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Climate Change Instrument through Green Taxation in Achieving Environmental Sustainability

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Abstract: Climate change remains a critical global challenge requiring effective policy interventions. Green taxation has emerged as a strategic policy instrument to mitigate environmental degradation and promote sustainability. This study investigates the impact of green taxes on environmental sustainability, particularly in energy sector companies disclosing carbon emissions from their operations. Additionally, it examines the role of Environmental, Social, and Governance (ESG) disclosures in fostering sustainable practices. A quantitative approach is employed, using purposive sampling to select a sample of energy sector companies listed on the Indonesia Stock Exchange (BEI) between 2022 and 2023. The sample criteria include: (1) energy companies listed on the BEI, (2) non-top-listed firms during the same period, and (3) firms without a complete sustainability report, resulting in 68 data points. This study utilizes secondary data sourced from company annual reports, analyzed using SPSS V25 software. The findings reveal that green taxes exert a significant and positive influence on environmental sustainability. The study's results are expected to contribute to the formulation of more effective environmental policies in Indonesia, while also advocating public awareness and support for green tax implementation through structured socialization efforts.

Keywords: Carbon Emissions, Environmental Sustainability, ESG Disclosure, Green Taxation.

INTRODUCTION

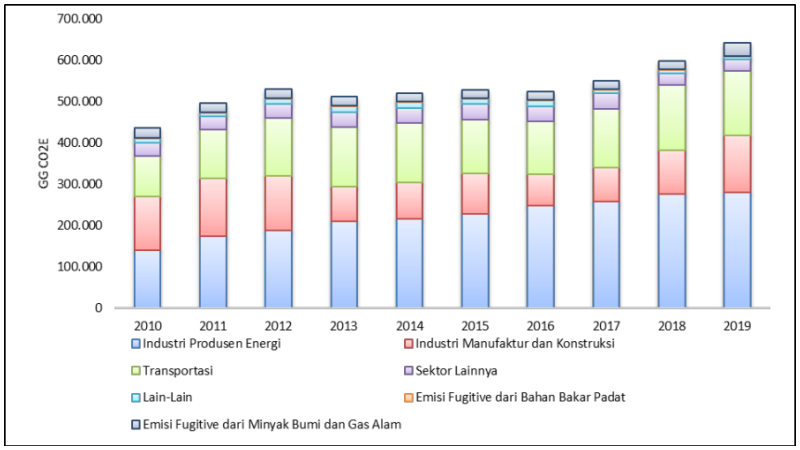
Climate change is currently one of the significant problems for living beings around the world (Bahriansyah & Ginting, 2022). According to Lestari & Lestari (2024)climate change poses a major threat to human life, ranging from food availability to natural disasters. This is caused by human behavior that does not support environmental sustainability by continuously exploiting natural resources, causing climate change to occur. Climate change triggers extreme global warming. Global warming occurs when the average temperature of the atmosphere, the Earth's land, and the oceans increases very rapidly by about 1.5-2.0 degrees Celsius (Malihah, 2022). The side effects of global warming include health problems, food security, water availability, livelihoods, human security, and economic growth.

Green tax as a tool to deal with climate change that has a wide impact on people's lives, especially in climate action. This can be achieved by developing and maximizing existing green taxes in Indonesia. Green taxes are applied to community activities that produce carbon emissions, contributing to climate change and the greenhouse effect (Firmansyah et al., 2022). Indonesia is experiencing a significant increase in air pollution levels. The main cause of this problem is the high greenhouse gas emissions produced by industries that burn fuel carelessly (Tauran et al., 2024). Green taxes play an integral role in the national strategy to address the climate change issue. Therefore, the implementation of green taxes is expected to encourage companies to adopt more sustainable practices to reduce negative impacts on the environment. Carbon emissions are a clear negative impact of global urgency. Since the 20th century, global average temperatures have continued to rise due to high concentrations of greenhouse gases or carbon emissions such as carbon dioxide (CO_2), methane (CH_4), NO_2, and CFC_5 (Nastiti & Hardiningsih, 2022). Carbon emissions are caused by deforestation, agricultural practices, and the burning of fossil fuels, which significantly trigger global warming. Repeated conditions like this will further trigger carbon emissions to become uncontrollable. The more carbon emissions released into the atmosphere, the greater the absorption of heat energy received by the earth, which ultimately causes an increase in global temperatures (Meila et al., 2024).

Based on research by Sari et al. (2021)Indonesia was among the top ten countries contributing to carbon emissions in 2018, totaling 0.61GT, or about 2%. This shows that between 2000 and 2018, most of these emissions came from the operational activities of the energy sector. Meanwhile, in 2021, according to the Intergovental Panel on Climate Change (IPCC) Indonesia contributed per capita emissions with the latest report from the 16th Global Carbon Project estimating the amount of carbon emissions at 36.4 giga tons, equivalent to a 4.9% increase in carbon dioxide from the previous year. Most of these carbon emissions come from industrial activities.

Companies in the energy sector are one of the largest contributors to carbon emissions from their industrial activities. In operational activities, companies require a large amount of energy resources, about 70% of the total energy used is fossil energy such as coal and petroleum (Khotimah & Sari, 2024).

Categories of Companies Contributing to Carbon Emissions



Source: (Kementerian Energi Dan Sumber Daya Mineral, 2020)

Data shows that the energy-producing industry is the largest contributor to emissions, with a share of 43.83%. In 2019, carbon emissions from the energy sector reached 653,787 Gg CO2e, an increase of 7.13% compared to the previous year. On the other hand, energy reserves in Indonesia are increasingly limited, such as fossil energy which is estimated to run out in nine

years, natural gas in 22 years with reserves of 77.3 trillion cubic feet and coal in 65 years with reserves of 37.6 trillion tons Amin & Donoriyanto (2023). This continuous exploitation threatens the destruction of nature and the future of future generations, thus becoming a global and Indonesian concern.

Environmental sustainability is an effort made to fix the damage caused by climate change. Many countries and international organizations are trying to commit to cutting greenhouse gas emissions (Adyana, 2023). As a result, awareness of the importance of the environment is increasing among the business community (Hasanah et al., 2024). On October 24, 2017, Indonesia ratified the Paris Agreement to the United Nations Framework Convention on Climate Change through Law No. 16 of 2017 (Ministry of Energy and Mineral Resources, 2020) and contributed to the Nationally Determined Contribution (NDC) to carry out low-emission development by 2030, with a target of reducing carbon emissions by 29%. Indonesia targets 23% renewable energy by 2025. Various regulations have been designed and implemented to overcome problems that affect various sectors, especially the energy sector (Rahelliamelinda & Handoko, 2024).

However, this process is not as easy as expected, it requires effective coordination and collaboration between the government and the community so that the vision, mission and goals of tackling climate change due to global warming and achieving sustainable development can be realized based on the targets that have been set (Malihah, 2022). The Environmental, Social, and Governance (ESG) concept is designed to assess the impact of a company's operations on the environment, social, and governance. Excellent ESG performance can improve company reputation and public trust (Rahelliamelinda & Handoko, 2024).

The role of companies and stakeholders is also an important contribution. Companies are now required to implement responsible accounting practices and prioritize the concept of environmental sustainability. The company as a party that has direct interaction with nature must be able to demonstrate the efforts made to improve the impact of climate change. The results of the efforts made by the company must be reported in the form of an annual report or made separately in the CSR report (Oktariyani, 2024). With this reporting, the company is expected to be able to provide information to stakeholders.

Based on the phenomena that have been described, this study has a novelty located in the context of sustainable development covering various aspects of policy, technological development, and the practice of using environmentally friendly and sustainable energy. Previous research has produced varied findings. Susandi et al. (2024)stated that the Indonesian government views Green Sukuk as an effective strategy to involve the community in environmental conservation and deal with climate change. In contrast, Asri et al. (2024)revealed that the implementation of environmental taxes had no impact. Therefore, this study focuses on the steps of companies in reporting carbon or greenhouse gas emissions from their operational activities, especially in the Energy Sector. This research study also focuses on the context of environmental sustainability by revealing Environmental, Social, and Governance in its application.

Literature Review

Environmental Stewardship Theory

Environmental stewardship theory is a theory that describes the moral obligation that humans have to care for and maintain the sustainability of the environment in which they live in a sustainable manner (Meila et al., 2024). This theory refers to the understanding that humans have a role as stewards of natural resources and ecosystems, not as utilizers solely exploiting these resources. In relation to carbon emissions, this theory addresses how humans can contribute to environmental sustainability by reducing carbon emissions. Environmental stewardship theory considers the integration of environment, economy and society. The

interconnectedness of the three forms a holistic approach to sustainable development. This theory is used to protect the environment by considering society and the economy in the long term (Nonkululeko, 2020).

Legitimacy Theory

Legitimacy theory is used in this study to explain the motivation for voluntary disclosure (Khotimah & Sari, 2024). Legitimacy theory is a concept in social science that explains how social entities, especially organizations such as companies, try to gain and maintain acceptance or approval from the wider community. This theory explains that social aspects related to corporate responsibility for the environment will create a relationship between the company and the public or stakeholders. The form of media used by the company is in the form of an annual report or a separate sustainability report that discloses social and environmental responsibilities including related disclosure of carbon emissions (Oktariyani, 2024).

Green Tax (X)

Green taxes are surcharges imposed on activities that damage the environment. The aim is to encourage companies and communities to switch to a more environmentally friendly way of reducing pollution (Firmansyah et al., 2022). According to Asri et al. (2024)green tax is a relatively new policy instrument, especially in developing countries, aimed at encouraging energy efficiency and conservation of natural resources. This tax is applied by imposing a fee on activities that produce emissions or waste, thus providing incentives for economic actors to switch to more sustainable practices.

Carbon Emissions Disclosure (Proxy X)

Financially strong companies have more resources to conduct in-depth carbon emissions analysis and reporting. This transparency on carbon emissions is typically valued by the public and environmental regulators. As a result, such companies have a greater chance of obtaining environmental certifications and building a positive reputation, which attracts investor attention and increases the value of the company in the capital market Imansari et al. (2024). According to Setiaji & Harfianto (2023) carbon emissions are the amount of carbon dioxide (CO2) gas released into the atmosphere which has an impact on the preservation of the earth. The main focus of activities that contribute to carbon emissions comes from company operations, such as burning fossils. Disclosure of carbon emissions according to Faizah (2022)as follows:

$$\text{Carbon Emissions} = \frac{number\ \ of\ \ items\ \ used}{amount\ that\ should\ have\ been\ disclosed}$$

Environmental Sustainability (Y)

Environmental sustainability is the ability of a *system* (be it an ecosystem, community, or planet) to maintain ecological balance over the long term. Thus, environmental sustainability is an effort to preserve the earth so that it is still able to support the lives of all living things.

Environmental performance is the company's ability to manage the environmental aspects of its operational activities. Environmental performance is measured from the environmental management system and environmental assessment based on environmental policies, environmental goals, and environmental targets (Hanafiyah et al., 2024).

Environmental, Social, Governance Disclosure (Proxy Y)

ESG is a framework used to measure the impact of a company's business on the environment and society, as well as the quality of corporate governance. Transparent ESG information can strengthen the confidence of investors and other relevant stakeholders, and encourage companies to adopt more sustainable business practices. According to Agustiningsih & Noviawan (2024) ESG is not just reporting, but also a strategic tool that can help companies increase long-term value by managing risk, improving reputation, and attracting sustainability-oriented investors. The measurement of ESG *disclosure* according to Wau (2023)is as follows:

$$\text{ESG } disclosure = \frac{amount\ diclosed\ in\ the\ annual\ report}{expected\ number\ of\ items}$$

The Effect of Green Taxes on Environmental Sustainability

It is important for companies to disclose all their activities to reduce environmental impacts related to climate change. One of these disclosure efforts is in the form of carbon emission disclosure which is the company's concern for the environment to make the environment much better. Disclosure of company information to the public is a form of transparency and accountability, shown in the company's annual report and sustainability report. This is based on the belief that sustainable investment not only benefits the environment, but can also provide long-term financial benefits (Susandi et al., 2024). Driven by awareness of environmental and social impacts, investors are increasingly integrating ESG factors into the company's environmental suistanbility strategy. This research is supported by Hanafiyah et al. (2024)that the implementation of carbon tax serves to transform the *greener* economy to more quickly reduce carbon emissions in the future and its role for sustainable economic development.

H_1: Green tax has a significant effect on *environmental*

The following research model is used:

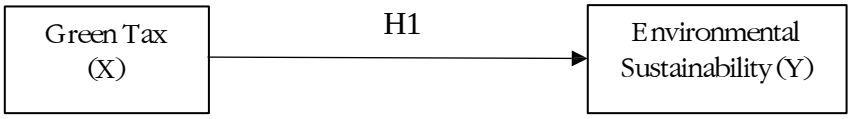


Figure 2. Research Framework
Source: Researcher, (2024)

METHOD

The study adopts a quantitative approach, which relies on numerical data and statistical analysis techniques. The data used is secondary, where information is collected from various sources such as annual reports, sustainability reports, books, journals, and other relevant literature. The object of this study is energy sector companies listed on the Indonesia Stock Exchange from 2022 to 2023.

This study uses a positivist approach that emphasizes knowledge gained through empirical observation and scientific methods. The positivist approach provides a strong framework for evaluating the effectiveness of green taxes in achieving environmental sustainability goals. By using quantitative methods, researchers can provide empirical evidence that supports or rejects hypotheses about the impact of green tax policies.

This study uses a non-probability sampling technique, namely purposive sampling. The selected sample is 68 energy sector companies listed on the Indonesia Stock Exchange for the period 2022-2023.

Table1 . Sample Criteria

	Sample Criteria	Total
1.	Energy sector companies listed on the Indonesia Stock Exchange 2022-2023	174
2.	Energy sector companies not listed on the main board of the Indonesia Stock Exchange 2022-2023	(94)
3.	Energy sector companies did not publish comprehensive sustainability reports for 2022-2023.	(12)
	Number of observation data	68

Source: Researcher, (2024)

Operational Definition of Variables

The operational definition of a variable is a concrete specification of how an abstract variable can be observed and quantified in a study. This study uses selected variables to be analyzed and processed in order to reach a conclusion. The independent variable is green tax, while the dependent variable is *Environmental Sustainability*. The following are the operational definitions of these variables.

Table 2 . Operational Definition of Variables

No.	Variables	Definition	Measurement
1	**Green Tax (X)**	Green taxes are a tool used to encourage a more sustainable economy. This tax is aimed at pollutant-producing economic activities such as carbon dioxide. The rapid increase in economic activity, especially since the industrialization era, has posed serious environmental challenges, making the application of green taxes increasingly relevant (Setiaji & Harfianto, 2023).	The measurement involves five main categories related to climate change and carbon emissions: climate change, greenhouse gas emissions, greenhouse gas reductions and associated costs, energy consumption, and accountability for carbon emissions. Carbon emissions disclosure= = $\frac{number\ of\ items\ used}{amount\ that\ should\ have\ been\ disclosed}$ (Faizah, 2022).
2	**Environmental Sustainability (Y)**	Environmental performance is the company's ability to manage the environmental aspects of its operational activities. Environmental performance is measured from the environmental management system and environmental assessment based on environmental policies, environmental goals, and environmental targets (Khotimah & Sari, 2024).	ESG disclosure measurement according to (Wau, 2023)as follows: ESG disclosure = $\frac{amount\ diclosed\ in\ the\ annual\ report}{expected\ number\ of\ items}$

Source: Researcher (2024)

RESULTS AND DISCUSSION

Descriptive Statistics

Descriptive statistical methods are applied to identify the lowest, highest, average, and standard deviation values of each variable. In short, the function of descriptive statistics is to provide an explanation of the characteristics of the data that has been collected. The following are the test results:

Table 3. Descriptive Statistics Test Results

	N	Minimum	Maximum	Mean	Std. Deviation
Pajak Hijau	68	,17	1,00	,6740	,21202
Environmental Sustainability	68	,16	,99	,5741	,22670
Valid N (listwise)	68				

Source: Processed Data (2024)

In this test, the value of carbon emissions shows a minimum percentage of 0.17 and a maximum of 1.00, with an average of 0.6740 and a standard deviation of 0.21202. Meanwhile, for ESG disclosure, the minimum value was recorded at 0.16 and a maximum of 0.99, with an average of 0.5741 and a standard deviation of 0.22670.

Normality Test

The normality test checks whether the data in the regression model follows a normal distribution. The success of this test is determined if the data is normally distributed. The success of this test can be determined if the data is normally distributed, which can be known if the significance value is less than 0.05. The following are the test results:

Table 4. Normality Test Results

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		68
Normal Parameters[a,b]	Mean	,0000000
	Std. Deviation	,18003638
Most Extreme Differences	Absolute	,092
	Positive	,071
	Negative	-,092
Test Statistic		,092
Asymp. Sig. (2-tailed)		,200[c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Source: SPSS output (2024)

Table 4 shows the Asymp. Sig. (2-tailed) value of 0.200> 0.05. Indicates the data is normally distributed.

Hesterokedastisity Test

The heteroscedasticity test is used to identify whether there is a difference in residual variance between one observation and another. Hesteroscedasticity test serves to check the occurrence of variance discrepancies in the regression model. The following are the test results:

Table 5. Hesteroscedasticity Test Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	,072	,040		1,794	,077
	Emisi Karbon	,112	,057	,236	1,972	,053

a. Dependent Variable: ABS_RES

Source: SPSS output (2024)

The results show a significance value of 0.053> 0.05, it can be concluded that there are no symptoms of heteroscedasticity.

Simple Linear Regression Analysis

The regression test analyzes changes in the dependent variable caused by changes in the independent variable to measure how much influence one variable has on another. The following are the test results:

Table 6. Simple Linear Regression Test Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	,136	,074		1,844	,070
	Pajak Hijau	,650	,105	,608	6,217	,000

a. Dependent Variable: Environmental Sustainability

Source: SPSS output (2024)

Based on the table above, the regression equation Y = 0.136 + 0.650X is obtained. The explanation is as follows:

1. The constant of 0.136 indicates that if carbon emissions do not exist, the value of ESG Disclosure will be at 0.136.
2. The carbon emissions regression coefficient of 0.650 indicates that any increase in carbon emissions by 0.650 will lead to an increase in ESG Disclosure by 0.650 points.

Hypothesis Test (T Test)

The T-test checks whether there is a significant relationship between one independent variable and the dependent variable. If the significance value is below 0.05, then the independent variable can affect the dependent variable.

Table 7. T-test Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	,136	,074		1,844	,070
	Pajak Hijau	,650	,105	,608	6,217	,000

a. Dependent Variable: Environmental Sustainability

Source: SPSS output (2024)

The results state that the significance value of carbon emissions is 0.000> 0.05. Proving carbon emissions have a significant effect on ESG *Disclosure*.

Determination Coefficient Test

The coefficient of determination shows the level of fit of the model to the existing data, indicating how much percentage of variation in the dependent variable can be explained by the independent variable. The following are the test results:

Table 8. Determination Coefficient Test Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,608[a]	,369	,360	,18140

a. Predictors: (Constant), Pajak Hijau

Source: SPSS 2024 output

The results show that the coefficient of determination is 0.369, carbon emissions contribute 36.9% to ESG *Disclosure*.

The Effect of Green Taxes on *Environmental Sustainability*

Based on the results of hypothesis testing, H1 is accepted, which means that green taxes have a positive impact on environmental sustainability. This finding is consistent with the findings of Imansari et al. (2024) and Agustiningsih & Noviawan (2024) that green taxes can encourage companies to adopt sustainable environmental practices. This study is in line with legitimacy theory, namely companies must be able to create a sustainable operational system to interact socially in society, not just thinking about profit. The application of green taxes encourages companies to support environmental sustainability through its influence on economic and social behavior by reducing carbon emissions by transparently disclosing environmental, social, governance in the company. This contributes to minimizing the dependence on fossil fuels produced by companies to support the transition to a low-carbon economy.

This study is also in line with the theory by Wijaya & Dwijayanti (2023) that ESG Disclosure can contribute to the social environment so that companies can be responsible for maintaining a good corporate image. Thus, the effect of green taxes on sustainability is in accordance with the environmental stewardship theory that the importance of companies being responsible and protecting and maintaining the environment. Companies should focus on how they use natural resources to reduce the negative impact of company operations on the ecosystem.

CONCLUSION

This conclusion suggests that green taxes have a direct influence on environmental sustainability. This study also found that energy sector companies are positively indicated in the practice of environmental sustainability which shows that companies care about the environment and not only think about financial benefits for the company.

This study certainly has limitations, namely the relatively low *R-square* value of 36.9% which indicates that the independent variable is a weak factor in the dependent variable. the use of independent variables is limited to the energy sector. Future studies or research are advised to include other different variables, such as environmental cost variables to find out how companies are able to disclose the environmental costs they use. As well as expanding the sector as the object of research such as the manufacturing and construction sectors that act as contributors to carbon emissions.

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