



The Effect of Green Accounting and Environmental Performance on Financial Performance on the Indonesia Stock Exchange: A Case Study of the Energy Sector from 2019 to 2024

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ABSTRACT

This study aims to examine and analyze the effect of green accounting and environmental performance on financial performance, both partially and simultaneously, among energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2019–2024 period. The study employed a quantitative approach with a causal explanatory research design and utilized secondary panel data obtained from companies' annual reports, audited financial statements, and sustainability reports. The sample was selected using purposive sampling, resulting in 40 companies with a total of 240 observations over six years. Data were analyzed using panel data regression with the Random Effect Model (REM) and processed using EViews 13 software. The findings reveal that green accounting has a positive and statistically significant effect on financial performance ($p = 0.0387$), whereas environmental performance has no significant effect ($p = 0.9605$). Simultaneously, the two independent variables do not have a significant effect on financial performance (F-test $p = 0.0888$), with the model explaining only a limited proportion of the variation in financial performance ($R^2 = 2.02\%$). These findings suggest important managerial implications, indicating that energy sector companies should adopt green accounting as an integral part of their business strategy rather than merely fulfilling regulatory compliance. Furthermore, companies should integrate environmental performance (as measured by the PROPER rating) with operational efficiency and financial strategies to ensure that sustainability initiatives generate tangible improvements in financial performance and long-term corporate value.

INTRODUCTION

The rapid pace of industrialization and globalization has accelerated business activities, compelling companies to manage their resources more effectively in order to remain competitive in increasingly intense national and international markets (Apriliyani et al., 2021). In this context, financial performance occupies a central position as an indicator of a company's ability to generate profits, utilize assets efficiently, and create value for shareholders. Strong financial performance not only reflects operational success but also serves as a primary reference for investors in assessing a company's growth prospects and long-term sustainability (Dewi & Rahayu, 2025).

The energy sector plays a strategic role in supporting Indonesia's economy. Backed by abundant natural resources, the oil and gas, coal, electricity, and renewable energy subsectors have become key drivers of national economic development, contributing as much as 7.2 percent to Indonesia's Gross Domestic Product (GDP) even during the COVID-19 pandemic (Estefania et al., 2021). Data from Statistics Indonesia (2024) reveal a highly fluctuating pattern in the sector's contribution to national GDP. The energy sector accounted for 7.26 percent of GDP in 2019 before declining to 6.43 percent in 2020 due to the COVID-19 pandemic. It then rebounded sharply to 8.97 percent in 2021 and reached its peak of 12.20 percent in 2022, driven by the global economic recovery and soaring coal and oil commodity prices. However, this upward trend reversed over the following two years, falling to 10.52 percent in 2023 and 9.15 percent in 2024. These significant fluctuations indicate that the performance of the energy sector is considerably more vulnerable to global commodity price cycles and market demand dynamics than many other industries. Consequently, the financial performance of companies operating within this sector reflects not only internal managerial efficiency but also substantial exposure to external factors beyond management's control.

At the same time, the energy sector is recognized as one of the largest contributors to environmental degradation. Activities ranging from exploration, exploitation, production, and distribution to the combustion of fossil fuels generate greenhouse gas emissions, liquid and solid waste, and land degradation, all of which create significant negative environmental externalities (Maytara et al., 2023). Growing concerns over global climate change have encouraged the international community, including Indonesia, to commit to reducing carbon emissions through initiatives such as the Paris Agreement and Net Zero Emission targets (Mufida et al., 2024). Consequently, energy companies are increasingly expected to transition toward sustainable business practices by shifting from fossil fuels to renewable energy sources and implementing Environmental, Social, and Governance (ESG) principles throughout their operations (Mustajirin & Putri, 2023). These expectations are also reinforced by capital market participants, who increasingly incorporate sustainability considerations into investment decisions, as reflected in the growing popularity of ESG-based investment instruments and stricter scrutiny of companies with significant environmental impacts. The Indonesian government has further strengthened its regulatory framework through initiatives such as the Corporate Performance Rating Assessment Program

(PROPER), administered by the Ministry of Environment and Forestry, as part of the country's sustainable finance agenda for publicly listed companies (Ministry of Environment and Forestry, 2021).

Fluctuations in corporate financial performance are also evident from the development of Return on Assets (ROA) during the 2019–2024 period. PT Petrosea Tbk. (PTRO) maintained relatively stable ROA levels of approximately 5–7 percent despite experiencing a slight decline in 2023 before recovering in 2024. PT Bukit Asam Tbk. (PTBA) recorded a significant increase from around 15 percent in 2019 to approximately 28 percent in 2022 before declining thereafter. PT Perusahaan Gas Negara Tbk. (PGAS) reported the lowest ROA, even recording a negative value in 2020 before gradually recovering. PT Alamtri Resources Indonesia Tbk. (ADRO) experienced substantial growth, reaching approximately 26 percent in 2022 before declining, while PT Harum Energy Tbk. (HRUM) consistently improved until reaching around 30 percent in 2023 before decreasing in 2024. These diverse patterns indicate that the financial performance of energy companies throughout the observation period remained unstable and was influenced by a combination of external factors, including fluctuations in global energy commodity prices and worldwide economic conditions, as well as internal factors such as resource management efficiency and the extent to which sustainable business practices were implemented.

One internal factor presumed to influence financial performance is the implementation of green accounting, an accounting approach that integrates environmental costs and benefits into a company's financial reporting system (Rizki & Supratiwi, 2025). Through green accounting, companies identify, measure, and disclose costs arising from operational activities that affect the environment, including post-mining land reclamation costs, waste management expenses, pollution control measures, compliance with environmental regulations, and sustainability reporting (Dewi & Rahayu, 2025). Its implementation is driven by the recognition that activities within the energy sector generate significant environmental externalities, thereby requiring an accounting mechanism that transparently reflects corporate environmental responsibility while responding to regulatory requirements and stakeholder expectations (Rosaline & Wuryani, 2020). However, the relationship between green accounting and financial performance remains debatable. On one hand, substantial environmental expenditures may reduce short-term profit margins, particularly for companies that have not yet achieved operational efficiency (Wulandari & Haryati, 2025). On the other hand, effective environmental management is believed to enhance resource efficiency, reduce the risk of fines and regulatory sanctions, strengthen corporate reputation, and ultimately increase market loyalty over the long term (Abi Wijaya et al., 2024).

Another factor that is expected to influence financial performance is environmental performance. While green accounting emphasizes the recording and disclosure of environmental costs, environmental performance focuses on evaluating how effectively a company manages the environmental impacts of its operational activities (Anggita et al., 2022). In Indonesia, environmental

performance is commonly measured using the PROPER rating issued by the Ministry of Environment and Forestry. This assessment has the advantage of being conducted by an independent authority based on objective field verification, thereby minimizing bias compared to voluntary disclosure-based measurements alone (Widanengsih & Yulianti, 2022). Companies receiving green or gold PROPER ratings are generally considered to have implemented superior environmental management practices, enabling them to gain a positive reputation among the public, government, and investors. Such recognition may facilitate licensing processes, reduce the risk of social conflicts, and strengthen market confidence (Lee & Raschke, 2023).

Previous studies have produced inconsistent findings regarding these relationships. Several studies reported that green accounting has a positive effect on financial performance because environmental disclosure enhances transparency, corporate reputation, and investor confidence (Maryanti, 2021; Salsabila & Widiatmoko, 2022; Herny & Herawaty, 2024). In contrast, Sapulette and Limba (2019) found that green accounting does not significantly affect financial performance. Similar inconsistencies are observed in studies examining environmental performance. Ahmed (2024), Herny and Herawaty (2024), and Helmina et al. (2025) found a positive relationship between environmental performance and financial performance, whereas Maryanti (2021) reported no significant effect. Inconsistencies are also evident in studies examining the simultaneous effects of green accounting and environmental performance, as reported by Devi and Effendy (2024), Herny and Herawaty (2024), Helmina et al. (2025), Lusiana et al. (2021), and Soa et al. (2024). These mixed findings suggest that the relationships among these variables cannot yet be generalized across different industrial sectors.

These inconsistencies reveal a research gap that underpins the importance of this study, namely whether the diverse findings reported in previous studies also apply specifically to the energy sector, given its unique operational characteristics, which combine high environmental impact with financial performance that is highly sensitive to fluctuations in global commodity prices. Based on the background, observed phenomena, and identified research gap, this study aims to (1) examine the effect of green accounting on financial performance, (2) analyze the effect of environmental performance on financial performance, and (3) investigate the simultaneous effects of green accounting and environmental performance on the financial performance of energy sector companies listed on the Indonesia Stock Exchange during the 2019–2024 period. Theoretically, this study is expected to enrich the literature on the relationship among environmental accounting, environmental performance, and financial performance within the context of the energy sector in developing countries. Practically, the findings are expected to provide valuable insights for corporate management in formulating sustainability strategies, for investors in incorporating ESG considerations into investment decisions, and for regulators in refining sustainable finance policies for the energy sector.

LITERATURE REVIEW

Legitimacy Theory

Legitimacy Theory explains that a company's long-term survival depends on the acceptance and recognition it receives from the society in which it operates (Dowling & Pfeffer, 1975). Baah et al. (2021) argue that legitimacy is a strategic factor supporting corporate development, particularly in fostering harmonious relationships with a continuously evolving social environment. Public acceptance constitutes a valuable intangible asset because it strengthens stakeholder trust while supporting the long-term sustainability of business operations.

Lee and Raschke (2023) further emphasize that legitimacy plays a crucial role in maintaining a company's going concern. Companies are required to align their business activities with prevailing social norms, values, and public expectations to avoid social conflict and ensure their continued existence. In the context of green accounting, this expectation translates into a moral obligation to disclose environmental activities in a transparent, accountable, and responsible manner, thereby aligning corporate interests with stakeholder expectations. Sugitan and Kapojos (2026) reinforce this perspective by identifying green accounting as a strategic instrument for maintaining corporate legitimacy while meeting society's growing demand for sustainable business practices. From the perspective of Legitimacy Theory, companies are expected to pursue not only investors' interests but also public welfare and environmental preservation. The more comprehensive the disclosure of environmental accounting information, the greater the opportunity for companies to improve their environmental performance, which may subsequently enhance financial performance and firm value through increased investor confidence and stronger market competitiveness (Anggita et al., 2022).

Nevertheless, Legitimacy Theory also highlights an important consideration. Legitimacy gained through environmental disclosure or regulatory compliance is cumulative and does not automatically translate into short-term economic benefits. Rather, legitimacy should be viewed as a necessary condition for corporate survival rather than a sufficient condition for improving financial performance. This theoretical perspective forms the basis for developing the hypotheses in this study and serves as an analytical framework for interpreting empirical findings that reveal inconsistent relationships between green accounting, environmental performance, and financial performance.

Financial Performance

Financial performance is an indicator used to evaluate a company's success in utilizing its resources to achieve operational and financial objectives (Adib et al., 2024). It reflects a company's ability to generate profits, manage assets and liabilities efficiently, and create sustainable economic value. Afrida and Setyorini (2024) emphasize that measuring financial performance is beneficial not only for internal stakeholders, such as management and shareholders, but also for external stakeholders, including investors, creditors,

and regulators, because it provides essential information for evaluating a company's current condition and future growth prospects.

Arhinful and Radmehr (2023) state that profitability reflects the effectiveness with which a company utilizes its available resources, making financial performance a crucial consideration for investors when making investment decisions. Various financial ratios are commonly employed as proxies for financial performance. Anggita et al. (2022) explain that Return on Assets (ROA) measures a company's efficiency in utilizing its total assets to generate profits, with higher values indicating more effective asset management. Lusiana et al. (2021) identify Return on Equity (ROE) as a measure of profitability from shareholders' equity, while Ahmad et al. (2025) highlight Net Profit Margin (NPM) as an indicator of the amount of net profit generated from each unit of sales revenue.

This study employs Return on Assets (ROA) as the proxy for financial performance because it provides a comprehensive measure of the effectiveness of utilizing a company's total assets, rather than focusing solely on shareholders' equity, as reflected by ROE, or sales volume, as measured by NPM. A higher ROA indicates more efficient resource utilization and serves as a positive signal to investors regarding the company's future prospects. ROA is calculated by dividing net income after tax by total assets during the same accounting period.

Green Accounting

Akbar et al. (2025) define green accounting as an accounting process that includes the measurement, recognition, recording, summarization, reporting, and disclosure of environmental information in an integrated manner to support sustainable economic development by balancing economic growth, environmental conservation, and intergenerational social equity. Herny and Herawaty (2024) emphasize that the implementation of green accounting extends beyond the preparation of financial statements to include the measurement and disclosure of the environmental impacts of corporate operations, including natural resource utilization, emissions, waste generation, and various environmental management activities. This approach seeks to balance economic objectives with environmental sustainability.

The measurement of green accounting varies across the literature. Apriliyani et al. (2021) measured it based on the extent of environmental disclosure using the Global Reporting Initiative (GRI) guidelines. In contrast, Devi and Effendy (2024) and Muljono and Rachmawati (2024) employed the environmental cost ratio, which compares total environmental costs with net income as an indicator of a company's commitment of financial resources to environmental preservation. This study adopts the disclosure index based on GRI 300: Environmental Topics because it provides a comprehensive measure of environmental information disclosure according to internationally recognized sustainability reporting standards. Furthermore, this approach facilitates quantification and enables more objective and consistent comparisons across companies (Mufida et al., 2024; Rizki & Supratiwi, 2025). The disclosure index is calculated as the ratio of the number of GRI 300 disclosure items

reported by a company to the total number of required items, resulting in a score ranging from 0 to 1.

Environmental Performance

Environmental performance is an indicator that assesses a company's ability to manage the environmental impacts arising from its operational activities while reflecting its commitment to implementing sustainable business practices (Suteja et al., 2023). In Indonesia, environmental performance is officially evaluated through the Corporate Performance Rating Assessment Program (PROPER), administered by the Ministry of Environment and Forestry. The program aims to enhance corporate transparency and accountability while encouraging companies to exceed minimum environmental regulatory requirements (Ministry of Environment and Forestry, 2021). Fawzyputra et al. (2025) further note that the publication of PROPER ratings also influences investors' and other stakeholders' perceptions of corporate credibility.

The PROPER assessment is based on two groups of criteria: compliance with environmental regulations and beyond compliance, which evaluates corporate efforts that exceed minimum regulatory standards (Ministry of Environment and Forestry, 2021). Widanengsih and Yulianti (2022) explain that the beyond compliance criteria are adaptive and continuously updated in accordance with technological developments and best practices in environmental management. PROPER ratings are classified into five categories: Gold (score of 5), awarded to companies demonstrating outstanding environmental performance accompanied by sustainable community empowerment programs; Green (score of 4), for companies that exceed regulatory compliance standards; Blue (score of 3), for companies that fully comply with environmental regulations; Red (score of 2), for companies that have not yet fully complied; and Black (score of 1), for companies committing serious environmental violations. This study uses the PROPER score as the proxy for environmental performance because it is an official assessment verified through field inspections by an independent authority, thereby minimizing bias compared with measures based solely on voluntary environmental disclosures (Muljono & Rachmawati, 2024).

Previous Studies

A summary of previous studies examining the relationships among green accounting, environmental performance, and financial performance is presented in Table 1. The summary demonstrates that the effects of the two independent variables on financial performance remain inconsistent across studies, depending on the industrial sector, observation period, and measurement indicators employed. These inconsistencies reinforce the need to re-examine these relationships within the context of Indonesian energy sector companies during the 2019–2024 period.

Table 1. Summary of Previous Studies

Author(s)	Main Variables	Findings
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(Year)		
Maryanti (2021)	Green Accounting, Environmental Performance, Financial Performance	Green accounting has a positive effect on financial performance, whereas environmental performance has no significant effect.
Salsabila & Widiatmoko (2022)	Green Accounting, Firm Value, Financial Performance (Mediating Variable)	Green accounting positively affects firm value through financial performance as a mediating variable.
Herny & Herawaty (2024)	Green Accounting, Environmental Performance, Financial Reporting Quality	Both green accounting and environmental performance have positive effects, with profitability serving as a moderating variable.
Sapulette & Limba (2019)	Green Accounting, Environmental Performance, Firm Value	Green accounting has no significant effect, whereas environmental performance has a significant positive effect on firm value.
Ahmed (2024)	Environmental Performance, Firm Value, Stakeholders	Environmental performance has a positive effect on firm value.
Helmina et al. (2025)	Green Development, Financial Performance, Corporate Value	Green practices positively affect financial performance and corporate value in the coal industry.
Devi & Effendy (2024)	Green Accounting, Environmental Performance, Environmental Costs, Financial Performance	Green accounting, environmental performance, and environmental costs jointly have a significant effect on financial performance.
Akbar et al. (2025)	Green Accounting, Profitability, Firm Value	Green accounting and environmental performance do not have a significant simultaneous effect without the inclusion of a mediating variable.
Wulandari & Haryati (2025)	Green Accounting, Environmental Performance, Financial Performance	The effects of green accounting and environmental performance vary depending on the company's operational efficiency.
Widanengsih & Yulianti (2022)	Green Accounting, Environmental Performance, Return on Assets (ROA)	Both green accounting and environmental performance have a significant effect on Return on Assets (ROA) in the non-cyclical consumer sector.

Conceptual Framework

Based on the review of Legitimacy Theory and previous empirical studies, the conceptual framework of this study positions green accounting and environmental performance as independent variables that are expected to influence financial performance, both individually and simultaneously, with financial performance being proxied by Return on Assets (ROA). This framework emphasizes that the transparent disclosure of environmental costs (green accounting) and the actual outcomes of environmental management (environmental performance) represent two distinct yet complementary pathways for establishing corporate legitimacy, which is ultimately expected to contribute to improved financial performance.

Hypothesis Development

1. The Effect of Green Accounting on Financial Performance

Legitimacy Theory asserts that companies require public acceptance to maintain their long-term survival (Dowling & Pfeffer, 1975), and one means of achieving such legitimacy is through the implementation of transparent and accountable green accounting practices (Soa et al., 2024). Transparent environmental disclosure is believed to strengthen corporate reputation, enhance investor confidence, and reduce reputational risk, thereby improving financial performance. Although previous findings remain inconsistent—Maryanti (2021), Salsabila and Widiatmoko (2022), Herny and Herawaty (2024), and Helmina et al. (2025) reported a positive relationship, whereas Sapulette and Limba (2019) found no significant effect—the majority of empirical evidence and theoretical arguments support a positive association. Therefore, the first hypothesis is formulated as follows:

H1: Green accounting has a positive effect on financial performance.

2. The Effect of Environmental Performance on Financial Performance

Consistent with Legitimacy Theory, companies are expected not only to pursue profitability but also to align their operations with prevailing social norms and public expectations, one of which is reflected in improved environmental performance (Dowling & Pfeffer, 1975). Companies with superior environmental performance demonstrate regulatory compliance and a strong commitment to sustainability, which can enhance the confidence of investors and other stakeholders, thereby strengthening corporate legitimacy and ultimately improving financial performance (Widanengsih & Yulianti, 2022). Ahmed (2024), Herny and Herawaty (2024), and Helmina et al. (2025) support this positive relationship, although Maryanti (2021) reported contradictory findings. Accordingly, the second hypothesis is proposed as follows:

H2: Environmental performance has a positive effect on financial performance.

3. The Simultaneous Effect of Green Accounting and Environmental Performance on Financial Performance

Green accounting and environmental performance represent two complementary dimensions of a company's commitment to sustainability. The former reflects corporate environmental responsibility through transparent

disclosure, whereas the latter demonstrates the actual outcomes of environmental management practices (Devi & Effendy, 2024). Several studies, including Lusiana et al. (2021), Herny and Herawaty (2024), Devi and Effendy (2024), Soa et al. (2024), and Helmina et al. (2025), suggest that the combination of these two factors contributes positively to financial performance. Based on these arguments, the third hypothesis is proposed as follows:

H3: Green accounting and environmental performance simultaneously have a positive effect on financial performance.

METHODOLOGY

Research Design

This study employed a quantitative approach with a causal explanatory research design to examine the effects of green accounting and environmental performance on the financial performance of energy sector companies listed on the Indonesia Stock Exchange (IDX). The study utilized secondary panel data (pooled data), consisting of six years of time-series observations combined with cross-sectional data across companies. The data were obtained from annual reports, audited financial statements, and sustainability reports published on the official website of the Indonesia Stock Exchange (www.idx.co.id). The use of panel data provides several advantages, including capturing changes across firms over time, improving estimation precision, and controlling for unobserved heterogeneity among firms.

Population and Sample

The study population consisted of all 62 energy sector companies listed on the Indonesia Stock Exchange during the 2019–2024 period. The sample was selected using purposive sampling based on the following criteria: (1) the company was consistently listed on the Indonesia Stock Exchange throughout the 2019–2024 period; (2) it published complete and consistent annual reports and/or sustainability reports during the observation period; (3) it disclosed information related to the implementation of green accounting and environmental performance in either its financial statements or sustainability reports; and (4) it did not experience delisting, mergers, or acquisitions during the study period.

The initial selection yielded 372 firm-year observations (62 companies × 6 years). Following an outlier screening process—where, according to Siska (2020), outliers refer to extreme observations that may distort estimation results—132 observations were excluded. Consequently, the final sample consisted of 40 companies with a total of 240 firm-year observations used in the analysis.

Operational Definition of Variables

Table 2. Operational Definition of Variables

Variable	Definition	Indicator/Proxy
Financial Performance (Y)	The company's ability to generate profits through the efficient utilization of its	Return on Assets (ROA) = Net Income After Tax / Total Assets

	assets.	
Green Accounting (X1)	The extent of environmental information disclosure in the company's annual and/or sustainability reports.	GRI 300: Environmental Topics Disclosure Index (Number of disclosed items / Total required items)
Environmental Performance (X2)	The level of the company's environmental management performance as assessed by an independent authority.	PROPER Rating Score: Gold = 5, Green = 4, Blue = 3, Red = 2, Black = 1

Data Analysis Technique

The data analysis began with descriptive statistics to provide an overview of the mean, minimum, maximum, and standard deviation of each research variable. Subsequently, the data were analyzed using panel data regression with the assistance of EViews 13 software, which allows estimation through three alternative models: the Common Effect Model (CEM), which assumes homogeneous behavior across entities and time periods; the Fixed Effect Model (FEM), which accounts for differences in intercepts across firms through the inclusion of dummy variables; and the Random Effect Model (REM), which treats cross-sectional variation as a random disturbance component and estimates the model using the Generalized Least Squares (GLS) method.

The most appropriate estimation model was selected through a three-stage testing procedure. First, the Chow test (Restricted F-test) was conducted to determine whether the Common Effect Model or the Fixed Effect Model was more appropriate. If the probability value of the cross-section chi-square statistic was less than 0.05, the Fixed Effect Model was selected. Second, the Hausman test was performed to determine whether the Fixed Effect Model or the Random Effect Model was more suitable. A probability value of the cross-section random statistic greater than 0.05 indicated that the Random Effect Model was preferable. Finally, the Breusch–Pagan Lagrange Multiplier (LM) test was employed to determine whether the Common Effect Model or the Random Effect Model provided a better fit based on the analysis of residual variance. The Random Effect Model was selected when the p-value was less than 0.05.

Before hypothesis testing, the regression model was evaluated using classical assumption tests, including the residual normality test and the multicollinearity test. Residual normality was assessed using the Jarque–Bera test, where residuals were considered normally distributed if the probability value exceeded 0.05. Multicollinearity among the independent variables was examined using the correlation matrix and the Variance Inflation Factor (VIF), with a correlation coefficient below 0.80 indicating the absence of serious multicollinearity. Hypothesis testing was conducted using the t-test to evaluate the partial effect of each independent variable, the F-test to examine their simultaneous effect, and the coefficient of determination (R^2) to measure the explanatory power of the regression model. All statistical tests were conducted

at a 5% significance level, with an independent variable considered to have a statistically significant effect when its probability value was less than 0.05.

RESULTS AND DISCUSSION

Descriptive Statistics

The final sample consisted of 40 energy sector companies representing the mining, oil and gas, energy support services, and energy transportation subsectors, resulting in a total of 240 firm-year observations during the 2019–2024 period. Table 3 presents the descriptive statistics for the three variables examined in this study.

Table 3. Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Green Accounting (GA)	240	0.00000	0.93548	0.25605	0.23279
Environmental Performance (EP)	240	1.00000	5.00000	3.17917	1.26969
Financial Performance (ROA)	240	0.00017	0.58519	0.08108	0.08142

The range of green accounting values, spanning from 0 to 0.93548 with a mean value of 0.25605, indicates that its implementation remains uneven across companies. Some companies disclose almost none of the GRI 300 items, while others disclose nearly all indicators. This pattern is consistent with the characteristics of environmental disclosure in Indonesia, which is largely voluntary and highly influenced by differences in corporate governance, stakeholder pressure, and the readiness of each entity's reporting system. The standard deviation of 0.23279 confirms this variation, although the distribution remains relatively moderate compared to the width of the data range.

For the environmental performance variable, the average PROPER score of 3.17917 which is close to the Blue rating category indicates that most sampled companies have only fulfilled the minimum level of environmental regulatory compliance and have not yet achieved higher categories such as Green or Gold. This condition suggests that reputational incentives associated with higher PROPER ratings (beyond compliance) have not become a strategic priority for most energy sector issuers, despite the significant environmental pressures faced by this sector. The standard deviation of 1.26969 demonstrates considerable variation in environmental performance, ranging from Black to Gold ratings within the same sample.

Meanwhile, financial performance, measured by ROA, has a relatively low average value of 8.108 percent, with a wide range from 0.017 percent to 58.519 percent and a standard deviation of 8.142 percent. This distribution aligns with the volatility pattern of ROA among companies described in the introduction, where issuers such as PGAS experienced negative performance, while HRUM and PTBA recorded ROA levels above 25 percent during peak commodity price periods. The high dispersion confirms that financial

performance in the energy sector is highly vulnerable to global commodity price cycles, an external factor that may dominate ROA variations more strongly than environmental accounting variables or environmental performance itself. This assumption will be further examined through the relatively low explanatory power of the regression model discussed in the following section.

Estimation Model Selection

The selection of the most appropriate panel data estimation model was conducted through three testing stages, as summarized in Table 4.

Table 4. Summary of Model Selection Tests

Test	Probability Value	Criteria	Selected Model
Chow Test (Cross-section Chi-square)	0.0000	< 0.05	Fixed Effect Model
Hausman Test (Cross-section random)	0.3698	> 0.05	Random Effect Model
Lagrange Multiplier Test	0.0000	< 0.05	Random Effect Model

Chow test indicates that the FEM is more appropriate than the CEM because the cross-section chi-square probability of 0.0000 is far below 0.05, suggesting the presence of inter-company heterogeneity that cannot be ignored by a simple pooled model. However, the subsequent Hausman test shows a cross-section random probability value of 0.3698, which is above 0.05. Therefore, the REM is statistically preferred over the FEM because it can accommodate entity-specific heterogeneity without substantially reducing degrees of freedom due to the inclusion of dummy variables. The Lagrange Multiplier test further supports this decision by producing a p-value of 0.0000, confirming that the REM is superior to the CEM. Based on the hierarchy of the three tests, the Random Effect Model is determined as the final estimation model in this study.

Classical Assumption Tests

The residual normality test using the Jarque-Bera test produced a statistical value of 3.440536 with a probability value of 0.179018, which is above the 0.05 significance level. Therefore, the model residuals are considered to be normally distributed. The multicollinearity test, conducted by examining the correlation coefficients among independent variables, shows that the correlation value between green accounting and environmental performance is 0.379793, which is far below the threshold of 0.8. Thus, no serious indication of multicollinearity was identified. Nevertheless, this correlation value can be categorized as moderate and should be acknowledged as a methodological consideration: the two independent variables are not entirely conceptually independent, as companies with higher environmental disclosure transparency (high green accounting) tend to also demonstrate better actual environmental

performance (higher PROPER scores). This pattern is consistent with the legitimacy theory argument that disclosure and actual performance are interconnected, although they are not identical.

Hypothesis Testing

Partial hypothesis testing was conducted using the t-test, with the results summarized in Table 5.

Table 5. Partial Hypothesis Test Results (t-Test) – Random Effect Model

Variable	Coefficient	t-statistic	t-table	Probability	Description
Green Accounting (X1)	0.058639	2.079261	1.97361	0.0387	Has a significant positive effect
Environmental Performance (X2)	0.000319	0.049625	1.97361	0.9605	Has no significant effect

The hypothesis testing results show that green accounting has a positive regression coefficient of 0.058639 with a t-statistic of 2.079261, which exceeds the t-table value of 1.97361, and a probability value of 0.0387, which is below 0.05. Therefore, H1 is accepted: green accounting has a positive and significant effect on financial performance. In contrast, environmental performance has a very small coefficient (0.000319) with a t-statistic of 0.049625, which is far below the t-table value, and a probability value of 0.9605, which is far above 0.05. Thus, H2 is rejected: environmental performance is not proven to have a significant effect on financial performance in this research model.

The simultaneous testing through the F-test produced an F-statistic value of 2.446015, which is slightly higher than the F-table value of 2.4282. However, the probability of the F-statistic is 0.088823, which exceeds the 0.05 significance level. This condition requires careful interpretation: the F-statistic versus F-table criterion indicates a marginally significant result, while the probability criterion – which serves as the primary basis for decision-making in this study – indicates an insignificant result at the 5 percent significance level, although it is close to the 10 percent significance threshold. By following the probability criterion as the main reference, H3 is rejected: green accounting and environmental performance simultaneously do not have a significant effect on financial performance, although the result is considered borderline and should be re-examined using a broader sample scope in future studies.

The coefficient of determination test resulted in an R-squared value of 0.020224 (2.02 percent) and an Adjusted R-squared value of 0.011956 (1.19 percent). This means that the two independent variables in the model are only able to explain a very small proportion of the variation in financial performance, while the remaining 98.81 percent is explained by other factors outside the model, such as company size, capital structure, leverage level, corporate governance, and global energy commodity price fluctuations, as discussed in the introduction section.

The Effect of Green Accounting on Financial Performance

The finding that green accounting has a positive and significant effect on financial performance indicates that better implementation of green accounting practices reflected through broader disclosure of environmental costs and activities based on GRI 300 is associated with improved ROA. From the perspective of legitimacy theory, transparent environmental disclosure serves as a means for companies to demonstrate compliance with social norms and regulations, which in turn may strengthen corporate reputation and investor confidence, ultimately contributing to improved financial performance. This finding is consistent with the results of Romadhon and Nawawi (2024) in the energy and mining sectors but differs from Sapulette and Limba (2019), who found no significant effect in the manufacturing sector. This difference highlights that the effectiveness of green accounting in improving financial performance is influenced by industry characteristics, where the energy sector, with higher environmental pressures, tends to place greater importance on environmental transparency signals compared to sectors with lower environmental risks.

A deeper analysis of the coefficient magnitude is also important to consider. The coefficient value of 0.058639 indicates that an increase in the GRI 300 disclosure index from the lowest point (0) to the highest point (1) is associated with an increase in ROA of approximately 5.86 percentage points – a substantial figure considering that the sample's average ROA is only 8.108 percent. In other words, although the overall explanatory power of the model (Adjusted R^2 of 1.19 percent) is very limited, the partial impact of green accounting on ROA has an economically meaningful effect at the per-unit index level. This implies that factors outside the model particularly global energy commodity price cycles, as reflected in inter-company ROA fluctuations discussed in the introduction – are likely to be dominant determinants of overall ROA variation. Meanwhile, green accounting continues to contribute a statistically consistent and robust partial effect.

The practical implication is that energy sector companies should position green accounting not merely as an administrative obligation or reporting formality, but as an integral component of business strategy that is genuinely embedded in managerial decision-making processes, allowing its impact on financial performance to be optimized sustainably.

The Effect of Environmental Performance on Financial Performance

Unlike green accounting, environmental performance measured by PROPER scores is not proven to have a significant effect on financial performance. This finding indicates that good environmental performance in terms of compliance and environmental management excellence assessed by external authorities does not necessarily translate directly into financial benefits for companies in the short term covered by this research period.

Several explanations can be proposed for this finding. First, PROPER scores are ordinal in nature, consisting of only five categories, meaning that variations in actual environmental performance among companies are not

captured as precisely (granularly) as continuous GRI-based disclosure indices. This measurement limitation may reduce the statistical power to detect existing relationships. Second, the economic benefits of improved PROPER ratings, such as compliance cost efficiency or easier licensing processes, are likely to emerge over the long term and involve delayed effects (lagged effects), meaning they may not immediately appear in current-year ROA. Third, investors in the Indonesian capital market, particularly in the energy sector that is strongly influenced by commodity prices, tend to respond more strongly to short-term financial indicators and commodity price movements than to environmental compliance status alone. Consequently, signals from PROPER ratings may not be fully transmitted into financial performance assessments.

This result is consistent with Akbar et al. (2025), who also found no significant effect of environmental performance on financial performance, but differs from Sapulette and Limba (2019), who found a significant effect on firm value. This difference further emphasizes that the financial performance proxy used (ROA versus firm value/Tobin's Q) influences the direction and strength of detected relationships, considering that firm value reflects long-term market expectations, while ROA represents short-term historical profitability.

The practical implication is that companies cannot rely solely on environmental compliance status as a strategy to improve financial performance. Instead, they need to integrate environmental performance with operational efficiency and concrete financial strategies so that sustainability benefits can be transformed into economic value rather than merely serving as social legitimacy.

The Simultaneous Effect of Green Accounting and Environmental Performance on Financial Performance

The insignificant simultaneous test result at the 5 percent significance level, although approaching the 10 percent threshold, suggests that the combination of green accounting and environmental performance is not yet strong enough to explain variations in financial performance collectively during the research period. From the perspective of legitimacy theory, this finding can be interpreted that the social legitimacy obtained by companies through green accounting implementation and improved environmental performance has not been fully converted into measurable economic benefits. This may occur because environmental practices in many sampled companies are still administrative-symbolic in nature and have not yet been optimally integrated into core business strategies.

This result is consistent with Akbar et al. (2025), who also found no significant simultaneous effect without mediation variables, but differs from studies incorporating mediating or moderating variables, such as profitability (Herny & Herawaty, 2024), which found significant indirect effects.

These differences provide important insights for future research model development: the relationship between sustainability practices and financial performance in the energy sector is likely to be indirect, mediated by variables such as operational efficiency or profitability, rather than a direct relationship as tested in the simple model of this study. The low Adjusted R² value of 1.19

percent further confirms that the current model remains far from complete in explaining the determinants of financial performance in the energy sector. Therefore, control variables such as company size, leverage, and capital structure should be considered in future studies.

The practical implication is that energy sector companies need to integrate green accounting and environmental performance into a coherent business strategy framework oriented toward value creation, rather than treating them as separate sustainability initiatives that are merely compliance-oriented.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the results of panel data regression analysis using the Random Effect Model on 40 energy sector companies listed on the Indonesia Stock Exchange during the 2019–2024 period (240 firm-year observations), this study concludes three main findings. First, green accounting has a positive and significant effect on financial performance, which is consistent with the findings of Romadhon and Nawawi (2024) in the energy and mining sectors but contradicts Sapulette and Limba (2019), who found no significant effect in the manufacturing sector. Second, environmental performance measured by PROPER scores is not proven to have a significant effect on financial performance, consistent with Akbar et al. (2025) but different from Sapulette and Limba (2019). Third, green accounting and environmental performance simultaneously do not have a significant effect on financial performance at the 5 percent significance level, although the result is considered marginal (borderline) and is in line with Akbar et al. (2025), who also found no simultaneous effect without the presence of mediating variables.

Research Limitations

This study has several limitations that should be considered to ensure that the findings are interpreted proportionally. First, the research object is limited to energy sector companies listed on the Indonesia Stock Exchange, meaning that the results may not be generalized to other industrial sectors with different environmental risk characteristics. Second, the research period is limited to 2019–2024, which may not fully capture the long-term effects of green accounting and environmental performance on financial performance. Third, environmental performance measurement only uses PROPER ratings issued by the Ministry of Environment and Forestry, which may not comprehensively represent all aspects of corporate environmental performance, such as quantitative carbon emission disclosures. Fourth, the model's ability to explain variations in financial performance is relatively low (Adjusted R^2 of 1.19 percent), indicating that other variables potentially have stronger influences on financial performance, such as company size, leverage, capital structure, and corporate governance, but were not included in this research model. Fifth, the insignificant simultaneous test (F-test) result indicates that the regression model

as a whole remains relatively weak in explaining the relationship among the investigated variables.

Recommendations

For energy sector companies, it is recommended to continuously improve the quality and consistency of green accounting implementation, considering its proven positive and significant effect on financial performance. Companies should also reevaluate the effectiveness of programs underlying PROPER ratings so that their impacts on operational efficiency and financial performance can be optimized rather than merely fulfilling administrative compliance requirements.

For investors and stakeholders, the level of green accounting disclosure can be considered as an additional signal in assessing the prospects of energy sector companies. However, PROPER ratings should not be used as the sole sustainability indicator, considering their limited influence on short-term financial performance.

For regulators, these findings provide input for evaluating the effectiveness of PROPER as an economic incentive instrument, including within the framework of implementing POJK Number 51/POJK.03/2017 concerning Sustainable Finance Implementation, so that good environmental performance can become more closely connected with economic benefits received by companies.

For future research, several recommendations are proposed: (1) adding other control variables, such as company size, leverage, capital structure, and corporate governance, considering that the explanatory power of the current model remains very low; (2) extending the observation period to capture the long-term dynamics of relationships among variables; (3) expanding research objects to other industrial sectors as comparisons, particularly sectors with different environmental intensity levels; (4) using alternative environmental performance indicators or combined indicators, such as quantitative GRI scores or carbon emission disclosure levels, to complement the limitations of ordinal PROPER scores; and (5) examining the possibility of indirect relationships between green accounting, environmental performance, and financial performance through mediating or moderating variables, such as profitability or operational efficiency, considering that the simultaneous test results in this study were marginal and may become significant when indirect pathways are taken into account.

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