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Research Article

The Effect of Green Investment and Carbon Emission Disclosure on Financial Reporting Quality in Energy Sector Companies Listed on the IDX (2021–2023)

Galuh Candra Mustika Dewi[1*], Muslimin[2], Syah Arief Atmaja Wijaya[3]

[1,2,3] Faculty of Economics And Business, Universitas Pembangunan Nasional "Veteran" Jawa Timur, East Java, Indonesia Email: 21013010252@student.upnjatim.ac.id

* Corresponding Author : Galuh Candra Mustika Dewi

Abstract: This study investigates the effect of green investment and carbon emission disclosure on the quality of financial reporting among energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2023 period. The research uses a quantitative approach and secondary data, with an exploratory design aimed at examining causal relationships between the independent variables and financial report quality. Green investment refers to the allocation of capital toward environmentally sustainable initiatives, while carbon emission disclosure involves the transparency of companies in reporting their greenhouse gas emissions. Financial report quality is measured through accrual quality and earnings persistence.Statistical analysis was conducted using panel data regression. The results indicate that neither green investment nor carbon emission disclosure has a statistically significant influence on the quality of financial reports. The significance values obtained were 0.525 for green investment and 0.069 for carbon emission disclosure, both above the 0.05 threshold. These findings suggest that while environmental responsibility practices are increasing in visibility, they have not yet translated into improvements in financial reporting quality in the energy sector. External pressures or compliance motives may drive environmental disclosures, rather than a commitment to improving transparency or financial integrity.The study highlights the necessity for further investigation into the mechanisms by which sustainability practices can enhance financial reporting. It also suggests that regulatory enforcement alone may not be sufficient to influence reporting behavior in the short term.

Keywords: carbon emission disclosure; energy sector; financial reporting quality; green investment; sustainability reporting.

1. INTRODUCTION

Green investment and carbon emission disclosure have become increasingly relevant in recent years due to rising investor awareness of climate change and corporate environmental accountability. These elements are now considered part of corporate responsibility and transparency, especially in the energy sector, which significantly contributes to global greenhouse gas emissions.

In Indonesia, regulatory frameworks such as POJK No. 51/POJK.03/2017 and SEOJK No. 16/SEOJK.04/2021 mandate companies to disclose environmental information, including carbon emissions and efforts to reduce them. These disclosures are expected to enhance investor trust and improve the overall transparency of financial reporting. Companies that provide more complete environmental disclosures are perceived as more accountable and responsible.

Sustainability reports are one of the key platforms for such disclosures. These reports contain information on environmental, social, and governance (ESG) aspects, including carbon emission levels and reduction strategies. According to recent statistics from the World Population Review (2023), Indonesia ranks seventh among countries with the highest CO_2 emissions, highlighting the urgency for corporate action, particularly from energy companies.

The energy sector is the largest contributor to global greenhouse gas emissions, accounting for approximately 75.7% of total emissions according to the World Resources Institute (2024). This includes emissions from electricity, transportation, industry, and construction. In Indonesia, the Central Bureau of Statistics (2024) reported that energy-

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related sectors, including electricity and gas, are among the top emitters. This underscores the need for companies in this sector to adopt sustainable practices and disclose their environmental impact.

Government commitments such as the ratification of the Paris Agreement through Law No. 16 of 2016 also emphasize emission reduction as a national priority. Transparency in carbon emissions reporting is expected to support this goal and influence stakeholder decisions. Disclosures allow investors to assess the environmental risks associated with a company's operations.

Financial reporting quality remains a critical element for decision-making among investors and other stakeholders. High-quality financial reports present an accurate, fair, and complete view of a company's financial position. Some studies have explored how internal control systems and accounting standards affect reporting quality, but the influence of environmental performance, such as green investment and carbon emission disclosure, remains under-researched in emerging markets like Indonesia.

There is limited empirical research in Indonesia linking green investment and carbon emission disclosure to financial reporting quality, especially in high-emission sectors like energy. This study aims to address that gap by examining how these environmental practices relate to the quality of financial statements in energy sector firms listed on the Indonesia Stock Exchange for the period 2021–2023.

2. THEORITICAL FRAMEWORK

Agency Theory

Agency theory, as proposed by Jensen and Meckling (1976), describes the relationship between principals (owners) and agents (managers), where the principal delegates authority to the agent to act on their behalf. This delegation often leads to conflicts of interest due to differing objectives and information asymmetry. Panda and Leepsa (2017) highlight that agency problems arise when agents prioritize personal goals over those of principals, especially when monitoring is weak. In financial reporting, managers may manipulate information to appear favorable unless effective oversight is in place. This theory supports the idea that environmental disclosure can serve as a monitoring tool, reducing agency conflicts and improving financial report quality.

Legitimacy Theory

Dowling and Pfeffer (1975) introduced legitimacy theory to explain how companies seek social approval by aligning their actions with societal norms and expectations. Firms voluntarily disclose environmental and social information to maintain or regain legitimacy, particularly when facing public scrutiny. Michael (2019) emphasized that organizations respond to societal pressure by disclosing sustainability-related data, which includes carbon emissions and environmental investments. Berthelot and Robert (2011) argue that such disclosures help large firms build public trust, and Akhter et al. (2023) found that green disclosures enhance corporate image and perceived legitimacy.

Financial Reporting Quality

According to Hütten and Sessar (2011), financial reporting quality is determined by qualitative characteristics, both fundamental (relevance, faithful representation, materiality) and enhancing (comparability, verifiability, timeliness, understandability). Febrita and Kristanto (2019) state that an unqualified audit opinion indicates reliable financial statements that are free from material misstatements. These characteristics ensure that financial reports are useful for decision-makers and reflect the true economic condition of a company. High-quality financial reports provide assurance to investors and reduce uncertainty in decision-making processes.

Carbon Emission Disclosure

Carbon emission disclosure involves the reporting of greenhouse gas emissions produced by a company's operations. Tila and Agustine (2019) observed that many companies voluntarily disclose emissions data to anticipate future regulatory changes and mitigate reputational risks. Jihan and Murwaningsari (2023) found that such disclosures can reduce capital costs by signaling transparency and environmental awareness to stakeholders. In the context of the energy sector, carbon disclosures allow companies to demonstrate environmental responsibility and align with global emission reduction goals, especially in carbon-intensive industries.

Green Investment

Green investment refers to the allocation of corporate resources toward projects or assets that contribute to environmental sustainability. Zhang and Berhe (2022) define it as

a corporate strategy aimed at reducing environmental impact through clean technology, renewable energy, or sustainable practices. Ramadhani and Astuti (2023) explain that companies use green investment to improve long-term financial performance while meeting environmental objectives. Nurmalasari and Kania (2024) found a positive link between green investment and financial transparency, suggesting that companies adopting green strategies tend to enhance their reporting practices. Wardaningtyas and Poerwati (2024) further emphasize that green investment can strengthen the credibility of sustainability and financial disclosures.

3. RESEARCH METHODS

This study employs an exploratory quantitative approach using secondary data. Quantitative research refers to a systematic investigation of phenomena through numerical data and statistical techniques (Priadana & Sunarsi, 2021). This approach allows the researcher to test hypotheses and identify relationships between variables in a structured manner. The use of numerical data provides objectivity and replicability, ensuring the validity of the analysis (Azhari et al., 2023). The object of the study includes green investment and carbon emission disclosure and their impact on the quality of financial reporting in energy sector companies listed on the Indonesia Stock Exchange (IDX) from 2021 to 2023. This sector was chosen due to its high contribution to global greenhouse gas emissions, making it critical in assessing environmental accountability and financial transparency.

The dependent variable in this study is the quality of financial reporting, which is measured using audit opinion as a proxy. Based on the classification from Atmaja & Probohudono (2015), five categories of audit opinion are used: Unqualified Opinion (WTP) scored 5, Unqualified Opinion with Explanatory Paragraph (WTP-DPP) scored 4, Qualified Opinion (WDP) scored 3, Adverse Opinion (TW) scored 2, and Disclaimer of Opinion (TMP) scored 1. This Likert scale allows the transformation of qualitative audit outcomes into ordinal data suitable for statistical modeling. Independent variables include Green Investment and Carbon Emission Disclosure. Green Investment is calculated by dividing the company's total environmental expenditure by its total assets (Riyanti & Murwaningsari, 2023), representing the firm's commitment to sustainability in proportion to its financial size.

Carbon Emission Disclosure (CED) is measured using a content analysis approach based on the Global Reporting Initiative (GRI) 305 standards. The CED index comprises seven items: direct GHG emissions (305-1), energy indirect GHG emissions (305-2), other indirect GHG emissions (305-3), GHG emissions intensity (305-4), GHG reduction (305-5), ozone-depleting substances (305-6), and other significant air emissions (305-7). Each disclosed item is scored 1, and 0 if not disclosed, with the total normalized by the maximum possible score of 7 to yield a percentage. This method reflects both the breadth and depth of a company's environmental transparency. The population of this study includes 90 energy companies listed on the IDX. Using purposive sampling based on specific criteria such as the availability of annual and/or sustainability reports during the 2021–2023 period 66 companies were selected, resulting in 198 firm-year observations.

The research utilizes secondary panel data obtained from publicly available annual reports, audit reports, and sustainability reports published on the official website of the Indonesia Stock Exchange (www.idx.co.id).

Data collection is conducted through documentation, a method involving the systematic review of company disclosures and financial reports. Panel data enables the tracking of changes across both time and entities, improving the robustness of the analysis (Ahmaddien, 2020). The documentation method ensures consistency and reliability of the data as it originates from regulated and audited sources. The nature of the data allows for longitudinal analysis, providing insight into trends and causality across the years under study.

4. RESULT AND DISCUSSION

Result

Descriptive Statistical Analysis

In this study, descriptive statistical analysis included standard deviation, maximum, and minimum values. The results of the descriptive statistical analysis for each variable were based on data obtained from each company, as follows:

Table 1. The average financial reporting quality.

	Maximum	Minimum	Deviation
X1	5,53	0,00	0,70
X2	1,00	0,00	0,32
Y	5	1	0,54

Financial Reporting Quality (Y)

The maximum value of financial reporting quality is 5, and the minimum value is unspecified. The average financial reporting quality is 4.87, indicating that the quality of financial reports among all analyzed entities is relatively high. This suggests that most entities have good and transparent reporting practices. The standard deviation for financial reporting quality is 0.54.

Green Investment (X1)

The maximum value of green investment was recorded by Mitrabara Adiperdana Tbk in 2021, at 5.53, while the minimum value was 0.00. The average green investment is 0.21. This means that, overall, environmental investments made by the companies are relatively low among all analyzed entities. Although some companies make substantial investments, many entities still lack commitment to investing in environmentally friendly projects. The standard deviation for green investment is 0.70. This high variation indicates inconsistency in commitment to green investment across different entities.

Carbon Emission Disclosure (X2)

The maximum value of carbon emission disclosure is 1.00, and the minimum is 0.00. The average is 0.33, indicating that the level of carbon emission disclosure among all entities is relatively low. This means that many entities only partially disclose emission-related information or do not disclose it at all. The standard deviation for the carbon emission disclosure variable is 0.32, showing a considerable variation in the data. This implies significant differences in emission disclosure levels among entities some disclose at a high level, while others provide very minimal or no disclosure.

Output Analysis

Table 2. Audit Opinion.

Audit Opinion	N	Marginal Percentage
0	1	0.5%
TMP	1	0.5%
WDP	11	5.7%
WTP	179	93.2%
Valid	192	100.0%
Missing	0	
Total	192	
Audit Opinion	**N**	**Marginal Percentage**

All 192 cases were considered valid, indicating that there were no missing values in the data. The absence of missing values indicates that the data is complete and ready for further analysis.

Ordinal Logistic Regression Test

Overall Model Fit

Table 3. Overall Model Fit.

Model	-2 Log Likehood	Chi-Square	df	Sig
Intercept Only	57.767			
Final	52.588	5.179	2	.075

Model fitting analysis showed that the -2 log likelihood value for the intercept-only model was 57.767, while for the final model it was 52.588. This decrease in the -2 log likelihood value indicates that the final model better explains the data, meaning the hypothesized model fits the data, or in other words, the proposed regression model is good. This is because the additional variables in the model make a significant contribution. The significance value (p-value) of 0.075 indicates that this result is not significant enough at the 0.05 level, although close to it.

Goodness-of-Fit Test

Table 4. Goodness-of-Fit.

	Chi-Square	df	sig
Pearson	104.939	229	1.000
Deviance	43.296	229	1.000

The Goodness-of-Fit test was conducted to evaluate the fit of the regression model. The Pearson significance value (p-value) was 1.000. Because this p-value was significantly greater than 0.1, the hypothesis (H0) was accepted. This indicates that there is no significant difference between the model and the observed data, meaning the model is considered good at predicting observed values. The Deviance significance value was 1.000. This high p-value indicates that the hypothesis (H0) was accepted for the Deviance test. This indicates that the model also shows no significant difference from the observed data.The results of this goodness-of-fit test indicate that the tested model is good at predicting observed values, as there is no significant difference between the model and the observed data. This means that the model can be considered appropriate and effective for the analysis.

Coefficient of Determination

Table 5. Coefficient of Determination.

Pseudo R-Square	
Cox and Snell	**.027**
Nagelkerke	**.061**
McFadden	**.047**

With a value of 0.061, the Nagelkerke R-Square provides a higher assessment than the Cox and Snell, indicating that the independent variables of green investment and carbon emission disclosure can influence the dependent variable, financial report quality, although only by 6.1% of the data variability.

Parameter Estimation Test

Table 6. Parameter Estimation Test.

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Treshold	[Y_OPINI=0]	-4.671	1.031	20.518	1	<,001	-6.692	-2.650
	[Y_OPINI=0]	-3.971	.749	28.099	1	<,001	-5.440	-2.503
	[Y_OPINI=0]	-2.015	.374	29.071	1	<,001	-2.747	-1.282
Location	X1_GI	-.842	1.324	.404	1	.525	-3.438	1.753
	X2_CED	3.139	1.724	3.315	1	.069	-.240	6.518

The significance values (Sig.) for [Y_OPINION = 0], [Y_OPINION = 1], and [Y_OPINION = 3] are <0.001. Because these values are far below 0.05, the null hypothesis is rejected. This indicates that the parameters for these thresholds are significant in the model. The significance value for green investment (X1) is 0.525, which is greater than 0.05. Therefore, the null hypothesis is accepted, indicating that this variable is not significant in the model. The significance value for carbon emission disclosure (X2) is 0.069, which is also greater than 0.05, so the null hypothesis is accepted. This indicates that this variable is also not significant. The results of the parameter estimation test show that all thresholds are significant and contribute to the model, while the independent variables green investment and carbon emission disclosure are not significant. This means that although thresholds are important in prediction, the location variable tested does not make a significant contribution to the model.

Test of Parallel Lines

Table 7. Test of Parallel Lines.

Model	-2 Log Likehood	Chi-Square	df	Sig
Null Hypothesis	52.588			
General	46.299[b]	**6.289[C]**	**4**	.179

The test results show that the p-value of 0.179 indicates that there is not enough evidence to reject the null hypothesis. In other words, there is no significant difference in the location parameters (slope coefficients) between the different categories. This means that the assumption of parallel lines is met, and the model is considered appropriate for

use. There is no indication of model misfit, so the selection of this model can be deemed appropriate.

Discussion

The Effect of Green Investments on Financial Reporting Quality

The results of the study indicate that green investment does not have a positive effect on the quality of financial statements. Green investment may affect financial reporting quality through several mechanisms. First, companies that allocate funds to environmentally friendly projects are more likely to prioritize accountability and transparency, which in turn strengthens investor trust. Second, better disclosures related to environmental activities can reduce information asymmetry between management and shareholders, thereby enhancing the overall quality of financial reporting.

However, despite the expected positive relationship, the regression analysis in this study shows that the significance value for green investment (X1) is 0.525, which is greater than the threshold of 0.05. This means that the null hypothesis is accepted, indicating that green investment does not have a statistically significant effect on the quality of financial statements in this context.

This result may be due to a lack of consistent commitment from companies in implementing long-term sustainable green investment practices. Without a strong and ongoing emphasis on environmental investments, the expected improvements in reporting quality may not be immediately observable or measurable.

The Effect of Carbon Emission Disclosure on Financial Reporting Quality

The findings of the study also explore the influence of carbon emission disclosure on financial reporting quality. Carbon emission disclosure is generally regarded as an important part of environmental transparency, enabling stakeholders to evaluate how companies manage and mitigate their environmental impacts.

Yet, the analysis shows that while the significance value for carbon emission disclosure (X2) is 0.069, which is close to the significance threshold, it is still above the 0.05 level. Therefore, the null hypothesis is also accepted for this variable, indicating that carbon emission disclosure does not significantly affect the quality of financial statements within the scope of this study.

This finding could reflect the current state of environmental disclosure practices in Indonesian energy sector companies, where such disclosures may still be treated as symbolic rather than integrated into the company's core financial reporting processes. As a result, the disclosures may not yet be robust enough to impact financial statement quality in a measurable way.

5. CONCLUSION

This study aims to examine the influence of green investment and carbon emission disclosure on the quality of financial reporting in energy sector companies listed on the Indonesia Stock Exchange (IDX) for the period 2021–2023. Using ordinal logistic regression analysis, the study investigates whether environmentally friendly practices and transparent disclosure of emissions impact the reliability and credibility of financial reports, as reflected through audit opinions. These aspects are increasingly relevant as stakeholders demand higher accountability regarding sustainability and governance practices.The results reveal that neither green investment nor carbon emission disclosure has a statistically significant effect on financial reporting quality. Green investment yields a significance value of 0.525, while carbon emission disclosure records a p-value of 0.069 both exceeding the conventional significance threshold of 0.05. This suggests that, within the observed period and sample, companies' environmental spending and emission transparency do not play a decisive role in shaping the auditors' assessment of financial statement quality. These findings may imply that auditors still place greater emphasis on traditional financial factors rather than environmental initiatives when issuing opinions.Despite the growing global emphasis on sustainability reporting, the findings of this study highlight a gap between environmental efforts and financial reporting outcomes. The lack of a significant relationship may be due to the limited integration of environmental metrics into the auditing process, or a lack of standardized and mandatory regulations around green disclosures in Indonesia. Therefore, stronger regulatory frameworks and increased stakeholder awareness may be necessary to ensure that environmental initiatives translate into tangible improvements in corporate transparency and accountability.

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