

The Effect of Environmental Performance and Audit Quality on Carbon Emissions Disclosure in Indonesian Energy Companies

Risma Amalia^{1*}, Aurellia Faiza Athifa², Agus Triyani³

^{1,2,3}Department of Accounting, Faculty of Economics and Business, Wahid Hasyim University, Semarang

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^{*)}Corresponding email: rismaamalia9125@gmail.com

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Abstract

This study was conducted in response to growing demands for transparency from companies in the energy sector regarding the disclosure of carbon emissions as a form of environmental responsibility. The study aims to examine the influence of environmental performance and audit quality on carbon emissions disclosure among energy sector companies listed on the Indonesia Stock Exchange during the 2020–2024 period. The method used is a quantitative approach with secondary data in the form of annual reports and sustainability reports. The research sample was determined using purposive sampling, comprising 75 observations, with data analysis employing multiple linear regression. The results indicate that, when considered individually, environmental performance does not have a significant effect on carbon emissions disclosure, whereas audit quality was found to have a positive and significant effect. This study contributes to the development of environmental accounting literature and underscores the importance of audit quality in enhancing the transparency of carbon emissions reporting, while also serving as input for companies and regulators in promoting more



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accountable reporting practices.

1. INTRODUCTION

The issues of climate change and rising carbon emissions have become a global concern, particularly in the energy sector, which is the primary contributor to greenhouse gas emissions. In this context, companies are expected not only to focus on economic performance but also to address environmental responsibility by providing honest information; one form of transparency is the disclosure of carbon emissions in sustainability reports, which is one way companies contribute to addressing climate change (Nilasakti et al., 2020). In Indonesia, the practice of disclosing carbon emissions continues to grow due to regulations regarding sustainability reporting. However, the quality Disclosure practices remain inconsistent across companies. This situation indicates a discrepancy between reporting requirements and actual transparency, necessitating further research into the factors influencing the level of carbon emissions disclosure, particularly in the energy sector, which generates high emissions. In theory, environmental performance is one of the key factors that can influence the extent of carbon emissions disclosure. Environmental performance indicates how effectively a company manages the impacts resulting from its operational activities, typically measured through indicators such as compliance with applicable regulations and participation in various environmental programs (Safa'at et al., 2025).

Companies that have good environmental performance usually have an incentive to convey environmental information more openly, as a way to gain recognition and provide positive signals to interested parties. Several studies confirm this, such as (Safa'at, 2025) and (Afdilah et al., 2023), which found that environmental performance has a positive impact on disclosure regarding carbon emissions. However, the results of previous research are not always consistent. (Rahmawati et al., 2024) and (Sekarini & Setiadi, 2021) found that environmental performance does not have a significant impact on carbon emissions disclosure. These differences in results indicate that the relationship between environmental performance and carbon emissions reports is not yet clear and requires further research. Apart from internal factors, external monitoring such as audit quality can also influence the level of trust and clarity in delivery of carbon emissions. Audit quality shows how well the auditor can find and convey errors or discrepancies in the company's reports. According to (Akbar et al., 2025), audit quality can be affected by several things such as the length of the audit, the duration of the auditor's work, and the size of the Public Accounting Firm. These things ultimately help improve the quality of information disclosure, including information related to carbon. However, research on the role of audit quality in the context of carbon emission disclosure is still limited, especially in Indonesia.

Based on this explanation, there are gaps in research, namely research results are still inconsistent regarding the impact of environmental performance on carbon emissions disclosure, and research that combines the role of audit quality as an external factor is still limited. Therefore, this research aims to study how environmental performance and audit quality influence carbon emissions reports carried out by companies. This research uses energy sector companies as research objects based on the fact that energy sector companies are one of the company sectors has a high level of operational activity and is the largest contributor to carbon emissions which have a direct impact on the environment. Apart from that, energy sector companies are also receiving more attention from stakeholders such as the government, investors and the public regarding the transparency of carbon emission disclosures. This sector is also considered relevant to examine the influence of environmental performance and audit quality on carbon emission disclosures because energy sector companies are required not only to have good financial performance, but also environmental responsibility and trustworthy or reliable reporting quality during the period 2020 to 2024. Based on the background explained, the formulation of the problem in this research is as follows:

1. Does environmental performance have a positive effect on carbon emissions disclosure?
2. Does audit quality have a positive effect on carbon emissions disclosure?

Based on the background explained, the research objectives in this study are as follows:

1. To analyze the influence of environmental performance on carbon emissions disclosure.
2. To analyze the effect of audit quality on carbon emissions disclosure.

This research is expected to be useful both in theory and in application. In theory, it deepens understanding of the factors that influence the disclosure of carbon emissions and explains differences in results from previous research. In practice, this serves as a guide for the government in making regulations regarding sustainability reporting and helps companies increase their openness and responsibility towards the environment. Therefore, this research is essential to support sustainable and more responsible business.

2. THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

2.1 Stakeholder Theory

Stakeholder theory according to Ghazali and Chairiri (2007) quoted in (Afdilah et al., 2023), explains that a company is not just an entity that only thinks about financial profits, but must also consider the interests of various parties related to the sustainability of the company. an entity that works only for its own interests, not only to meet the interests of stakeholders, such as shareholders, credit providers and consumers. suppliers, government, community and other related parties. Stakeholders have the right to obtain information regarding the impact of company activities on the environment, even though this information may not be used directly or may not have a noticeable impact on the company. As a result, the survival of a company is highly dependent on the support provided by parties with an interest in the entity.

2.2 Legitimacy Theory

Legitimacy theory according to Dowling & Pfeffer, 1975, quoted in (Afdilah, 2023) states that a company is considered to have organizational legitimacy if there is conformity. Between the values held by the company and the values that exist in the social system around society. On the other hand, if there is a mismatch between the company's values and society's values, this could have an impact on the company's credibility. These threats can cause legal risks, economic losses, or social sanctions.

2.3 Hypothesis Development

2.3.1 Effect of Environmental Performance on Carbon Emission Disclosure

Environmental performance is a company's ability to manage and control environmental impacts arising from its operational activities, such as waste management, efficient use of energy, and reduction of greenhouse gas emissions. This performance also shows the company's level of compliance with environmental regulations and the implementation of sustainable business principles. In Indonesia, environmental performance measurement generally refers to PROPER, where a higher rating reflects better quality environmental performance (Safa'at et al., 2025). In addition, environmental performance is a manifestation of the company's commitment to preserving the environment while meeting stakeholder expectations (Afdilah et al., 2023), thus acting as an important indicator of corporate social responsibility.

According to the perspective of legitimacy theory, companies with good environmental performance tend to disclose environmental information more widely in order to gain recognition from the public. Meanwhile, stakeholder theory emphasizes the importance of company transparency in providing information to stakeholders, including regarding carbon emissions. Companies that have high environmental performance will show their responsibility through disclosing carbon emissions as a form of accountability. Previous research findings support this relationship (Safa'at et al., 2025) and (Afdilah, 2023) state that environmental performance has a positive and significant influence on carbon emissions disclosure. Thus, it can be concluded that the better the company's environmental performance, the greater the level of carbon emissions disclosure carried out. This shows that environmental performance has a positive effect on carbon emissions disclosure.

H1: Environmental performance has a positive effect on carbon emissions disclosure.

2.3.2 Influence of Audit Quality on Carbon Emission Disclosure

Audit quality describes the auditor's ability to carry out the audit process professionally, independently and in accordance with applicable standards, thereby producing reliable financial reports. Auditor quality is used to assess the extent to which the auditor is able to monitor and evaluate the information disclosed by the company (Kamila et al., 2024). Auditors who have high quality are usually supported by adequate resources, such as competent professional staff, extensive experience, and the use of audit technology. One indicator of audit quality is the use of Big Four Public Accounting Firms (KAP) which have an international reputation and audit standards that are stricter than non-Big Four KAPs (Tarigan et al., 2022).

Based on stakeholder and legitimacy theory, companies are required to convey environmental information in order to gain trust and support from stakeholders. Companies audited by Big Four KAPs tend to make broader disclosures of carbon emissions, because auditors have an interest in maintaining reputation and minimizing legal risks, thereby encouraging transparency (Tarigan et al., 2022). This research also shows that audit quality has a positive effect on carbon emissions disclosure. Thus, it can be concluded that the better the audit quality of a company, the higher the level of transparency demonstrated, including in disclosing carbon emissions as a form of responsibility towards the environment.

H2: Audit quality has a positive effect on carbon emissions disclosure.

2.4 Research Model

This framework was created to describe the relationship between the variables studied in this research. With this framework, it is hoped that readers will more easily understand the direction and flow of research. The framework of thinking can be seen in the following picture:

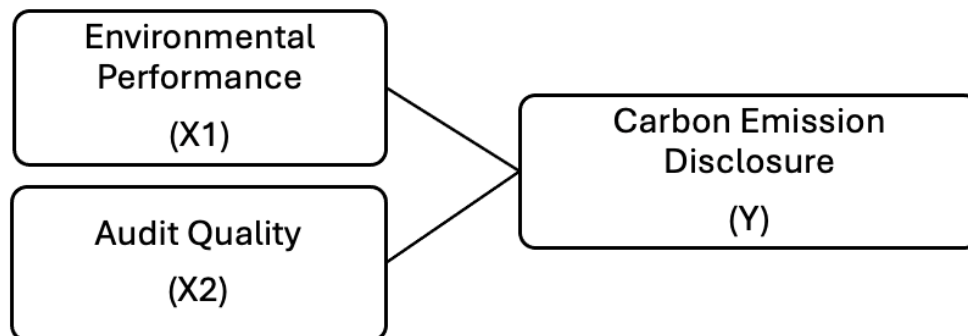


Figure 1. Empirical Research Model

3. RESEARCH METHODS

This research uses a quantitative research approach with descriptive and associative causal analysis. A quantitative approach is a way of conducting research with a focus on testing theory. The theory is tested by measuring variables using data in the form of numbers, then analyzing them using statistical methods. According to (Sugiyono, 2019), quantitative research is used to examine certain groups of people or objects with the aim of testing predetermined hypotheses. This approach is suitable for use in research on carbon emissions disclosure because it can help analyze the relationship between variables clearly and can be measured. This is also in accordance with research conducted (Safa'at, 2025) and (Afdilah, 2023).

This research is included in the explanatory research type, namely research that aims to clarify the relationship between variables by testing hypotheses. According to (Sugiyono,

2019), explanatory research is used to explain the position of the variables studied and the relationships between these variables. This research uses an explanatory research approach to analyze the impact of environmental performance and audit quality on carbon emissions reports. The data used in this research is secondary data, namely data obtained indirectly through intermediary media such as annual reports and sustainability reports published by companies. According to (Sugiyono, 2019), secondary data can be in the form of financial reports, annual reports, or sustainability reports prepared by the company. The data in this research was obtained through the company's official website or through the Indonesian Stock Exchange (BEI). The use of secondary data is also supported by research conducted by (Safa'at et al., 2025) and research by (Nilasakti et al., 2020).

This research uses a multiple linear regression analysis model to examine the impact of independent variables on dependent variables. The independent variables in this research are environmental performance and audit quality, while the dependent variable is carbon emission disclosure. Data processing techniques used in this research include descriptive statistical analysis, checking classical assumptions such as normality tests, multicollinearity tests, heteroscedasticity tests, and autocorrelation tests, as well as hypothesis testing using multiple linear regression analysis.

1. Companies in the energy sector listed on the Indonesia Stock Exchange (BEI) for the last five years, namely from 2020 - 2024.
2. Companies that consistently publish annual reports and sustainability reports during the research period.
3. Companies that disclose GRI Standard 305 regarding carbon emissions in published reports.
4. Companies that have complete data regarding research variables, namely environmental performance and audit quality.

Based on the specified criteria, 15 companies in the energy sector were found as research samples with an observation period of 5 years, so the total amount of data used in this research was 75 observation data. This sample size is considered sufficient to represent the entire population and allows deeper analysis of the variables studied.

Table 1. Operational Variables

Source Indicator Variable Name

PEK Carbon Emission Disclosure =

Total items (P. Fazrin & , A. Basit, 2025)

Environmental Performance 5 = Gold = Very good

4 = Green = Very good

3 = Blue = Good

2 = Red = Bad

1 = Black = Very Bad (P. Fazrin & , A. Basit, 2025)

Audit Quality of Affiliated Accounting Firms:

1. Audited by KAP Big Four= Scale= 1

2. Audited by a Non – Big Four KAP= Scale= 0 (Tarigan et al., 2022)

Variable Name	Indicators	Sources
Carbon emission disclosure	PEK = Number of items disclosed Total Items	(P. Fazrin & , A. Basit, 2025)
Environmental Performance	5 = Gold = Very very good 4 = Green = very good 3 = Blue = Good 2 = red = Bad 1 = Black = Very bad	(P. Fazrin & , A. Basit, 2025)
Audit Quality	Affiliated Accounting Firms : 1. Audited by KAP Big Four= Scale= 1 2. Audited by a Non – Big Four KAP= Scale= 0	(Tarigan et al., 2022)

Formulation Of The Regression Equation Model

The following is the equation model for multiple linear regression analysis:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \epsilon$$

Information:

Y = Carbon Emission Disclosure

α = Constant

$\beta_1 X_1$ = Regression Coefficient

X1 =Environmental Performance

X2 = Audit Quality

ϵ = Error

4. RESULTS AND ANALYSIS

Based on a purposive sampling technique, this research used a sample of 15 energy sector companies listed on the Indonesian IDX during the 2020-2024 period. Research data was obtained through annual reports and company sustainability reports which were published consistently during the observation period. With a research time span of five years, the total number of observation data analyzed in this study was 75 observations.

Table 2. Descriptive Statistics

	Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std Deviation
Carbon-Emission_Y	75	14	1.00	.6838	.25865
Environmental_PerformanceX1	5	3	3.55	3.55	.501
Audit_Quality_X2	75	0	1	.79	.412
Valid N (listwise)	75				

Based on the results of descriptive statistical tests on 75 research samples, the Carbon Emissions (Y) variable has a minimum value of 0.14 and a maximum value of 1.00 with an average (mean) value of 0.6838 and a standard deviation of 0.25865. An average value that is greater than the standard deviation indicates that the carbon emission variable data has a relatively good distribution and does not vary too much. The Environmental Performance

variable (X1) has a minimum value of 3 and a maximum of 4 with an average of 3.55 and a standard deviation of 0.501. Furthermore, the Audit Quality variable (X2) has a minimum value of 0 and a maximum value of 1 with an average value of 0.79 and a standard deviation of 0.412. An average value close to 1 indicates that the majority of companies in the sample have been audited by high-quality auditors.

Table 3. Normality Test

Tests of Normality						
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic			Statistic	df	Sig.
Carbon_Emission_Y	.196		75	.000	.884	75

a. Lilliefors Significance Correction

Source: Data processed with SPSS 24, 2026

Based on the test results, the carbon emissions variable (Y) has a Kolmogorov-Smirnov statistical value of 0.196 with a df of 75 and a significance value of 0.000. Meanwhile, the Shapiro-Wilk test obtained a statistical value of 0.884 with a df of 75 and a significance value of 0.000. The significance value in both tests is smaller than 0.05, thus indicating that the Carbon Emission variable data is not normally distributed. However, the number of samples in this study was 75 observations, so based on the central limit theorem approach, the data can still be considered close to a normal distribution. Therefore, even though statistically the data is not completely normal, the data is still suitable for use for regression analysis in this research.

Table 4. Multicollinearity Test

Coefficients ^a								
Model		Unstandardized		Standardized	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.316	.207		1.522	.132		
	Environmental_Performance_X1	.065	.063	.125	1.022	.310	.805	1.242
	Audit_Quality_X2	.176	.077	.281	2.289	.025	.805	1.242

a. Dependent Variable: Carbon_Emission_Y

Based on the Coefficients table, the tolerance value for Environmental Performance (X1) and Audit Quality (X2) is 0.805 (>0.10) respectively and the VIF value is 1.242 (<10). This result shows that there is no multicollinearity, so the assumption is appropriate to use. In the heteroscedasticity test, Environmental Performance has a significance value of 0.310 (>0.05), which means that heteroscedasticity does not occur, while Audit Quality is 0.025 (<0.05) indicating the presence of heteroscedasticity. Thus, the research model still contains symptoms of heteroscedasticity.

Table 5. Autokorlation Test

Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.355a	.126	.102	.24517	.984

Based on the results of the Durbin-Watson autocorrelation test, a value of 0.984 was obtained. Values close to 2 indicate no autocorrelation, while values close to 0 indicate positive autocorrelation, so these results indicate a tendency for positive autocorrelation in the model. This means that there is a relationship between the residuals, so that the assumption of error independence is not fully met. However, the level of autocorrelation is still relatively weak, so the regression model can still be used with caution in interpreting the results.

Based on the results of the multiple linear regression test, Carbon Emissions (Y) are influenced by Environmental Performance (X1) and Audit Quality (X2). A constant value of 0.316 indicates that when the independent variable is considered constant, the Carbon Emissions value is 0.316. The Environmental Performance regression coefficient (X1) of 0.065 indicates a positive relationship, which means that every increase in environmental performance will increase carbon emissions by 0.065. However, based on the t test, a significance value of $0.310 > 0.05$ was obtained, so this variable does not have a significant effect on carbon emissions. Meanwhile, the Audit Quality regression coefficient (X2) of 0.176 also shows a positive relationship. The results of partial hypothesis testing (t test) show that the environmental performance variable does not have a significant influence on carbon emissions. This matter shown by a significance value of 0.310 which is greater than the significance level of 0.05, as well as a calculated t value of 1.022 which is relatively small. On the other hand, the audit quality variable shows a significant influence on carbon emissions. This is proven by the significance value of 0.025 which is smaller than 0.05, as well as the calculated t value of 2.289.

Table 6. F Test

ANOVAa						
Model	Sum of Suares	df	Mean Square	F	Sig.	
1	Regression	.623	2	.311	5.181	.008b
	Residual	4.328	72	.060		
	Total	4.951	74			

a. Dependent Varaiable: Carbon_Emission_Y

b. Predictors: (Constant), Audit_Quality_X2, Environmental_Performance_X1

Based on the test results, the calculated F value is 5.181 with a significance level of 0.008 (<0.05) indicating that environmental performance and audit quality simultaneously have a significant influence on carbon emissions. This indicates that the regression model used is suitable for explaining the relationship between variables, although not all variables have a partially significant effect. The coefficient of determination (R Square) value of 0.126 indicates that the two variables are only able to explain 12.6% of the variation in carbon emissions, while the other 87.4% is influenced by other factors outside the research model.

4.1 Environmental Performance (H1 rejected)

The environmental performance variable does not show a significant influence on carbon emissions, which can be seen from the significance value of 0.310 which exceeds 0.05 and the calculated t value of 1.022 which reflects a relatively low influence. Therefore, the first hypothesis (H1) which states that there is an influence of environmental performance on carbon emissions is declared not supported or rejected. Even though the regression coefficient

value shows a positive direction of 0.065, this relationship does not have sufficient statistical strength. This indicates that improving environmental performance has not been able to provide significant changes to carbon emission levels. This condition can lead to allegations that the company's environmental performance is more symbolic or administrative in nature, compared to real implementation in emissions management. Thus, environmental performance has not been a dominant factor in influencing carbon emissions in this research.

4.2 Audit Quality (H2 accepted)

The audit quality variable is proven to have a significant influence on carbon emissions, as shown by the significance value of 0.025 which is below 0.05 and the calculated t value of 2.289 which shows the strength of the influence is quite good. Based on these results, the second hypothesis (H2) which states that there is an influence of audit quality on carbon emissions is declared accepted. A positive regression coefficient value of 0.176 indicates that there is a unidirectional relationship between audit quality and carbon emissions. This means that the higher the audit quality a company has, the higher the level of carbon emissions disclosure presented. This effect is more related to increased transparency and reliability of reporting, rather than simply an increase in the actual number of emissions. Thus, audit quality plays an important role in influencing carbon emissions, especially in the aspect of information disclosure.

5. CONCLUSION

Based on the research results, partially environmental performance does not show a significant influence on carbon emissions, while audit quality is proven to have a significant influence. Together, these two variables have a significant effect on carbon emissions so that the research model is considered suitable for use. However, the low value of the coefficient of determination indicates that there are still many other factors outside the model that influence carbon emissions. This research is limited by an adjusted R Square value of 0.126, which indicates that the environmental performance and audit quality variables are only able to explain 12.6% of the variation in carbon emissions disclosure, while the other 87.4% is influenced by other factors outside the research model, including the limited number of independent variables, data conditions that do not fully meet the normality assumption, and the presence of indications of autocorrelation that can affect the accuracy of the results. In addition, the measurement of environmental performance variables may not fully represent the company's real conditions in managing carbon emissions. For further research, it is recommended to add other variables such as company size, profitability, leverage and environmental policy so that the model's ability to explain carbon emissions increases. In addition, the use of more complex analytical methods and a longer research period is expected to provide more comprehensive results. Practically, it is hoped that the results of this research can be used as consideration for companies in improving audit quality and environmental reporting transparency, as well as as a reference for further research.

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