



Environmental Costs, Performance, and CSR Disclosure Effects on Energy Companies' Profitability

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Abstract

Purpose: This study aims to examine the effect of environmental costs, environmental performance, and Corporate Social Responsibility (CSR) disclosure on profitability of energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2022–2024 period.

Research Methodology: This study applies a quantitative approach using panel data analysis. The research sample consists of 16 energy sector companies selected through purposive sampling, resulting in 48 firm-year observations. Secondary data were obtained from annual reports, sustainability reports, PROPER ratings, and IDX publications. Data analysis was conducted using the Random Effect Model (REM) with supporting classical assumption tests, model selection tests, t-tests, F-tests, and coefficient of determination analysis.

Results: The results show that environmental costs have a negative and significant effect on profitability, indicating that higher environmental expenditures may reduce short-term financial performance. Meanwhile, environmental performance and CSR disclosure have positive but insignificant effects on profitability. Simultaneously, environmental costs, environmental performance, and CSR disclosure do not significantly affect profitability.

Conclusions: This study concludes that sustainability-related practices have not yet provided direct financial benefits for energy companies during the observation period. Effective management strategies are required to transform environmental initiatives into long-term economic value.

Limitations: This study is limited to energy sector companies and a three-year observation period.

Contributions: This research contributes to environmental accounting literature by providing updated evidence regarding sustainability practices and financial performance in Indonesia energy sector, while offering practical insights for managers and investors in balancing environmental responsibility and profitability.

Keywords: *Corporate Social Responsibility Disclosure, Environmental Costs, Environmental Performance, Profitability*

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1. Introduction

The energy sector occupies a central and strategic position in Indonesia economic structure, serving as a backbone for industrial activity, infrastructure development, and national revenue generation. As a

provider of essential resources such as oil, natural gas, coal, electricity, and renewable energy sources, this sector directly influences economic growth and social welfare. However, behind its substantial contribution to gross domestic product and state income, the energy industry is also characterized by intensive resource extraction and production processes that pose considerable environmental risks.

Companies operating in this field are commonly categorized as high-profile firms because their activities are highly visible and closely monitored by the public due to their potential environmental and social impacts ([Adams, Donovan, & Toppo, 2023](#)). Environmental degradation, ecosystem disruption, carbon emissions, and waste generation are some of the challenges inherently associated with energy production. Consequently, energy companies face increasing pressure from regulators, investors, and communities to operate responsibly while maintaining strong financial performance.

In a competitive market environment, profitability remains the primary indicator of corporate success and sustainability. Profitability reflects management's ability to utilize company resources efficiently to generate earnings and ensure long-term survival. In this research, profitability is measured using Return on Assets (ROA), a financial ratio that evaluates how effectively a company converts its total assets into net income ([Kanji, 2019](#); [Helmisar, & Wiyono, 2023](#)). A higher ROA indicates more efficient asset management and stronger operational performance. Nevertheless, profitability within the energy sector is highly sensitive to global commodity price volatility. During the 2022–2024 period, fluctuations in coal, nickel, and oil prices significantly affected the financial stability of several energy companies listed on the Bursa Efek Indonesia. Declining commodity prices reduced revenues and exerted downward pressure on net profits, demonstrating how external market dynamics can weaken financial performance. This economic uncertainty underscores the need for companies to adopt comprehensive strategies that balance financial objectives with environmental and social responsibilities.

In response to growing environmental awareness and stakeholder expectations, corporations are increasingly encouraged to implement sustainable business practices aligned with the Triple Bottom Line framework introduced by John Elkington. This framework emphasizes that corporate responsibility extends beyond profit generation to include social equity (people) and environmental stewardship (planet) ([Afridayanti, Stevana, Hidayah, Sandea, Indrasta, Dewi, & Sari, 2023](#)). Within this context, environmental costs represent expenditures incurred to prevent, reduce, or remediate environmental damage arising from operational activities. These costs may include waste management, emission control, environmental rehabilitation, and compliance with regulatory standards. Although environmental spending demonstrates corporate commitment to sustainability, some managers perceive it as an additional financial burden that may reduce short-term earnings. This perception creates a dilemma: while environmental investment may temporarily decrease profits, it can also enhance corporate reputation, reduce regulatory risk, and generate long-term economic benefits. In addition to environmental costs, environmental performance plays a crucial role in shaping corporate image and stakeholder trust. In Indonesia, environmental performance is formally evaluated through the *Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan Hidup* (PROPER) program, which ranks companies based on their environmental management practices ([Aurelia, Murni, & Yatim, 2022](#)). A favorable PROPER rating signals compliance with environmental regulations and commitment to sustainable operations, potentially attracting environmentally conscious investors. Furthermore, Corporate Social Responsibility (CSR) disclosure serves as a communication mechanism through which companies report their environmental and social initiatives to stakeholders. CSR reporting often follows standards established by the Global Reporting Initiative, which provide globally recognized guidelines for sustainability disclosure ([Wulolo & Rahmawati, 2021](#)). Transparent CSR disclosure can strengthen legitimacy, improve corporate reputation, and foster investor confidence ([Mahaputra, 2023](#)). However, despite regulatory frameworks and reporting standards, environmental incidents involving energy companies continue to occur, revealing inconsistencies between formal disclosure and actual practice ([Senn & Giordano-Spring, 2020](#)). Such incidents may damage public trust and ultimately affect financial outcomes. These circumstances highlight a critical issue: whether environmental costs, environmental performance, and CSR disclosure genuinely contribute to

improved profitability or merely function as compliance mechanisms without significant financial impact.

The inconsistencies in previous empirical findings further emphasize the existence of a research gap. Some studies argue that environmental responsibility and transparent CSR disclosure positively influence profitability by enhancing reputation and stakeholder loyalty ([Musfirati, Ginting, & Hakim, 2021](#)). Others suggest that increased environmental expenditures may negatively affect short-term financial performance due to rising operational costs ([Kalyar, Shoukat, & Shafique, 2020](#)). Moreover, many prior studies have examined these variables independently or focused on earlier observation periods, failing to capture the unique economic conditions and commodity price volatility experienced between 2022 and 2024.

This study seeks to address these limitations by simultaneously analyzing the effects of environmental costs, environmental performance measured through PROPER ratings, and CSR disclosure on profitability proxied by ROA among energy sector companies listed on the Indonesia Stock Exchange during the 2022–2024 period. By integrating financial and non-financial performance indicators within a single analytical framework, this research offers a more comprehensive understanding of how sustainability-related factors influence corporate profitability. The objectives of this study are fourfold: first, to examine the partial effect of environmental costs on profitability; second, to analyze the impact of environmental performance on profitability; third, to evaluate the influence of CSR disclosure on profitability; and fourth, to assess the simultaneous effect of these three variables on financial performance. The novelty of this research lies in its updated observation period, sector-specific focus, and integrated analytical approach, which collectively contribute to the development of environmental accounting and sustainability literature. Practically, the findings are expected to provide insights for corporate management in designing strategies that balance economic performance with environmental responsibility, as well as for investors in making informed investment decisions that consider both profitability and sustainability dimensions.

2. Literature Review and Hypothesis/es Development

2.1 Stakeholder Theory

Stakeholder theory explains that companies are not only responsible for maximizing shareholder value but also for considering the interests and expectations of various stakeholders, including investors, employees, governments, communities, and consumers. According to this perspective, corporate sustainability practices are essential because stakeholders increasingly demand transparency, accountability, and responsible business operations. Companies that are able to meet stakeholder expectations tend to obtain greater support, maintain reputation, and strengthen long-term business sustainability ([Awa, Etim, & Ogbonda, 2024](#)).

In the context of the energy sector, stakeholder pressure is relatively high because operational activities are closely associated with environmental risks, such as carbon emissions, resource depletion, and ecosystem disruption. Therefore, companies are encouraged to implement environmental management practices, allocate environmental costs, and disclose sustainability-related information as a form of accountability. Environmental performance and CSR disclosure can become strategic tools for companies to demonstrate their commitment to stakeholders and maintain positive relationships with society ([Alsayegh, & Homayoun, 2020](#); [Ardiansyah, 2024](#)).

2.2 Legitimacy Theory

Legitimacy theory suggests that companies continuously seek to ensure that their activities are perceived as appropriate and consistent with prevailing social values and expectations. Organizational legitimacy is important because companies depend on social acceptance to maintain operational continuity. When companies operate in industries with significant environmental impacts, maintaining legitimacy becomes a crucial strategic objective ([Kuruppu, Milne, & Tilt, 2019](#)).

Energy sector companies face greater legitimacy challenges due to the environmental consequences associated with exploration, production, and distribution activities ([Crossley, Elmagrhi, & Ntim, 2021](#)). Through environmental management practices, improved environmental performance, and CSR disclosure, companies attempt to demonstrate their responsibility toward environmental and social issues. Sustainability reports and CSR disclosures function as communication mechanisms that allow companies to explain their efforts in reducing negative environmental impacts and fulfilling stakeholder expectations.

2.3 Green Accounting

Green accounting is an accounting approach that incorporates environmental aspects into corporate accounting systems by identifying, measuring, recording, and reporting environmental-related activities ([Kalyar, Shoukat, & Shafique, 2020](#)). Unlike conventional accounting, which primarily focuses on financial performance, green accounting provides broader information by considering the environmental impacts of business operations. Through green accounting practices, companies can evaluate the economic consequences of environmental activities and integrate sustainability considerations into strategic decision-making processes ([Rounaghi, 2019](#)).

The implementation of green accounting encourages companies to recognize and manage environmental costs as part of their operational strategies. Environmental costs include expenditures related to pollution prevention, waste management, environmental restoration, emission control, and compliance with environmental regulations ([Ayinla et al., 2024](#)). In environmentally sensitive industries such as the energy sector, green accounting becomes increasingly important because companies face significant pressure from regulators, investors, and communities to reduce environmental impacts while maintaining financial performance ([Ayinla et al., 2024](#)).

From the perspective of stakeholder theory and legitimacy theory, green accounting functions as a mechanism for enhancing transparency and demonstrating corporate responsibility toward environmental issues. Effective implementation of green accounting may improve resource efficiency, reduce environmental risks, and strengthen corporate reputation. However, environmental investments may also increase short-term operational costs, resulting in different impacts on profitability. Therefore, green accounting provides an important framework for understanding how environmental responsibility can influence corporate financial performance ([Awa, Etim, & Ogbonda, 2024](#); [Helmisar, & Wiyono, 2023](#)).

2.4 Environmental Cost

Environmental cost refers to expenditures incurred by a company to prevent, control, or remediate environmental damage resulting from its operational activities. These costs represent a tangible manifestation of corporate responsibility toward environmental sustainability ([Kotango, Jeandry, & Ali, 2024](#)). According to [Hansen \(2022\)](#), environmental costs can be categorized into prevention costs, detection costs, internal failure costs, and external failure costs. Prevention costs aim to reduce waste generation at the source, while detection costs ensure compliance with environmental standards. Internal and external failure costs arise when environmental damage occurs, either within the company's operational boundaries or after pollutants are released into the environment. Thus, environmental cost reflects both compliance efforts and strategic environmental management.

From a financial perspective, environmental expenditures are often viewed as burdens that may reduce short-term profitability because they increase operational expenses ([Tsabitah & Nuzula, 2021](#)). If the allocation for environmental programs is substantial, it may raise production costs and potentially increase product prices, which can affect market competitiveness and profit margins. However, environmental cost should not solely be perceived as a financial sacrifice. [Hansen \(2022\)](#) emphasize that structured environmental budgeting can reduce raw material usage, energy consumption, and waste disposal expenses in the long run. Therefore, while environmental costs may initially reduce earnings, they can enhance efficiency and operational sustainability over time.

In the context of stakeholder and legitimacy theories, environmental cost allocation demonstrates corporate commitment to fulfilling societal expectations. Stakeholders increasingly demand that firms take responsibility for environmental impacts, and companies that invest in environmental management are more likely to maintain public trust ([Anugrawati, Asmeri, & Meriyani, 2024](#); [Bastian, Burhanuddin, Rauf, Kurniawan, & Nurman, 2024](#)). Empirical studies provide mixed evidence: some research finds that environmental costs negatively affect profitability due to higher expense structures ([Fahmi, Rosmanidar, & Tanjung, 2023](#); [Lalo, & Hamiddin, 2021](#)), whereas other findings suggest that proper environmental cost management may contribute to long-term financial stability. These inconsistencies indicate that the impact of environmental cost on profitability depends on how effectively such expenditures are managed and integrated into corporate strategy.

2.5 Environmental Performance

Environmental performance represents the extent to which a company effectively manages and minimizes the environmental impact of its activities. It reflects compliance with environmental regulations, efficient resource utilization, and the adoption of sustainable practices ([Nazir, Zhaolei, Mehmood, & Nazir, 2024](#)). In Indonesia, environmental performance is commonly assessed through the PROPER rating system developed by the Ministry of Environment, which evaluates corporate compliance, waste management, emission control, and transparency ([Fitri & Pyhälä, 2021](#)). A higher environmental performance rating signals stronger environmental governance and greater accountability to stakeholders.

Improved environmental performance may generate economic benefits by enhancing corporate reputation and strengthening stakeholder confidence. According to [Hansen \(2022\)](#), firms with strong environmental performance often experience lower risk exposure, improved operational efficiency, and greater innovation opportunities. Consumers increasingly prefer environmentally friendly products, and investors are more inclined to support companies with sustainable practices ([Ghozali, 2021](#); [Meiyana, & Aisyah, 2022](#)). Furthermore, good environmental management can reduce environmental penalties, regulatory risks, and remediation costs, thereby indirectly supporting financial performance.

Empirical findings generally suggest a positive relationship between environmental performance and profitability, as companies that effectively manage environmental risks tend to achieve better financial outcomes ([Afridayanti, Stevana, Hidayah, Sandea, Indrasta, Dewi, & Sari, 2023](#); [Susanti, & Samara, 2022](#)). From a stakeholder theory perspective, improved environmental performance strengthens the relationship between firms and their stakeholders by creating shared value. Similarly, legitimacy theory explains that companies with strong environmental records are more likely to gain social approval and maintain their operational continuity ([Nirawati, Samsudin, Stifanie, Setianingrum, RyanSyahputra, Khrisnawati, & Saputri, 2022](#)). Nevertheless, variations in industrial characteristics and measurement proxies may produce different empirical results, highlighting the importance of contextual analysis.

2.6 Corporate Social Responsibility (CSR) Disclosure

Corporate Social Responsibility (CSR) disclosure refers to the communication of corporate activities related to social, environmental, and economic responsibilities in sustainability reports. In Indonesia, CSR reporting is mandated by Law No. 40 of 2007 and Government Regulation No. 47 of 2012, requiring companies to disclose social and environmental initiatives in their annual or sustainability reports ([Musfirati, Ginting, & Hakim, 2021](#)). CSR disclosure commonly follows standards established by the Global Reporting Initiative, which provide structured guidelines for reporting economic, environmental, labor, human rights, social, and product responsibility aspects ([Rahayudi, & Apriwandi, 2023](#); [Demir, Min, & Coppola, 2022](#)).

CSR disclosure functions as a strategic tool to build corporate image and enhance stakeholder trust. By transparently reporting social and environmental contributions, companies send positive signals to investors, customers, and regulators ([Syahzuni & Florencia, 2022](#)). Legitimacy theory suggests that

organizations must operate in accordance with societal expectations to maintain their social contract. Through comprehensive CSR reporting, firms demonstrate accountability and ethical commitment, which may improve reputation, customer loyalty, and competitive positioning.

Several empirical studies reveal that CSR disclosure can positively influence profitability because it strengthens brand image and fosters consumer loyalty ([Musfirati et al., 2021](#)). Companies that actively disclose CSR activities often gain greater public appreciation compared to those that do not. However, some research reports insignificant effects, suggesting that the financial impact of CSR depends on the quality, consistency, and credibility of the disclosure. Overall, CSR disclosure serves not only as a compliance mechanism but also as a strategic instrument to enhance long-term corporate performance and sustainability.

2.7 Corporate Sustainability Performance in Energy Sector

Corporate sustainability performance reflects the ability of companies to integrate economic objectives with environmental and social responsibilities. The Triple Bottom Line framework introduced by Elkington emphasizes that corporate success should not only be measured through financial performance but also through environmental protection and social contribution ([Alsayegh & Homayoun, 2020](#)).

The energy sector represents one of the industries with the highest sustainability challenges due to its dependence on natural resources and potential environmental impacts. Companies in this sector are required to implement sustainable strategies to reduce environmental risks while maintaining profitability. Environmental costs, environmental performance, and CSR disclosure represent important dimensions of sustainability practices that demonstrate corporate efforts to achieve responsible growth ([Derila, Evana, & Dewi, 2020](#)).

Effective sustainability management can potentially improve operational efficiency, reduce risks, and enhance corporate value. However, the economic outcomes of sustainability initiatives may vary depending on industry conditions, company strategies, and stakeholder responses ([Brulhart, Gherra, & Quelin, 2019](#)).

2.8 Profitability and Return on Assets (ROA)

Profitability represents a company's ability to generate financial returns through effective utilization of available resources. It is one of the most important indicators used to evaluate corporate performance and management effectiveness. Higher profitability reflects better operational efficiency and stronger financial capability. Return on Assets (ROA) is commonly used as a profitability measurement because it indicates how effectively companies utilize their total assets to generate net income. ROA provides information regarding management efficiency in transforming company resources into financial returns ([Sukesti, Ghozali, Fuad, & Nurcahyono, 2021](#)).

In the context of sustainability research, profitability is often used to evaluate whether environmental and social responsibility practices provide economic benefits. Companies that successfully integrate sustainability strategies into their operations are expected to achieve improved efficiency, stronger reputation, and better financial outcomes ([Bodhanwala & Bodhanwala, 2018](#)). However, sustainability investments may also create short-term financial pressures, resulting in different empirical findings regarding their impact on profitability.

2.9 Research Framework

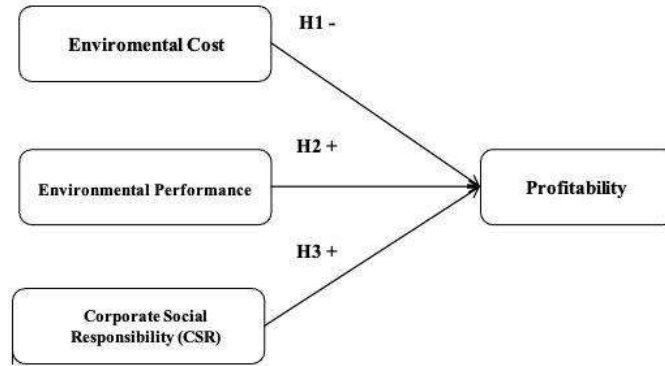


Figure 1. Research Framework

Based on Figure 1, the conceptual framework illustrates the proposed relationships between environmental cost, environmental performance, and corporate social responsibility (CSR) as independent variables and profitability as the dependent variable.

2.10 Hypothesis Development

Environmental cost reflects a company's commitment to managing and mitigating the environmental impact of its operations. Although such costs may reduce short-term profits due to increased operational expenditures, they also represent preventive and corrective actions that support sustainable business practices (Hansen, 2022). From the perspective of stakeholder and legitimacy theories, allocating environmental costs demonstrates corporate responsibility and responsiveness to societal expectations. However, prior empirical findings indicate that substantial environmental expenditures may decrease profitability, particularly when the costs are not efficiently managed (Fahmi, Rosmanidar, & Tanjung, 2023; Lalo, & Hamiddin, 2021). Therefore, environmental cost is expected to have a negative relationship with profitability.

Environmental performance measures how effectively a company controls pollution, manages waste, and utilizes resources efficiently. Strong environmental performance can enhance corporate reputation, reduce regulatory risks, and improve operational efficiency (Awewomom, Dzeble, Takyi, Ashie, Ettey, Afua, & Akoto, 2024). Stakeholder theory suggests that firms that meet environmental expectations are more likely to gain stakeholder trust and support, which can positively influence financial outcomes (Awa, Etim, & Ogbonda, 2024). Empirical studies also indicate that companies with better environmental performance tend to achieve higher profitability (Afridayanti, Stevana, Hidayah, Sandea, Indrasta, Dewi, & Sari, 2023; Ramlawati, Junaid, Alattas, & Muslim, 2022). Accordingly, environmental performance is predicted to positively influence profitability.

Corporate Social Responsibility (CSR) disclosure represents the company's effort to transparently communicate its social and environmental responsibilities. Through CSR reporting, companies provide signals to stakeholders regarding their ethical commitments and sustainability initiatives (Musfirati, Ginting, & Hakim, 2021). Based on legitimacy theory, organizations seek to maintain societal approval by aligning their operations with public expectations. Transparent CSR disclosure may strengthen corporate image, increase customer loyalty, and attract investors, thereby enhancing financial performance (Syahzuni & Florencia, 2022). Consequently, CSR disclosure is hypothesized to have a positive effect on profitability.

Based on the theoretical framework and prior empirical evidence, the hypotheses of this study are formulated as follows:

H₁: Environmental Cost negatively affects Profitability.

H₂: Environmental Performance positively affects Profitability.

H₃: Corporate Social Responsibility (CSR) Disclosure positively affects Profitability.

3. Research Methodology

This chapter outlines the research methodology, including the population and sampling procedures, data sources, variable measurement, and analytical techniques used to test the hypotheses. The population consists of 88 energy sector companies listed on the Bursa Efek Indonesia in 2024. Using purposive sampling, 16 firms were selected based on specific criteria: they operate in the energy sector, participate in the *Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan Hidup* (PROPER), publish financial and sustainability reports for 2022–2024, and disclose environmental costs in their annual or sustainability reports. The study employs quantitative secondary data obtained from corporate reports, the official PROPER website managed by the Ministry of Environment and Forestry, and the Indonesia Stock Exchange website. The data include environmental costs, environmental performance ratings, CSR disclosures, and financial performance indicators.

The independent variables comprise environmental cost, environmental performance, and Corporate Social Responsibility (CSR) disclosure, while profitability—measured by Return on Assets (ROA)—serves as the dependent variable. Environmental cost is calculated from reported expenditures and transformed into natural logarithm form. Environmental performance is assessed using PROPER color ratings, scored from 1 (black) to 5 (gold). CSR disclosure is measured through content analysis based on the 2021 Global Reporting Initiative (GRI) index, applying a disclosure ratio approach. Data analysis includes descriptive statistics, classical assumption tests (normality, heteroskedasticity, and multicollinearity), and panel data regression analysis. Model selection is determined through Chow, Hausman, and Lagrange Multiplier tests to identify the most appropriate estimation approach among common, fixed, or random effects models. Hypotheses are examined using F-tests, t-tests, and the coefficient of determination (R^2) to evaluate both simultaneous and partial effects of the independent variables on profitability.

4. Results and Discussions

4.1 Results

This study examines 16 energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2022–2024 period, resulting in 48 firm-year observations. The descriptive statistical analysis shows variations in profitability, environmental costs, environmental performance, and CSR disclosure among the observed companies. The average profitability measured by Return on Assets (ROA) was 0.181544 (18.15%), with a minimum value of 0.002500 and a maximum value of 0.602500, indicating differences in companies' ability to utilize their assets to generate profits. Environmental costs had an average value of 217,561.4, ranging from 22,898.00 to 258,714.0, with a standard deviation of 67,778.12, reflecting substantial differences in environmental expenditure allocation among firms. Environmental performance measured by PROPER ratings had an average score of 3.833333, with values ranging from 3.000000 to 5.000000, indicating that most companies achieved relatively good environmental management performance. Meanwhile, CSR disclosure had an average value of 0.635840, with a minimum value of 0.094000 and a maximum value of 1.000000, suggesting that the level of sustainability disclosure among energy companies was moderate.

Before conducting panel data regression analysis, several model selection tests were performed to determine the most appropriate estimation model. The Chow test resulted in a probability value of 0.0000 (<0.05), indicating that the Fixed Effect Model (FEM) was more appropriate than the Common Effect Model (CEM). However, the Hausman test produced a probability value of 0.7030 (>0.05), suggesting that the Random Effect Model (REM) was more suitable than the Fixed Effect Model. Furthermore, the Lagrange Multiplier test confirmed the selection of REM with a Breusch-Pagan probability value of 0.0000 (<0.05). Therefore, the Random Effect Model was selected as the final estimation model.

The regression equation based on the Random Effect Model is presented as follows:

$$Y = 0.308772 - 6.99E-07X_1 + 0.006249X_2 + 0.001248X_3$$

The model feasibility test shows that the independent variables do not simultaneously influence profitability at the 5% significance level, as indicated by the F-statistic probability value of 0.061103 (>0.05). The coefficient of determination (R^2) was 0.152591, indicating that environmental costs, environmental performance, and CSR disclosure explain 15.25% of the variation in profitability, while the remaining 84.75% is influenced by other factors outside the research model.

The partial regression results reveal that environmental costs have a negative and significant effect on profitability, with a coefficient of $-6.99E-07$, t-statistic of -2.746198 , and probability value of 0.0087 (<0.05). This finding indicates that increased environmental expenditures tend to reduce profitability among energy sector companies. Conversely, environmental performance shows a positive but insignificant effect on profitability, with a coefficient of 0.006249 and a probability value of 0.8678 (>0.05). Similarly, CSR disclosure has a positive but insignificant effect on profitability, with a coefficient of 0.001248 and a probability value of 0.9839 (>0.05).

The classical assumption tests confirm that the regression model meets the required statistical criteria. The normality test shows a Jarque–Bera probability value of 0.056521 (>0.05), indicating that the residuals are normally distributed. The heteroskedasticity test produces an Obs* R^2 probability value of 0.2292 (>0.05), confirming the absence of heteroskedasticity problems. In addition, multicollinearity testing indicates that all variables have centered VIF values below 10, namely 1.412922 for environmental costs, 1.479003 for environmental performance, and 1.201743 for CSR disclosure, demonstrating that no multicollinearity issue exists among the independent variables.

Table 1. Summary Table of Main Results

Variable	Coefficient	t-Statistic	Probability	Interpretation
Constant	0.308772	2.050517	0.0463	Significant
Environmental Cost (X1)	-6.99E-07	-2.746198	0.0087	Negative, Significant
Environmental Performance (X2)	0.006249	0.167381	0.8678	Positive, Not Significant
CSR Disclosure (X3)	0.001248	0.020242	0.9839	Positive, Not Significant

Model Fit:

$R^2 = 0.152591$ (15.25%)

Prob (F-statistic) = 0.061103

Table 1 presents the results of the panel data regression analysis using the Random Effect Model (REM). The results indicate that environmental cost has a negative and significant effect on profitability ($p < 0.05$), while environmental performance and CSR disclosure show positive but insignificant effects. The model explains 15.25% of the variation in profitability, as indicated by the R^2 value of 0.152591, while the remaining variation is influenced by other factors outside the research model. Furthermore, the F-statistic probability value of 0.061103 indicates that environmental cost, environmental performance, and CSR disclosure do not simultaneously have a significant effect on profitability at the 5% significance level.

4.2 Discussion

4.2.1 The Effect of Environmental Cost on Profitability

The results demonstrate that environmental costs have a negative and significant effect on profitability. This finding indicates that increased environmental expenditures tend to reduce the profitability level of energy companies during the 2022–2024 period. Environmental costs, including

waste management, emission control, environmental restoration, and compliance activities, require substantial financial resources that may increase operational expenses and reduce short-term earnings. This finding supports the perspective that environmental investment may create financial pressure when companies have not yet achieved efficiency benefits from environmental management practices. In the energy sector, which is characterized by intensive resource utilization and high environmental risks, environmental expenditures represent significant costs that directly affect financial performance. This result is consistent with previous studies showing that environmental costs may negatively affect profitability when environmental spending has not generated immediate economic returns ([Fahmi et al., 2023](#); [Lalo et al., 2021](#)).

However, environmental costs should not be viewed solely as a financial burden. Based on stakeholder theory and legitimacy theory, environmental expenditures represent corporate responsibility in responding to environmental expectations. Although the financial benefits may not appear in the short term, effective environmental cost management may improve operational efficiency, reduce regulatory risks, and support long-term sustainability.

4.2.2 The Effect of Environmental Performance on Profitability

The results show that environmental performance has a positive but insignificant effect on profitability. This finding indicates that improvements in PROPER ratings do not necessarily increase the financial performance of energy companies. Although companies with better environmental performance may receive greater stakeholder recognition, these benefits have not directly translated into higher ROA during the observation period. One possible explanation is that environmental performance improvements require significant investments, while the financial benefits from reputation enhancement, customer trust, and operational efficiency generally require a longer period to materialize. Furthermore, investors may consider environmental performance as a compliance requirement rather than a primary factor influencing profitability decisions. This finding differs from previous studies that identified a significant relationship between environmental performance and financial performance ([Afridayanti, Stevana, Hidayah, Sandea, Indrasta, Dewi, & Sari, 2023](#); [Voinea, Hoogenberg, Fratostiteanu, & Bin, 2020](#)). The difference may be attributed to variations in research periods, industry characteristics, and economic conditions affecting energy companies during 2022–2024.

4.2.3 The Effect of CSR Disclosure on Profitability

The findings reveal that CSR disclosure has a positive but insignificant effect on profitability. This result suggests that the extent of CSR information disclosed by energy companies does not directly influence their ability to generate profits. Although CSR disclosure can improve transparency, corporate image, and stakeholder trust, these benefits have not yet produced measurable financial impacts in terms of ROA. From the perspective of legitimacy theory, CSR disclosure functions as a mechanism for companies to maintain social acceptance and demonstrate accountability to stakeholders. However, disclosure quality and stakeholder perception may determine whether CSR activities generate economic value. Merely increasing the quantity of CSR disclosure without effective implementation may not significantly improve financial performance. This result supports previous studies suggesting that CSR disclosure does not always have a direct effect on profitability because financial outcomes depend on the credibility, relevance, and strategic integration of CSR activities within business operations ([Musfirati et al., 2021](#)).

5. Conclusions

This study examines the effect of environmental costs, environmental performance, and Corporate Social Responsibility (CSR) disclosure on profitability of energy sector companies listed on the Indonesia Stock Exchange during the 2022–2024 period. The findings indicate that environmental cost has a negative and significant effect on profitability, suggesting that increased environmental expenditures may reduce short-term financial performance. Meanwhile, environmental performance

and CSR disclosure have positive but insignificant effects on profitability, indicating that improvements in environmental management and sustainability disclosure have not yet generated direct financial benefits for companies. Furthermore, environmental cost, environmental performance, and CSR disclosure simultaneously do not significantly influence profitability, implying that other financial and operational factors play an important role in determining corporate profitability.

This study contributes to the environmental accounting literature by providing empirical evidence regarding the relationship between sustainability practices and financial performance in the Indonesian energy sector. The findings suggest that companies need to manage environmental investments more effectively by integrating sustainability initiatives into their business strategies to create long-term economic value. Future research is encouraged to expand the observation period, include broader industry sectors, and incorporate additional variables such as green accounting, corporate governance, operational efficiency, and external market factors to provide a more comprehensive understanding of sustainability and profitability relationships.

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Author Contributions

MRH contributed to the conceptualization, research design, methodology development, data collection, data analysis, and manuscript preparation. Z contributed to the theoretical framework development, validation of research methods, interpretation of findings, and critical review of the manuscript. S contributed to research supervision, evaluation of the results, and manuscript refinement. All authors contributed to reviewing and approving the final version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article. The research was conducted independently, and all interpretations and conclusions presented in this manuscript are solely the responsibility of the authors.

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