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The Effect of Green Accounting, Environmental Management System, and Corporate Social Responsibility on Environmental Performance of Energy Sector Companies in 2021-2023

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Abstract:

This research aims to empirically examine and analyze the effect of green accounting, environmental management systems, and corporate social responsibility on environmental performance. The population used is 77 energy sector companies listed on the Indonesia Stock Exchange (IDX) for the 2021-2023 period, with a sample size of 57 company data. The testing method uses partial least square (PLS) processed with SmartPLS for Windows Version 3.0. The test results show that the variables of green accounting, environmental management systems, and corporate social responsibility affect environmental performance.

Keywords: *Green Accounting, Environmental Management Systems, Corporate Social Responsibility, Environmental Performance.*

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1. Introduction

Increasing awareness of the consequences of climate change, including environmental crisis issues such as air, water, and soil pollution, is pushing companies worldwide to consider their environmental responsibilities. In Indonesia, many companies have developed in various sectors, one of which is in the energy sector.

According to Amira and Siswanto (2022), one of the most concerning environmental problems is global warming, where the average surface temperature of the earth is increasing due to an increase in greenhouse gas concentrations. According to the Ministry of National Development Planning/Bappenas, the energy and transportation sectors dominate most

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emissions, reaching 50.6% (potential of around 1 Giga Ton CO2eq) of total emissions in Indonesia in 2022. It is estimated that the emission potential will continue to increase until 2030, where it is estimated that the percentage of emissions from the energy sector will reach around 1.4 Giga Ton CO2eq (59%). The emergence of various problems in the energy sector, for example, excessive exploitation of nature that is not balanced with environmental restoration efforts such as waste or factory pollution can have an impact on natural damage (Margireta & Khoiriawati, 2022).

Efforts to improve environmental performance in accordance with Indonesian government regulations are the Company Performance Rating Program (PROPER) published by the Ministry of Environment and Forestry (KLHK) (Pelu et al., 2022). Through these environmental performance improvement efforts, new innovations will be created that have an impact on increasing company value (Okta et al., 2022).

There are several factors that can affect environmental performance, one of which is green accounting. It is a branch of accounting that focuses on measuring, reporting, and analyzing financial information related to environmental impacts. The influence obtained from implementing green accounting includes simplifying the evaluation of environmental costs related to waste and assisting in operational decision making (Prasetyo & Adi, 2020). Melenia et al. (2023) it was mentioned that revealing social and environmental issues is a company's obligation to strengthen its legitimacy. Research conducted by Wahyuni et al. (2019) and Pelu et al. (2022) concluded that the allocation of environmentally friendly costs has a positive effect on improving the company's environmental performance.

Another factor that can affect environmental performance is the environmental management system. According to the Ministry of Environment (KLH), the Environmental Management System (EMS) helps organizations identify, manage, monitor and control environmental issues holistically. The meaning of EMS can be easily integrated into the management system issued by ISO. The ISO 14001 standard is a global guideline used to regulate environmental management systems. This guideline is issued by the International Organization for Standardization (ISO) and provides a structure for organizations to reduce the environmental impact resulting from their activities. ISO 14001:2015 EMS is defined as part of the management system used to manage environmental aspects, compliance with obligations, and risks related to threats and opportunities (Maryeska et al., 2020). Referring to research by Kristianto and Lasdi (2022) and Chiu et al. (2020), companies that have ISO 14001 certification can affect environmental performance. The company has a good environmental management system, so this shows that the

company's activities are in accordance with the norms or rules that apply where the company stands and raises the company's concern in managing its environment.

The continuity of the company's business will also be ensured when the company pays attention to social and environmental aspects of how negative reactions from the community towards companies that are considered to ignore their social, economic and environmental responsibilities often arise in various places and times (Alfiana et al., 2019). Effective CSR can have a positive impact on the company's environmental performance. CSR disclosure is in line with stakeholder theory which states that company success is measured not only in terms of financial profits, but also from the extent to which the company meets the needs and interests of various stakeholders. Research by Pelu et al. (2022) says that Corporate Social Responsibility has a significant positive effect on environmental performance in companies, the higher the value of Corporate Social Responsibility disclosure, the higher the value of environmental performance will increase.

2. Theoretical Background

Legitimacy Theory: The concept of legitimacy shows the existence of a social contract where the company is located responsible for the demands of society and the environment (Wahyuni et al., 2019). Companies must ensure that their business activities are in accordance with the boundaries and standards that apply in society (Nastiti & Hardiningsih, 2022).

Stakeholder Theory: Stakeholder theory emphasizes the importance of aligning company interests with the interests of stakeholders. As a result, companies will face pressure from the community to meet the needs and interests of these various stakeholders (Istiningrum, 2023). Stakeholder theory prioritizes relationships with stakeholders compared to society in general (A. D. Lestari & Khomsiyah, 2023). According to Freeman et al. (2021) stakeholder theory emphasizes the development and maintenance of sustainable stakeholder relationships as the key to company performance.

Green Accounting: Green Accounting is a process that aims to increase the efficiency of the accounting system by identifying, recording, and reporting negative impacts on the environment, such as quality degradation and environmental pollution (Husni et al., 2022). The goal is to combine company growth with environmental preservation and provide social benefits (Dura & Suharsono, 2022). The benefit for companies if they implement green accounting is that it can help to realize green industries and achieve sustainable development by improving environmental performance (Melenia et al., 2023).

Environmental Management System: Good environmental management system requires a standard that explains the system. The ISO 14001 International Standard serves as a tool to ensure the performance of the environmental management system (Ramadan et al., 2019). The main benefit of implementing ISO 14001 is that it can improve internal processes by reducing environmental impacts (such as air emissions and waste) and increasing production efficiency (Chiu et al., 2020)

Corporate Social Responsibility: Corporate Social Responsibility (CSR) is an ongoing commitment from a business to act ethically and contribute to economic development, by improving the quality of life of employees and their families, as well as the local community and wider society (Razak et al., 2020). This contribution can be made through various forms, such as financial assistance, expert assistance, assistance in the form of goods, and other initiatives, to improve the quality of life of the community and protect the environment (Fatikha & Suhartini, 2022).

3. Methodology

This research applies quantitative research methods by utilizing secondary data. This research focuses on analyzing processed data to produce a conclusion. The data collection technique used in this research is the documentation technique by downloading or accessing from the website www.idx.co.id which is sourced from the Indonesia Stock Exchange and the company's official website that is in accordance with the sample selection criteria. This research applies quantitative research methods by utilizing secondary data. This research focuses on analyzing processed data to produce a conclusion. The data collection technique used in this research is the documentation technique by downloading or accessing from the website www.idx.co.id which is sourced from the Indonesia Stock Exchange and the company's official website that is in accordance with the sample selection criteria. Green accounting in this study is measured using environmental costs in the company's sustainability report and presented in one overall cost calculation and expressed in Rupiah (Melenia et al., 2023). Measurement of environmental management systems using a nominal scale, if the company gets ISO 14001 certification, it will be given a score of 1 and if the company has not received this certification, it will be given a score of 0 (Chiu et al., 2020). According to the Global Reporting Initiative Standard (2021), there are 117 items related to CSR disclosure so that, the calculation of CSR disclosure items using dummy variables with a ratio scale is as follows (Hafidz & Deviyanti, 2022):

CSR Index = CSRIj = $\sum$ Xij/nj

Description:
CSR Index (CSRIj)= CSR disclosure index of the company (disclosure level)
ΣXij= Total items disclosed by company j (companies that do not disclose items are given a score of 0; and companies that disclose items are given a score of 0).
items are scored 1).
nj = Total items (n = 117 GRI 2021 disclosure items). The criteria used as the basis for selecting research samples are:

Table 1. Sample Criteria

No	Criteria	Qualified	Unqualified
1.	Energy Sector Companies listed on the Indonesia Stock Exchange (IDX) for the period 2021-2023.	77	
2.	Energy Sector Companies that publish a Sustainability Report, either as a separate document or incorporated in the Annual Report for the consecutive period 2021-2023.	63	14
3.	Energy Sector Companies that are ranked in the PROPER environmental performance evaluation program by the Ministry of Environment during 2021-2023.	19	44
Research Sample		19	
Total Sample Data (19 x 3 years)		**57**	

4. Empirical Findings/Result

Outer Model

Convergent Validity

This validity indicator is determined by outer loadings, which explain the relationship between the indicators used and each variable. Convergent validity is considered valid if the loading factor value > 0.7 and the AVE value > 0.5 (Hardisman, 2021:6). The following is a table of convergent validity analysis results using SmartPLS 3.0 software.

Table 2. Convergent Validity Results

Variable	X1	X2	X3	Y
AL	1.000			
SML		1.000		
CSR			1.000	
KL				1.000

Source: 2024 processed original data

Based on table 2 which displays the results of the convergent validity analysis, it can be concluded that each indicator used has a loading factor value of 1,000, thus meeting the validity criteria with a loading factor value requirement > 0.7, which means all these indicators are declared valid (Hardisman, 2021:6).

Table 3. AVE Results

Variable	*Average Variance Extracted* (AVE)
AL	1.000
SML	1.000
CSR	1.000
KL	1.000

Source: 2024 processed original data

In table 3, the average variance extracted (AVE) value of each research variable indicator shows that it has met the validity requirements. This is evidenced by the value of each indicator of 1,000, so that the AVE value > 0.5 which means that these indicators are declared valid (Hardisman, 2021:6).

Discriminant Validity

This test uses the cross loading factor value which is useful for determining whether the construct has sufficient discrimination by comparing the value of the intended construct. Discriminant validity is considered valid if the value of cross loading > 0.7 (Hardisman, 2021:7). The following is a table of discriminant validity analysis results using SmartPLS 3.0 software.

Table 4. Discriminant Validity Results

Variable	X1	X2	X3	Y
AL	**1.000**	0.093	-0.003	0.386
SML	0.093	**1.000**	0.247	0.259
CSR	-0.003	0.247	**1.000**	0.382
KL	0.386	0.259	0.382	**1.000**

Source: 2024 processed original data

Based on table 4 which displays the results of the discriminant validity analysis, it can be concluded that each indicator used has a cross loading value of 1,000, thus meeting the validity criteria with a cross loading value requirement > 0.7, which means all these indicators are declared valid (Hardisman, 2021:7).

Reliability Test

The reliability test helps assess how stable and accurate the instrument is in measuring the construct or variable to be studied. This test is determined based on the Cronbach alpha value and composite reliability. The construct is considered reliable if the Cronbach alpha and composite reliability values > 0.7 (Hardisman, 2021:7). The following is a table of reliability test results using SmartPLS 3.0 software.

Table 5. Reliability Test

Variable	Cronbach's Alpha	Composite Reliability
AL	1.000	1.000
SML	1.000	1.000
CSR	1.000	1.000
KL	1.000	1.000

Source: 2024 processed original data

In table 5, the Cronbach alpha and composite reliability values of each research variable indicator show that they have met the validity requirements. This is evidenced by the value of each indicator of 1,000, and the requirement for Cronbach alpha and composite reliability values > 0.7 which means that the processed data has been proven reliable, so it can be continued to assess the accuracy, consistency, and precision of research instruments (Hardisman, 2021:7).

Inner Model

R-Square

The structural model in the study uses R-Square testing. The level of accuracy of model predictions achieved based on criteria ≥ 0.75 is strong, ≥ 0.50-0.75 is moderate/moderate and the model is declared weak if the R-Square value is ≥ 0.25-0.50 (Hardisman, 2021:11). The following is a table of R-Square test results using SmartPLS 3.0 software.

Table 6. R-Square Results

Variabel	R Square	R Square Adjusted
KL (Y)	0.313	0.275

Source: 2024 processed original data

Based on table 6 which displays the R-Square results, it concludes that environmental performance has an R-Square value of 0.313 or 31.3%, meaning that the AL, SML, and CSR variables affect the KL variable by 31.3% and the remaining 68.7% is influenced by other variables outside the research.

Path Coefficient

Hypothesis testing is carried out using a bootstrapping scheme with path coefficients to test the significance of the path relationship between variables

formulated in the hypothesis. The value that must be met to determine whether the hypothesis can be accepted is if T-statistic > 1.96 and the p-value < 0.05 (Hardisman, 2021:11). The following are the path coefficient results using SmartPLS 3.0 software:

Table 7. Path Coefficient Results

	T-Statistics	P-Values
Green Accounting (AL) -> Enviromental Performance (KL)	4.120	**0.000**
Environmental Management System (SML) -> Environmental Performance (KL)	2.066	**0.039**
Corporate Social Responsibility (CSR) -> Environmental Performance (KL)	3.101	**0.002**

Based on table 7, the results of hypothesis testing between variables show the following results:

a. The first hypothesis (H1) shows that the green accounting variable affects environmental performance. This is evidenced by the T-statistics value of 4.120 and a p-value of 0.000. These results have met the specified path coefficient requirements so that the hypothesis is accepted.
b. The second hypothesis (H2) shows that the environmental management system variable affects environmental performance. This is evidenced by the T-statistics value of 2.066 and a p-value of 0.039. These results have met the specified path coefficient requirements so that the hypothesis is accepted.
c. The third hypothesis (H3) shows that the corporate social responsibility variable affects environmental performance. This is evidenced by the t-statistics value of 3.101 and a p-value of 0.002. These results have met the specified path coefficient requirements so that the hypothesis is accepted.

5. Discussion

Based on the results of hypothesis testing that has been carried out, it shows that green accounting affects environmental performance. This result is in line with research by Wahyuni et al. (2019) and Pelu et al. (2022) which concluded that the allocation of environmentally friendly costs has a positive effect on improving the company's environmental performance. This is evidenced by the disclosure of environmental costs that can increase the PROPER assessment rating of an energy sector company every year in table 4.12. PT Adaro Energy Indonesia Tbk experienced an increase in environmental cost disclosure of up to 37%. imilarly, PT Bukit Asam Tbk experienced an increase of up to 47%. This situation led PT Adaro Energy and PT Bukit Asam to receive the

PROPER Gold rating consecutively from 2021 to 2023. The results of this study are in line with legitimacy theory, which states that green accounting allows companies to obtain societal legitimacy by disclosing environmental costs, thus enabling companies to improve the environment and enhance their reputation. Transparent disclosure of environmental costs and appropriate allocation in the field will make the surrounding community believe that the company has managed the environment well.

The results of hypothesis testing also show that the Environmental Management System affects environmental performance. The Environmental Management System in this study is proxied as ISO 14001:2015 certification. This result is in line with research by Kristianto and Lasdi (2022) and Chiu et al. (2020), companies that have ISO 14001 certification can affect environmental performance. The company has a good environmental management system, so this shows that the company's activities are in accordance with the norms or rules that apply where the company stands and raises the company's concern in managing its environment. This can also be proven by the existence of ISO 14001:15 certification which improves the PROPER assessment rating of an energy sector company every year in table 4.13. PT Adaro Energy Indonesia Tbk and PT Bukit Asam Tbk both received this certification every year. This situation makes PT Adaro Energy and PT Bukit Asam can be said to be companies that can manage their environment well, thus obtaining the PROPER Gold rating consecutively from 2021 to 2023. The implementation of an environmental management system is in line with legitimacy theory, where the ISO 14001 standard has a close relationship with the company's environmental performance. ISO 14001 helps companies achieve and maintain legitimacy through regulatory compliance, increased transparency, and demonstrating commitment to sustainability. Companies that obtain this certification will be viewed as companies that have carried out their economic activities by paying attention to the surrounding environment and managing it effectively by the community.

Other test results state that Corporate Social Responsibility affects environmental performance. Corporate Social Responsibility (CSR) that is carried out effectively helps companies achieve optimal environmental performance, which can then be measured and recognized through PROPER assessment. This research is in line with Pelu et al., (2022) and Orazalin (2020) who concluded that CSR disclosure can improve company environmental performance, because the items in CSR disclosure are the same as the criteria in PROPER assessment and the implementation of effective CSR strategies will result in better company environmental performance. This is evidenced by energy sector companies that have disclosed several CSR items and caused an increase in the PROPER rating obtained. Based on Table 4.14, PT Adaro

Energy Indonesia and PT Bukit Asam experience an increase in disclosing CSR items based on GRI 2021 every year, reaching 85% and 97%. This situation makes PT Adaro Energy and PT Bukit Asam can be said to be companies that can manage their environment by looking at the environmental aspects that have been disclosed in CSR, thus obtaining the PROPER Gold rating consecutively from 2021 to 2023. The results of this study support stakeholder theory which emphasizes the importance of aligning company interests with the interests of stakeholders. CSR is disclosed transparently through open reporting on company activities and performance, including environmental aspects. CSR disclosure can improve a company's PROPER assessment because it has explained how a company manages its environment effectively. Transparency in CSR disclosure can build trust with stakeholders and motivate companies to improve their environmental performance.

6. Conclusions

Based on the research results on energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021-2023 period, it can be concluded as follows:

1. The results of testing the first hypothesis (H1) show that the green accounting variable affects environmental performance. This is evidenced by the disclosure of environmental costs that can improve the PROPER assessment rating of an energy sector company every year.
2. The results of testing the second hypothesis (H2) show that the environmental management system variable affects environmental performance. The environmental management system is proxied as ISO 1400:2015 certification. This certification has been obtained by energy sector companies and shows a fairly good or increasing PROPER rating every year.
3. The results of testing the third hypothesis (H3) show that the corporate social responsibility variable affects environmental performance. This is evidenced by energy sector companies that have disclosed several CSR items and caused an increase in the PROPER rating obtained.

Based on the research results that have been carried out, the following are some suggestions conveyed by the researcher:

1. For companies
   a. It is recommended for companies to consistently create and report sustainability reports for each period.
   b. It is recommended for companies to disclose environmental costs in annual reports and sustainability reports.

c. It is recommended for companies to participate in PROPER assessment activities every year and have certification on environmental management.
d. It is recommended for companies to create and report sustainability reports in accordance with applicable GRI Standards.

2. For future researchers
   a. Future researchers are expected to be able to add a wider research population.
   b. Future researchers can compare environmental costs with total company costs to obtain the percentage or ratio of environmental costs to total costs.
   c. Future researchers can analyze other factors that affect environmental performance because the variables used in this study only have an effect of 31.3%.
   d. Future researchers can include many company sectors that will be used as samples

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