing: 203, 2025

From the measurement results above, it can be seen that 6 variables have met the Cronbach's Alpha criteria with a value of >0.7 is quite reliable. So that the dependent latent variable is appropriate and worthy to be tested to determine its effect on the dependent latent variable, namely the value of corporate. The summary of the results of the reliability and validity test with smartPLS3 is as follows:

Resume Construct Reliability and Validity

Table 9

Construct Reliability and Validity

Matrix | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted ...

	Cronbach's Al...	rho_A	Composite Rel...	Average Varian...
ESG DISCLOSURE (X2)	0.901	0.951	0.936	0.831
GREEN INOVATION (X1)	0.854	0.890	0.931	0.871
KINERJA KARBON (Z)	1.000	1.000	1.000	1.000
KINERJA KEUANGAN (X3)	0.870	0.923	0.921	0.798
Moderating Effect 1	1.000	1.000	1.000	1.000
PAJAK KARBON (M)	1.000	1.000	1.000	1.000
VALUE OF CORPORATE (Y)	1.000	1.000	1.000	1.000

Source: Appendix 4 data processing: 204, 2025

Designing the Inner Model

R - SQUARE

The goodness of fit model is measured using R-Square. According to Rizkia et al (165:2023) the R-Square test is used to show how much the independent variable is able to explain the dependent variable where some experts argue that the R-Square value of 0.75 means a high substance influence, 0.50 moderate and 0.25 weak according to (Hair et al 2019) and another opinion The R-Square value of 0.67 means 0.67 (high), 0.33 (moderate) and 0.19 (weak) according to (Chin 1998)

R – Square

Table 10

VARIABEL	R - SQUARE
VALUE OF CORPORATE (Y)	0.070
KINERJA KARBON (Z)	0.046

Source: Appendix 4 data processing: 204, 2025

From the R Square table above, it explains the influence of the variables Green innovation (X1), Environmental, Social and Governance disclosure (X2), Financial performance (X3), Carbon performance (Z) and carbon tax (M) as a moderation giving a value of 0.070 which can be interpreted that the value of corporate can be explained by 7% by Green innovation (X1), Environmental, Social and Governance disclosure (X2), Financial performance (X3), Carbon performance (Z) and carbon tax (M) and 93% can be explained by other variables outside the study. Meanwhile, the R Square table above also explains the influence of the variables Green innovation (X1), Environmental, Social and Governance disclosure (X2), Financial performance (X3), corporate value (Y) and carbon tax (M) as moderation giving a value of 0.046 which can be interpreted that carbon performance can be explained by 4.6% by Green innovation (X1), Environmental, Social and Governance disclosure (X2), Financial performance (X3), corporate value (Y) and carbon tax (M) and 95.4% can be explained by other variables outside the study.

Goodness of Fit (Q^2)

According to Tenenhaus et al (2004) in Hanseler and Sarsted (2012) GOF is an overall evaluation of the structural and measurement model. This GOF can only be calculated with a reflective measurement model with GOF values of 0.10 (low gof), 0.25 (medium gof) and 0.36 (high gof) and can be calculated using the formula:

$$Q^2 = 1 - (1 - R^2 1) (1 - R^2 2)$$

$$Q^2 = 1 - (1 - 0.0049) (1 - 0.0021)$$

$$Q^2 = 1 - 0.993$$

$$Q2 = 0.004$$

$Q2$ calculation, a value of 0.004 was obtained, so that for this model, the diversity of research data can be explained by the structural model by 0.4%. This shows that the structural model meets Goodness of Fit. quite low because it is below 0.10

Hypothesis Testing

In hypothesis testing, the value analyzed is the value in the t-statistic and compared with the t-table, the PLS output is the estimate of the latent variable which is an aggregate of indicators. The hypothesis that will be used is as follows:

The testing criteria are with a significance level (α) of 5% or 0.05 with the following determination:

- If t-count > t-table, i.e. more than 1.96, then the hypothesis is accepted (significant)
- If t-count > t-table, i.e. less than 1.96, then the hypothesis is rejected (not significant).
- If p-values ≤ 0.05 then the hypothesis is accepted (significant)
- If p-values ≥ 0.05 then the hypothesis is rejected (not significant)

Testing of independent latent variables against dependent latent variables is carried out in 3 stages, namely (1) directly calculating the influence of independent latent variables on dependent latent variables (2) directly calculating the influence of independent latent variables on dependent latent variables with carbon performance intervening. So that the output of PLS bootstrapping results to test the hypothesis (H1 to H12) is as follows:

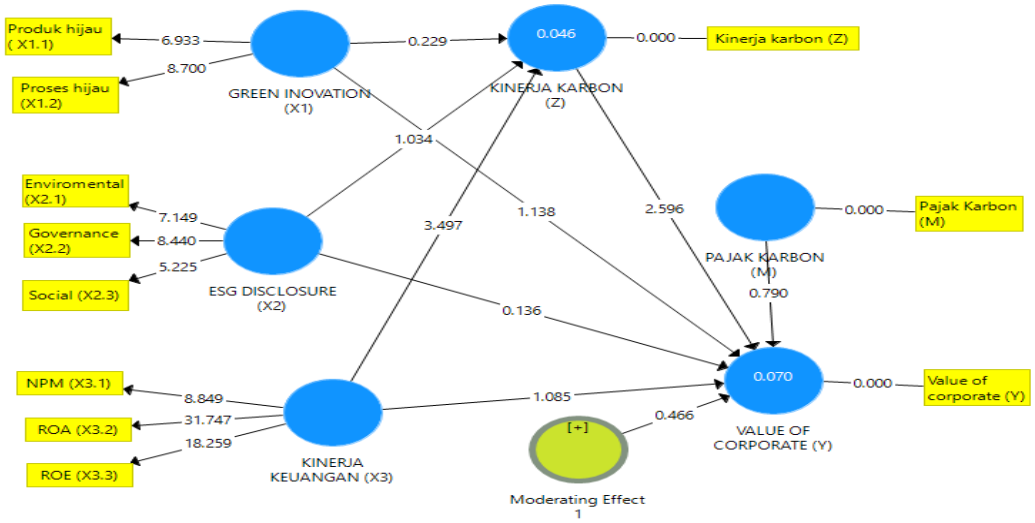

Figure 2. PLS Bootstrapping Results
Source: Appendix 4 data processing, 204, 2025

The following is a summary of the overall hypothesis after bootstrapping:

Table 11

Bootstrapping hipotesis (koevisien jalur)

Path Coefficients

Mean, STDEV, T-Values, P-Val... | Confidence Intervals | Confidence Intervals Bias Co... | Samples | Copy to Clipboard: | Excel Format

	Original Sample ...	Sample Mean...	Standard Deviation ...	T Statistics...	P Values
ESG DISCLOSURE (X2) -> KINERJA KARBON (Z)	-0.109	-0.113	0.105	1.034	0.302
ESG DISCLOSURE (X2) -> VALUE OF CORPORATE (Y)	-0.014	-0.025	0.101	0.136	0.892
GREEN INOVATION (X1) -> KINERJA KARBON (Z)	0.021	0.015	0.093	0.229	0.819
GREEN INOVATION (X1) -> VALUE OF CORPORATE (Y)	0.129	0.124	0.114	1.138	0.256
KINERJA KARBON (Z) -> VALUE OF CORPORATE (Y)	-0.111	-0.123	0.043	2.596	0.010
KINERJA KEUANGAN (X3) -> KINERJA KARBON (Z)	-0.179	-0.187	0.051	3.497	0.001
KINERJA KEUANGAN (X3) -> VALUE OF CORPORATE (Y)	0.166	0.167	0.153	1.085	0.278
Moderating Effect 1 -> VALUE OF CORPORATE (Y)	0.102	0.097	0.218	0.466	0.641

Source: Appendix 4, data processing: 205, 2025

Bootstrapping hypothesis (path coefficient)

Table 12

Specific Indirect Effects

Mean, STDEV, T-Values, P-Val... | Confidence Intervals | Confidence Intervals Bias Co... | Samples | Copy to Clipboard: | Excel Format | R Format

	Original Sample...	Sample Mean...	Standard Deviation...	T Statistics ...	P Values
ESG DISCLOSURE (X2) -> KINERJA KARBON (Z) -> VALUE OF CORPORATE (Y)	0.012	0.013	0.014	0.844	0.399
GREEN INOVATION (X1) -> KINERJA KARBON (Z) -> VALUE OF CORPORATE (Y)	-0.002	-0.001	0.013	0.186	0.852
KINERJA KEUANGAN (X3) -> KINERJA KARBON (Z) -> VALUE OF CORPORATE (Y)	0.020	0.023	0.010	1.968	0.050

Source: Appendix 4 Data processing: 205, 2025

DISCUSSION

H1 : Green Innovation has a positive and insignificant effect on carbon performance.

Based on statistical calculations, it can be concluded that the green innovation variable has a positive and insignificant effect on carbon performance in energy sector companies that are used as research samples. Green innovation on carbon performance, shows a t-statistic of 0.229 which is <1.96, so the first hypothesis in this study is rejected. From the results of these data, it can be interpreted that the sample data of the independent latent variable Green innovation did not succeed in testing the relationship with the intervening variable carbon performance.

In this study, it can be concluded that green innovation is unable to explain its influence on carbon performance, with several assessments such as (1) Reducing consumption and increasing resource & energy efficiency, (2) Using recycling techniques, recycled materials, and environmental technology, (3) Conducting environmental campaigns, (4) Using equipment to control pollution, (5) Adopting pollution control technology & projects where these 5 assessments are part of the green process indicators. (1) Changing product design to avoid pollution in the production process, (2) Designing and improving environmentally friendly product packaging. And (3) Modifying product design to increase energy efficiency and these 3 assessments are part of the green product indicators. In this case, companies in the energy sector need quite a lot of time to develop green innovations in order to significantly reduce carbon emissions. However, these assessments are not strong enough to reveal the influence of green innovation on carbon performance so that other more dominant variables are needed.

The results of this study also do not support the legitimacy theory because the results of the study show that the disclosure of green innovation in energy sector companies within a period of 4 years has no impact on carbon performance. This condition also affects stakeholders to ignore the existence of supporting technology for green innovation to reduce carbon emissions. This is also in line with the research of Rochmah Siti & Taharuddin (2024) and Liangchui Rahelliamelinda & Jesica Handoko (2024) where green innovation is not significant to the value of the company mediated by sustainability reports. where sustainability reports are the basis for researchers to assess green innovation. According to Yan Zheming et al (2017) where green innovation has no significant effect on carbon performance. While this hypothesis is different from the research of Maharani Deviyola & R Rosiyana Dewi (2024) namely green innovation and green strategy have a positive impact on carbon emission disclosure.

H2 : Green innovation has a positive and insignificant effect on company value.

Based on statistical calculations that test the relationship between Green innovation has a positive and insignificant effect on company value in energy sector companies, showing *a t-statistic* of 1.138 . The measurement results show that *the t-statistic* <1.96, so the 2nd hypothesis in this study is rejected. From the results of the data, it can be interpreted that the sample data of the independent latent variable *Green innovation* failed to test the relationship with the dependent latent variable (company value), or in other words X1 did not have a significant effect on Y.

This study explains that with several indicators related to green products and green processes are not the main ones in increasing the value of the company in attracting investors. Because in developing countries themselves, the treatment of green innovation is still very massive, prioritizing profitability because green innovation itself is a long-term investment that does not necessarily produce higher profits or costs. This study is not in line with the Signal Theory where companies in disclosing green innovation have not become the main factor for investors so that they have not had a direct financial impact.

This study is in line with Nashrulloh Fian Aufa and Achyani Fatchan (2024) where the results of the study show that the variables of eco-efficiency, green innovation and carbon

emission disclosure do not affect the value of the company. While this study is contrary to Damas Dading, Rovila El Maghviroh and Meidiyah Indreswari (2021) where the results of the study are that green innovation has a significant positive effect and carbon emission disclosure has a significant positive effect on the value of the company.

H3 : Environmental, Social and Governance disclosure has a positive and insignificant effect on carbon performance.

Based on statistical calculations that test the relationship between Environmental, Social and Governance disclosure, there is a positive and insignificant effect on carbon performance. in energy sector companies, shows a *t-statistic value* of 1,034. <1.96, then the 3rd hypothesis in this study is rejected. From the results of the data, it can be interpreted that the sample data of the independent latent variables *Environmental, Social and Governance disclosure* failed to Test the relationship with the intervening variable carbon performance, or in other words X1 did not have a significant effect on Z.

In this study, where Environmental, Social and Governance disclosure has a wider scope where the supporting indicators are Environmental, Social and Governance which are massively directly related to carbon performance. Environmental, Social and Governance disclosure is the output of the community's response to the impact of an industry so that carbon performance here is a way for a company to reduce carbon emissions. So this study is not in line with the legitimacy theory

In this study, it is in accordance with the statement of Cho, Lee and Pfeiffer (2019) that greenwashing can cause Environmental, Social and Governance disclosures not to reflect actual carbon performance.

H4 : *Environmental, Social and Governance disclosure* has a positive and insignificant effect on company value.

Based on statistical calculations that test the relationship between *Environmental, Social and Governance disclosure has a positive and insignificant effect on company value* in energy sector companies, *t-statistic* 0.136 <1.96 then the fourth hypothesis in this study is rejected. From the results of the data, it can be interpreted that the sample data of the independent latent variable *Environmental, Social and Governance disclosure* failed to test the relationship with the dependent latent variable (company value), or in other words X2 does not have a significant effect on Y.

In this study, it is not in line with the theory of stakeholders Maksum and Kholis (2003) that Environmental, Social and Governance disclosure itself is closely related to the pattern of the social environment in which the company is located, so that with minimal consideration of Environmental, Social and Governance disclosure as a means of decision making, it will affect the credibility of a company itself . So that the possibility that occurs is that Environmental, Social and Governance disclosure has not become the main factor so that it does not reflect real financial performance.

The results of this study are in accordance with the research of Oktaviana Sonya, Sembel Roy and Manurung Adler Haymans (2024) regarding Environmental Disclosure, Social Disclosure, General Disclosure partially do not have a significant effect on company value. While this hypothesis is contrary to the research of Liangchui Rahelliamelinda & Jesica Handoko (2024) and Ashfaq Habib, Judit Ol'ah, Mushtaq Hussain Khan, Smutka Lubo˘s (2025) which obtained a positive and significant relationship between green finance and *Environmental, Social and Governance Disclosure disclosure* .

H5 : Financial performance has a positive and significant effect on carbon performance.

Based on statistical calculations that test the relationship between Financial performance has a positive and significant effect on carbon performance in energy sector companies, showing a *t-statistic value of* 3,497> 1.96, then the fifth hypothesis in this study is accepted. From the results of the data, it can be interpreted that the sample data of the independent latent variable of financial performance has successfully tested the relationship with the intervening variable (carbon performance), or in other words, X3 has a significant effect on Z.

The results of this study show that a company that prioritizes reducing carbon emissions requires sufficient funds to achieve its goals so that the company can have a positive impact on the environment where the business is located, so this study has an impact on stakeholder perceptions. Companies with strong profit intensity allow them to absorb the costs of energy transitions and improvements related to technology in supporting carbon emission reduction. With increasing financial performance, it can provide a positive signal to investors through the disclosure of carbon performance from sustainability reports.

This study is in accordance with the research results of Yuliandhari Willy Sri and Rezma Aulia Ramadhanty (2024) that carbon performance has a significant effect on the company's financial performance. However, this hypothesis is contrary to the research of Musthafa Afif and Taufiq Arifin (2024). The results of the study show that the company's voluntary carbon disclosure has no effect on financial performance.

H6 : Financial performance has a positive and insignificant effect on company value.

Based on statistical calculations that test the relationship between Financial performance has a positive and insignificant effect on company value in energy sector companies, showing a *t-statistic value of* 1,085 <1.96, then the sixth hypothesis in this study is rejected. From the results of the data, it can be interpreted that the sample data of the independent latent variable of financial performance did not succeed in testing the relationship with the dependent variable (company value), or in other words X3 did not have a significant effect. On Y.

In this study, if in theory the signal. good financial performance such as (ROA, ROE and NPM) is able to send a positive signal to the market. so that it can increase investor confidence by increasing the company's value. However, several possibilities occur whether investors consider non-financial factors such as reputation, environmental risk or the existence of *Environmental, Social and Governance Disclosure risks.*

In this study, it is in line with the research of Hermawan Sigti and Ma'ulah Nurul Afiyah (2914) that partially the financial performance variable does not have a significant effect on the company's value. However, it is in contrast to Y's research. Rochmah Siti and Taharuddin (2024) Financial performance has a significant effect on company value.

H7 : Carbon performance has a positive and significant effect on company value.

Based on statistical calculations that test the relationship between Carbon performance has a positive and significant effect on company value in energy sector companies, showing a *t-statistic value* of 2,596. The measurement results show that *the t*-statistic > 1.96), then the seventh hypothesis in this study is accepted. From the results of the data, it can be interpreted that the sample data of the carbon performance variable has successfully tested the relationship with the dependent variable (company value), or in other words Z has a significant effect on Y.

In this study, carbon performance shows the company's ability to manage and reduce carbon emissions. The stakeholder perspective and legitimacy of companies with good carbon performance are considered to have more social and environmental responsibility. This can also be a benchmark in gaining support from investors, consumers and other stakeholders. Regarding the significant research results, investors have assessed carbon performance as an indicator of long-term sustainability. With the company's emphasis on carbon emissions, the sustainability of a company is considered more efficient and low risk.

in the study according to Elizabeth Parulian Damanik, Wiwik Prihandini (2025) where disclosure of carbon emissions and financial performance have a significant positive effect on company value.

H8 : Carbon tax moderates carbon performance and has a negative and insignificant effect on firm value.

Based on statistical calculations that test the relationship between Carbon tax moderating carbon performance has a negative and insignificant effect on company value in energy sector companies, showing a *t-statistic value* of 0.466 <1.96. then the eighth hypothesis in this study is rejected. From the results of the data, it can be interpreted that the sample data of the carbon tax variable failed to Test the relationship of moderating carbon performance with the dependent variable (company value), or in other words M does not have a significant effect on Y and Z.

In this study, carbon tax is an environmental policy instrument that aims to provide emphasis on companies that produce high carbon emissions. In Indonesia itself, the implementation of carbon tax has not been fully implemented in companies, so this needs to be considered from various aspects. With the encouragement of carbon tax, this should have a positive impact on company value because of the increase in carbon performance in reducing carbon emissions. However, in this study, carbon tax moderates carbon performance and company value insignificantly, this allows for weak implementation of carbon tax, companies have not responded to carbon tax, investors have not taken carbon tax into account and the implementation of carbon tax has not been explicitly seen in the short term. In this study, it is not in accordance with signaling theory where carbon tax is unable to provide a signal to companies in showing commitment to environmental issues.

This study is in accordance with Kruger's (2015) statement that market responses to carbon performance can vary and carbon taxes do not necessarily strengthen this relationship significantly.

H9 : Carbon tax has a positive and insignificant effect on firm value.

Based on statistical calculations that test the relationship between carbon tax has a positive and insignificant effect on the value of energy sector companies, showing a *t-statistic value of* 0.790 <1.96. then the ninth hypothesis in this study is rejected. From the results of the data, it can be interpreted that the sample data of the carbon tax variable failed to Test the relationship with the dependent variable (company value), or in other words M does not have a significant effect on Y.

In this study, carbon tax is an environmental policy instrument that aims to provide emphasis on companies that produce high carbon emissions. In Indonesia itself, the implementation of carbon tax has not been fully implemented in companies so this needs to be considered from various aspects. With the encouragement of carbon tax, this should have a positive impact on company value because of the increase in carbon performance in reducing carbon emissions. But in this study, carbon tax moderates carbon performance and company value is not significant, this allows for weak implementation of carbon tax, companies have not responded to carbon tax, investors have not taken carbon tax into account and the implementation of carbon tax has not been explicitly seen in the short term.

in this study is not in accordance with the signaling theory where carbon taxes are unable to provide signals to companies in showing commitment to environmental issues. This study contradicts Aiwu Zhao, Huizheng Zhang, Yilin Liu, Hongjun Guan (2024) who stated that the mechanism analysis reveals that the quantity of innovation plays a significant partial mediation role in the positive impact of environmental taxes on company performance.

H10 : Environmental, Social and Governance disclosure has a negative and insignificant effect on company value with carbon performance as an intervening variable.

Based on statistical calculations that test the relationship between Environmental, Social and Governance disclosure has a negative and insignificant effect on company value with carbon performance as an intervening variable in energy sector companies as the basis of research, showing a *t-statistic value* of 0.844 <1.96, then the tenth hypothesis in this study is rejected. From the results of the data, it can be interpreted that the sample data of the carbon performance intervening variable did not succeed in intervening the independent variable (Environmental, Social and Governance disclosure) on the dependent variable (company value), or in other words M does not intervene X2 on Y.

This study explains in stakeholder theory that companies are not only responsible to shareholders, but also to all stakeholders including society and the environment. Environmental, Social and Governance disclosure is a means of corporate communication towards the environment, social and governance of a company, so that in theory Environmental, Social and Governance disclosure provides increased trust, improves environmental performance and is able to increase company value. In this study, Environmental, Social and Governance disclosure has disclosed environmental indicators well, but there are social and governance indicators whose disclosure is still incomplete such as environmental indicators. In this way, the company uses Environmental, Social and Governance disclosure as a measuring tool for the theory of legitimacy from society but must be supported by strong carbon performance, disclosure of each Environmental, Social and Governance disclosure indicator is fulfilled so that the company's value can increase.

In this study, in accordance with the statement by Clarkson, LI, Richardson and Vasvari (2008), Environmental, Social and Governance disclosures do not necessarily directly influence company value through carbon performance.

H11 : Green innovation has a negative and insignificant effect on company value with carbon performance as an intervening variable.

Based on statistical calculations that test the relationship between Green innovation has a negative and insignificant effect on company value with carbon performance as an intervening variable, showing a *t-statistic value* of 0.186 <1.96, then the eleventh hypothesis in this study is rejected. From the results of the data, it can be interpreted that the sample data of the carbon performance intervening variable did not succeed in intervening the independent variable (Environmental, Social and Governance disclosure) on the dependent variable (company value), or in other words M does not intervene X1 on Y.

In this study, green innovation is a strategic asset that can create competitive advantage, green innovation should be able to increase energy efficiency, reduce carbon emissions and improve the company's reputation. There are several possibilities, namely the lack of disclosure related to green innovation technology contained in a company's sustainability report. This is not in line with the signaling theory where green innovation should be a signal and care about environmental issues so that companies are able to face carbon regulations. So this study has not been able to provide a long-term impact on increasing profitability and company sustainability with a green innovation approach.

In this study, it is in accordance with the statement of Triguero, Moreno-Mondejar and Davia (2013) that green innovation does not always have a significant impact on company value through carbon performance.

H12 : Financial performance has a negative and insignificant effect on company value with carbon performance as an intervening variable.

Based on statistical calculations that test the relationship between financial performance has a negative and insignificant effect on company value with carbon performance as an intervening variable in energy sector companies, showing a *t-statistic value* of 1.994> 1.96, then the twelfth

hypothesis in this study is accepted. From the results of the data, it can be interpreted that the sample data of the carbon performance intervening variable successfully intervenes in the independent variable (Financial performance) on the dependent variable (company value), or in other words M can intervene X3 on Y.

This study explains that internal resources including finance are the main ones in utilizing advantages in developing sustainable capabilities. So with good financial performance, the company is able to innovate in reducing greenhouse gas emissions. with good carbon performance and minimal carbon emissions creating good company value. This study is in line with signaling theory, namely companies that have good financial performance and are able to demonstrate efficient carbon performance and can send signals to investors that the company has good financial performance, with carbon performance that can reduce greenhouse gas emissions. So investors can see that the company has long-term prospects. And good financial performance shows that the company is responsible to the environment and society so that this can increase stakeholders.

In this study, in accordance with the statement of Eccles, Icoannou and Serafeim (2014), they found that good financial performance supported by carbon performance significantly increases the company's value.

4. CONCLUSION

Based on the discussion of the previous chapters and answering the formulation of the problem, the purpose of the study and referring to the process and results of data analysis in this study. Then several conclusions can be drawn as follows:

1. *Green innovation* does not have a significant effect on carbon performance in energy companies on the Indonesia Stock Exchange. This is supported by the theory of Rochmah Siti & Taharuddin (2024) and Liangchui Rahelliamelinda & Jesicap Handoko (2024) where green innovation is not significant on company value mediated by sustainability reports.

2. *green innovation* is positive and has no significant effect on *corporate value* in energy companies on the Indonesia Stock Exchange. This study is in line with Nashrulloh Fian Aufa and Achyani Fatchan (2024) where the results of the study show that the variables eco-efficiency, green innovation and carbon emission disclosure do not affect corporate value.

3. *Environmental, Social and Governance disclosure* is positive and has no significant effect on carbon performance in Energy companies on the Indonesia Stock Exchange Based on statistical calculations that test the relationship between carbon tax moderating carbon performance and company value in energy sector companies. In this study, carbon tax is an environmental policy instrument that aims to provide emphasis on companies that produce high carbon emissions.

4. *Environmental, Social and Governance disclosure* is positive and has no significant effect on *corporate value* in Energy companies on the Indonesia Stock Exchange. This study is not in line with the theory of stakeholders Maksum and Kholis (2003) that Environmental, Social and Governance disclosure itself is closely related to the pattern of the social environment in which the company is located, so that with minimal consideration of Environmental, Social and Governance disclosure as a means of decision making, it will affect the credibility of a company itself. So the possibility that occurs is that Environmental, Social and Governance disclosure has not become the main factor so that it does not reflect real financial performance in accordance with the results of research by Oktaviana Sonya, Sembel Roy and Manurung Adler Haymans (2024) related to Environmental Disclosure, Social Disclosure, General Disclosure partially does not have a significant effect on company value.

5. financial performance has a positive and significant effect on carbon performance in Energy companies on the Indonesia Stock Exchange The results of this study are that a company that prioritizes reducing carbon emissions requires sufficient funds to achieve its goals so that the company can have a positive impact on the environment where the business is located so that this study has an impact on stakeholder perceptions. Companies with strong profit intensity allow them to absorb energy transition costs and improvements related to technology in supporting carbon emission reduction. By increasing financial performance, it can provide a positive signal to investors through the disclosure of carbon performance from sustainability reports. This study is in accordance with the results of research by Yuliandhari Willy Sri and Rezma Aulia Ramadhanty (2024) carbon performance has a significant effect on the company's financial performance

6. financial performance has a positive and insignificant effect on *the value of corporate* in Energy companies on the Indonesia Stock Exchange In this study, if in theory the signal. good financial performance such as (ROA, ROE and NPM) is able to send a positive signal to the market. so that it can increase investor confidence by increasing the value of the company. However, several possibilities occur whether investors consider non-financial factors such as reputation, environmental risk or the existence of ENVIRONMENTAL, SOCIAL AND GOVERNANCE DISCLOSURE risks

7. carbon performance has a positive and insignificant effect on *corporate value* in Energy companies on the Indonesia Stock Exchange In this study, carbon performance shows the company's ability to manage and reduce carbon emissions. Stakeholder perspectives and corporate legitimacy with good carbon performance are considered to have more social and environmental responsibility. This can also be a benchmark in obtaining investor support,

8. carbon tax moderates the relationship between carbon performance and *corporate value* in Energy companies on the Indonesia Stock Exchange obtained negative and insignificant results. In this study, carbon tax is an environmental policy instrument that aims to provide emphasis on companies that produce high carbon emissions. in Indonesia itself, the implementation of carbon tax has not been fully implemented in companies so this needs to be considered from various aspects. with the encouragement of carbon tax, this should have a positive impact on company value because of the increase in carbon performance in reducing carbon emissions. But in this study, carbon tax moderates carbon performance and company value is not significant, this allows for weak implementation of carbon tax, companies have not responded to carbon tax, investors have not taken carbon tax into account and the implementation of carbon tax has not been explicitly seen in the short term. in this study it is not in accordance with signaling theory where carbon tax is unable to provide a signal to companies in showing commitment to environmental issues

9. Positive and significant influence of financial performance on company value with carbon performance as an intervening variable This study explains that internal resources including finance are the main ones in utilizing advantages in developing sustainable capabilities. So with good financial performance, the company is able to innovate in reducing greenhouse gas emissions. with good carbon performance and minimal carbon emissions creating good company value. This study is in line with signaling theory, namely companies that have good financial performance and are able to demonstrate efficient carbon performance and can send signals to investors that the company has good financial performance, with carbon performance that can reduce greenhouse gas emissions. So that investors can see that the company has long-term prospects. And good financial performance shows that the company is responsible to the environment and society so that this can increase stakeholders.

10. Positive and significant influence of financial performance on carbon performance. The results of this study are that a company that prioritizes reducing carbon emissions requires sufficient funds to achieve its goals so that the company can have a positive impact on the environment where the business is located so that this study has an impact on stakeholder perceptions. This study is in accordance with the results of research by Yuliandhari Willy Sri and Rezma Aulia Ramadhanty (2024) carbon performance has a significant effect on the company's financial performance.

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