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The Effect of Environmental Costs and Profitability on Environmental Performance

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Abstract

This research aims to analyze the influence of environmental costs and profitability on ecological performance at companies in Indonesia. This study is motivated by the phenomenon where many companies allocate ecological costs, but their effectiveness in improving environmental performance is still questionable. By using the method Weighted Least Squares (WLS) to overcome heteroscedasticity, this research tests the relationship between these variables using secondary data from company financial reports. The research results show that Environmental Cost does not have a significant effect on Environmental Performance, indicating that environmental spending is often used as a legitimation tool rather than as a real sustainability strategy. ROE has a significant negative effect on Environmental Performance, which shows that companies with high profitability focus more on achieving profits than on environmental investments. On the contrary, Firm Size has a significant positive effect on Environmental Performance, asserting that large companies are better able to implement environmental policies because they have more resources and face greater stakeholder pressure. This research provides implications for regulators to increase transparency in environmental spending as well as for investors in considering sustainability aspects in their investment decisions.

Keywords: *Environmental Costs, Profitability, Environmental Performance.*
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I. INTRODUCTION

In recent years, the issue of sustainability and environmental responsibility has become a major concern in the global business world. Many companies are starting to implement sustainability practices with the aim of not only meeting regulations, but also improving their reputation and competitiveness. In Indonesia, regulations related to sustainability are starting to be strengthened, especially after their publication Financial Services Authority (OJK) Regulation Number 51 of 2017, which requires financial sector companies to apply sustainability principles in their business activities. However, the implementation of sustainability practices in Indonesia still faces major challenges, especially in terms of the effectiveness of environmental costs on corporate environmental performance.

Although many companies in Indonesia have allocated funds for environmental programs, their effectiveness is still questionable. Several studies have found that companies only incur environmental costs as a form of compliance with regulations, not as a real commitment to

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improve Environmental Performance (Amidjaya & Widagdo, 2020). This can be seen from the widespread environmental pollution carried out by large companies in the energy, manufacturing, and plantation sectors. In addition, published sustainability reports are often symbolic and do not reflect actual implementation (Supatmi et al., 2021).

Several previous studies have shown mixed results regarding the impact of environmental investment on corporate sustainability performance. (Nguyen, 2020) states that environmental costs have a positive impact on environmental performance, because they can be used for investment in environmentally friendly technology and sustainability certification. However, (Barry & Eccles, 2015) argue that in some cases, environmental costs are more often used as a tool of corporate legitimacy than as a real effort to improve sustainability. In Indonesia, (Hope & Lu, 2020) found that many large companies report on their environmental initiatives, but few actually demonstrate improved environmental performance.

The findings of (Jadoon et al., 2021) confirm that investors positively value corporate sustainability performance – particularly when demonstrated through social, economic, and governance dimensions – alongside the quality of sustainability reporting. Consistent with this global evidence, (Schiehll & Kolahgar, 2021) further establishes that ESG disclosures are materially relevant to investors, with financial materiality in ESG reporting contributing to more informative stock pricing. Within the Indonesian context, this empirical foundation suggests environmental performance – as an integral component of ESG – holds significant potential to emerge as a key determinant of investor interest. Crucially, such non-financial metrics would complement rather than replace conventional accounting indicators, a position strongly supported by longitudinal research from (Ratnaningrum et al., 2019, 2021, 2022) demonstrating the enduring value and relevance of traditional accounting figures in Indonesia's capital markets.

Based on this phenomenon, this research aims to test whether environmental costs have an impact on Environmental Performance in Indonesia. Apart from that, this research also wants to examine how profitability (ROE) and Firm Size play a role in improving or hindering a company's environmental performance. This study seeks to fill the gap in previous research by providing empirical evidence in the Indonesian context, where sustainability regulations are still developing and the implementation of sustainable practices is often influenced by external pressures. Theoretically, this research refers to Legitimacy Theory (Suchman, 1995), which explains that companies can use environmental policy as a tool to gain legitimacy from stakeholders. In addition, this research also uses Stakeholder Theory (Freeman, 2010), which emphasizes that pressure from investors, consumers, and regulators can influence company decisions in managing sustainability issues. Practically, it is hoped that this research can provide insight for regulators

in designing more effective policies, as well as for companies in improving their sustainability strategies so that they are not only symbolic but also have a real impact on the environment.

This research aims to (1) analyze the influence of Environmental Cost on Environmental Performance, (2) test how ROE moderates this relationship, and (3) examine whether Firm Size contributes to improving the company's environmental performance. With this approach, it is hoped that this research can provide a deeper understanding of the effectiveness of sustainability strategies in Indonesia and how financial factors and company size play a role in long-term sustainability. This study contributes to PROPER policy development by identifying operational weaknesses: the current rating system over-relies on corporate financial disclosures (e.g., environmental expenditures) without verifying physical impacts such as river pollution or land reclamation. These findings provide a basis for regulators to enhance PROPER methodology through the inclusion of outcome-based indicators (e.g., wastewater quality, biodiversity metrics) alongside financial data.

Although PROPER serves as our environmental performance proxy, the non-significant relationship between environmental costs and performance exposes a fundamental system flaw: PROPER cannot currently distinguish substantive environmental investments from cost-recording practices for legitimacy purposes. This constitutes a critical theoretical contribution by confirming institutional decoupling (Meyer & Rowan, 1977) within Indonesian environmental governance. Consequently, PROPER should evolve from compliance-based to outcome-based evaluation, incorporating physical indicators (e.g., verified emission reductions, ecosystem restoration metrics) as rating requirements. These results further underscore the urgency of field-verification research for corporate environmental reports.

II. LITERATURE REVIEW

A. Environmental Costs and Environmental Performance

In an era of increasing regulatory pressure and public awareness of environmental issues, companies are required to not only manage negative environmental impacts but also invest resources proactively for environmental improvement. Environmental costs are expenses used to prevent, reduce, or repair environmental damage. This investment covers waste processing costs, clean energy use, and environmental certification. Environmental costs represent a company's commitment to dealing with environmental issues, including preventive efforts, pollution control, and investment in environmentally friendly technology.

The greater the allocation of funds towards environmental costs, the greater the company's opportunity to improve the quality of its environmental management. These costs also cover

aspects of environmental audits, employee training on the environment, and certification such as ISO 14001. In the Indonesian context, increasing pressure from regulations such as PROPER and POJK No. 51/2017 reinforces the importance of adequate environmental cost allocation. Companies today are under growing pressure to align their operations with environmental expectations.

Environmental costs-such as those for pollution control, green certifications, and waste management-reflect a company's proactive investment in sustainability. According to (De Villiers & Marques, 2016), organizations that incorporate environmental costs into strategic planning tend to report improved environmental performance. Likewise, (Huang & Watson, 2015) found that environmental initiatives tied to accounting and reporting systems positively affect firm-level sustainability outcomes. Furthermore, (Lee & Farzipoor Saen, 2012) applied environmental efficiency metrics and found that firms with higher eco-investments achieved better sustainability scores in Asian contexts. Thus, the hypothesis is as follows:

H1: Environmental costs have a positive effect on the environmental performance of companies in Indonesia.

B. Profitability and Environmental Performance

A company's profitability reflects its financial capacity to invest in sustainable environmental initiatives. Companies that have a high Return on Equity (ROE) tend to be better able to finance environmentally oriented projects without disrupting their main operations. According to legitimacy theory, large/profitable companies are often in the spotlight of the public, investors, and regulators, so they are more motivated to demonstrate environmental responsibility. Company profitability plays an important role in the company's ability to implement environmental programs.

Return on Equity (ROE) as an indicator of profitability reflects the company's efficiency in generating profits from the equity it owns. More profitable companies have greater financial resources to allocate to clean technology, green production systems, and transparent sustainability reporting. Companies with high profitability tend to make more voluntary environmental disclosures and have better environmental performance scores than less profitable companies. This is because financially strong companies are better able to face the costs of transitioning to environmentally friendly practices.

Profitability, often captured by Return on Equity (ROE), enables firms to allocate greater resources to sustainable practices. Profitable firms are more likely to see environmental investment as a strategic advantage rather than a compliance cost.

(Farlinno & Bernawati, 2020) found that profitability has a significant influence on environmental performance, suggesting that companies with higher profitability are more likely to undertake environmentally conscious initiatives. However, in contrast, (Panggabean et al., 2025) reported that profitability does not have a substantial effect on environmental performance. Thus, the hypothesis is as follows:

H2: Profitability (ROE) has a positive effect on the company's environmental performance, Firm Size

Company size (*firm size*), which is measured based on total assets or income, in this study, is placed as a variable control. The role of this control variable is important to ensure that the relationship between main variables such as environmental costs, profitability, and digital maturity on environmental performance is not influenced by the size of the company. (Dienes et al., 2016), firm size has a significant positive influence on environmental disclosure because larger firms face stronger pressure from stakeholders to be transparent about their environmental practices (Dienes et al., 2016). Similarly, (Hummel & Schlick, 2016) found that large firms are more likely to engage in substantive rather than symbolic environmental reporting due to reputational risks.

Larger companies generally have more resources to fulfill social and environmental responsibilities, and are more exposed to public pressure and stringent regulations. Therefore, large companies tend to be more active in disclosing and implementing good environmental practices to maintain their reputation. Large companies are better able to implement sustainability strategies because they have higher resources, capacity, and reputational pressure. Therefore, company size is controlled in the model to isolate the real influence of the main variables studied on environmental performance (Drempetic et al., 2020). Thus, the hypothesis is as follows:

H3: Firm Size is a control variable

III. RESEARCH METHOD

This study examines the influence of two independent variables, namely Environmental Costs and profitability, on the dependent variable of environmental performance. While also incorporating Firm Size as a control variable. This study focuses on mining sector companies listed on the Indonesia Stock Exchange (IDX) that participated in the PROPER program during the period 2021–2023. The population consists of all mining companies listed on the IDX and included in the PROPER environmental performance assessment during this period.

The sample was selected using a purposive sampling method, based on the following criteria: a). Mining companies listed on the Indonesia Stock Exchange (IDX) from 2021 to 2023; b).

Companies that participated in the PROPER program during the research period; c.) Companies that consistently published financial statements and either environmental performance or sustainability reports during the 2021–2023 period. Based on data from the official PROPER website (https://proper.menlhk.go.id/proper/), a total of 10 companies met these criteria. With data collected over three years, the final sample consists of 30 firm-year observations. Although limited to 10 firms, the sample's depth—derived from three years of longitudinal tracking—enables granular analysis of strategic dynamics inaccessible through cross-sectional data. This approach is particularly valuable in emerging markets with scarce ESG data (Amidjaya & Widagdo, 2020) and meets minimum requirements for complex regression models (Gay & Diehl, 1992).

IV. RESULT AND DISCUSSION

A. Result

The descriptive statistics provide a preliminary view of the overall distribution and central tendencies of the variables used in this study. Environmental Performance (EN_PERF) varies from 3.30 for its mean and 4.00 for its median, meaning most firms have relatively high environmental performance. The Environmental Cost (ENCOST) variable varies from 0.072 with a relatively high standard deviation of 0.126, suggesting extreme variability across firms. Return on Equity (ROE) also has a broad spread, whose mean is 0.574 and standard deviation is 0.760, reflecting mixed levels of profitability between the sampled companies. These trends are consistent with those reflected in Table 1.

Table 1. Descriptive Statistics Test Result

Variable	Mean	Median	Std. Dev.	Min	Max
EN_PERF (Environmental Performance)	3.30	4.00	1.82	0.00	5.00
ENCOST (Environmental Cost)	0.072	0.023	0.126	-0.018	0.513
ROE (Return on Equity)	0.574	0.271	0.760	-0.300	2.804
TA (Total Assets - Log)	8.914	8.984	0.696	7.842	10.033

The results of descriptive statistical tests show several main characteristics of the research variables. Environmental Performance (EN_PERF) has a mean of 3.3, with a median of 4.0, indicating that most companies have quite high environmental performance. Environmental Cost (ENCOST) has an average of 0.072, but there is a negative value (-0.018). The negative environmental costs (observed in two cases) result exclusively from scaling the variable against net income (ENCOST = Environmental Costs / Net Income). When firms incur losses, this ratio mathematically yields a negative value, reflecting the heightened relative burden of environmental expenditures during financial stress. This aligns with (Drempetic et al., 2020), who demonstrated that profitability-scaled ESG metrics accurately capture sustainability commitment relative to financial capacity, including periods of low performance.

Return on Equity (ROE) has an average of 0.574, but some companies experience losses (minimum value -0.300), with a high standard deviation indicating large differences in profitability between companies. Total Assets (TA - Log) has a mean of 8,914, with a minimum value of 7,842 and a maximum of 10,033, indicating variations in company size in the sample. Based on the results of descriptive statistics, it can be concluded that the research variables have quite diverse distributions, with indications that the majority of companies have good environmental performance, but there are variations in environmental expenditure (ENCOST), profitability (ROE). This variation needs to be analyzed further to see its effect on the dependent variable in the regression model.

1. Classic Assumption Test Results

For checking the validity of the regression model, certain diagnostic tests were carried out under the conditions of normality, heteroscedasticity, autocorrelation, and model specification. The normality test shows that the residuals are not normally distributed and can lead to biased standard errors. The existence of heteroscedasticity suggests that the variance of the residuals is not constant and can reduce the efficiency of regression estimates. Although the Durbin-Watson statistic shows a slight positive autocorrelation, the model is still more desirable than the initial version, and the Ramsey RESET test is also positive in affirming that the model is well specified. The findings are shown in Table 2.

Table 2. Classic Assumption Test Results

Test Type	Statistics / Test Values	p/DW value	Information
Normality Test	Jarque-Bera	$p < 0.05$	Residuals not normally distributed can affect the standard error.
Heteroscedasticity Test	Glejser / White Test	$p < 0.05$	Happens when heteroscedasticity, the residual variance, is not constant.
Autocorrelation Test	Durbin-Watson (DW)	DW = 0.907	There are indications of positive autocorrelation, although better than the initial model.
Test Model Specifications	Ramsey RESET Test	$p > 0.05$	There are no model specification errors; the shape of the model is correct.

Normality Test → $p < 0.05$ means the residuals are not normally distributed. This could cause a biased standard error. Heteroscedasticity test → $p < 0.05$ indicates that the residual variance is not constant, which could cause the regression to be less efficient. Autocorrelation test → DW = 0.907 means there is still a slight positive autocorrelation in the residuals, even though it is better than the initial model. These diagnostic results suggest that the model still requires improvement to meet classical assumption standards.

A bivariate regression was performed to observe the impact of environmental cost, return on equity (ROE), and firm size on environmental performance. The intercept is statistically

significant, but the other independent variables, Environmental Cost, ROE, and Firm Size, are not statistically significant at this stage. The R-squared of 28.2 percent indicates that the model has a relatively weak explanatory power, and the F-statistic is also not significant, which means that the model is still not strong. There is a clear coefficient decomposition, standard error, and t-statistic that are displayed in Table 3.

Table 3. Coefficient & Significance Analysis

Variable	Coefficient	Std. Error	t-Statistics
Intercept	2.5518	6.398	0.000***
Environmental cost	4.437e-09	0.160	0.874
ROE	-6.64e-10	-0.721	0.478
Firm_Size	4.728e-10	0.967	0.343
R^2: 28.2%			
F: = 0.0724			

2. Results Regression After Repair (WLS)

The baseline model was heteroscedastic and therefore Weighted Least Squares process was used to eliminate this peculiarity. Using this process, the model was greatly enhanced with an R squared level of 92.4 percent, showing much better explanatory capability. ROE has a clear negative impact, whereas Firm Size shows a positive effect on the environment. This new model yields more stable estimates and can correct the heteroscedasticity problem. The estimates of the regression after this correction are shown extensively in Table 4.

Table 4. Results Regression After Repair (WLS)

Variable	Coefficient	Std. Error	t-Statistics
Intercept	3.0005	0.126	23.729***
Environmental_Cost	1.249e-09	2.35e-09	0.531
ROE	-6.981e-10	8.22e-11	-8.491***
Firm_Size	3.778e-10	4.94e-11	7.649***
R^2: 92.4%			
F: = 1.16e-14			

The current model is much better, with an R^2 of 92.4%, Profitability (ROE) is significant & has a negative impact on Environmental Performance. Company Size (Firm Size) has a significant & positive impact on Environmental Performance. Heteroscedasticity has been corrected with WLS, but a little autocorrelation still remains. The estimation results of the linear regression model which tested the influence of Environmental Cost, Return on Equity (ROE), on Environmental Performance showed several important findings.

Environmental_Cost was not significant ($p = 0.600$) → Environmental costs had no real impact on Environmental Performance. This possibility is caused by two things: (1) these costs have not been allocated efficiently or on target, or (2) reporting and documentation on the use of environmental funds has not been transparent or standardized, making it difficult to measure the

impact directly. ROE is significantly negative ($p < 0.01$) → The higher the profitability, the lower the Environmental Performance. This shows that companies that focus more on profitability tend to pay less attention to environmental aspects.

The ROE (Return on Equity) variable shows a significant negative influence on Environmental Performance with a coefficient of -6.981e-10 and p-value = 0.000. These results indicate that there is a trade-off between achieving profitability and environmental performance. This means that highly profit-oriented companies may tend to reduce operational costs, including expenditure on environmental activities, so that their environmental performance decreases. These findings support the literature that suggests that in some contexts, a company's focus on short-term profits can come at the expense of long-term investments in the environment

Firm Size is significantly positive ($p < 0.01$) → Large companies are more likely to have higher Environmental Performance. Company Size (Firm Size) has a positive and significant influence on Environmental Performance (coefficient = 3.778e-10; p-value = 0.000). This strengthens the argument that large companies tend to have greater resource capacity, are under more public and regulatory pressure, and thus are more motivated to contribute to sustainable practices. This is in line with previous findings in the literature, where large companies tend to have special departments dealing with social and environmental responsibility, and are more active in ESG reporting.

The model has R-squared = 92.4% → This model is quite good at explaining variability in Environmental Performance. The overall model is significant ($p < 0.01$) → The independent variables jointly influence the dependent variable. In this research, Company Size is positioned as a control variable to ensure that the main effect observed between independent variables, such as *Environmental Cost* or *ROE,* on *Environmental Performance* is not influenced by the size of the company. This means that, although Firm Size is not the main focus of the research, this factor is included in the model because it has been proven in various previous studies to be an important factor that can influence a company's environmental performance.

Large-scale companies usually have more resources, both financial, technological, and managerial, to carry out sustainability programs and fulfill environmental obligations. In addition, large companies also tend to be more exposed to public pressure, government regulations, and capital market expectations, so they are encouraged to have better environmental practices than small companies. The finding that Firm Size has a significant positive effect on Environmental Performance also strengthens the role of this control, because it is consistent with previous literature, which states that Large companies usually adopt environmental management practices that require more resources, to improve their environmental impact, reduce costs, and enhance

business performance. On the other hand, small companies tend to use simpler practices like green logistics and eco-friendly packaging, which mainly help with environmental impact and cost savings (Wong et al., 2020). By controlling for company size, we can be more confident that the relationship between *Environmental Cost* or *ROE* to *Environmental Performance* not influenced by the size of the company.

B. Discussion

The finding that Environmental Cost (EC) does not significantly affect Environmental Performance (EP) suggests two critical possibilities: First, environmental fund allocation and utilization may remain suboptimal, failing to generate a measurable ecological impact. Second, companies might engage in greenwashing—merely reporting environmental expenditure figures without substantive action. Here, EC functions as a "communicative legitimacy shield." (Liu et al., 2023): a symbolic tool to maintain an image of compliance with public expectations despite minimal environmental practices.

This phenomenon aligns with Legitimacy Theory (Richardson, 1985), where symbolic management secures external legitimacy without internal substantive change. EC allocation in such contexts acts purely as a legitimacy ritual to meet administrative demands (e.g., PROPER regulations), lacking strategic integration into business processes. This reflects the decoupling between formal policies and operational practices described by (Meyer & Rowan, 1977)—a pattern prevalent in weak institutional environments like many developing economies. Further, (Ifada & Saleh, 2022) find that high EC weakens the EP-Environmental Disclosure (ED) relationship, as firms rely on nominal figures without elaborating on environmental engagement.

"*Quantitative costs act as a summary signal, diminishing the need for elaborate disclosures—even if decoupled from actual performance."* This creates a ritualistic loop: EC is reported not as ecological accountability but as a symbolic appeasement of stakeholder pressure. (Yıldız, 2025) notes that rehabilitation costs directly impacting EP (e.g., forest land restoration) go unmonitored, while symbolic administrative costs dominate EC reports. Consequently, cosmetic EC allocation fails to drive tangible environmental improvement.

(Li et al., 2025) demonstrate ESG's role in transforming EC from administrative expenditure to outcome-oriented investment, closing the EC-EP gap. (Zhang et al., 2024) position ESG as an "engine of transformation": (Chen et al., 2024) add that ESG drives novelty innovation via resource expansion and agency problem mitigation. Without ESG, EC yields only incremental innovations incapable of ecological performance leaps. (Shi et al., 2025) confirm EC impacts EP only when directed to specific restoration (e.g., land remediation), not symbolic training/generic administrative costs.

The negative ROE-EP relationship reflects a managerial dilemma, reinforcing Stakeholder Theory's critique of shareholder primacy (Freeman, 2010). In Indonesia's extractive sector, high-ROE firms often neglect non-shareholder stakeholders to preserve short-term profitability. Yet (Kalash, 2021) shows this trade-off is avoidable: Turkish firms with high EP achieved superior ROE through reduced debt costs and operational efficiency—proving strategic management can align profitability and sustainability. (Ma & Peng, 2025; Makpotche et al., 2024) advocate fiscal incentives (e.g., green subsidies/bonds).

Green bonds prove most effective by binding funds to impact projects (not symbolic ones), breaking the ROE-EP deadlock. Firm size consistently correlates with EP, as large firms leverage scale efficiency and green tech adoption to offset ROE-EP tensions (Ifada & Saleh, 2022). ESG's impact is strongest in large non-polluting/tech firms due to adaptive capacity (Li et al., 2025; Ma & Peng, 2025). (Luo et al., 2023) emphasize that economic-environmental alignment requires precise policy design (e.g., regulations focusing on green technology innovation).

Structural solutions demand measurable catalysts like carbon pricing to drive technological—not administrative—transformation. Their findings refute simplistic regulatory narratives: insignificant EC mirrors failed green management innovations where funding serves only legitimizing purposes (masking effect), while negative ROE-EP ties reflect absent differential policies for profitable firms (e.g., China's carbon trading spurring green innovation in non-SOEs). (Mennig & Szigeti, 2025) confirm EP-profitability friction is resolvable via targeted incentives/regulation. (Jain & Malhotra, 2025) warn that excessive governance rigidity may reduce profitability, increase compliance burdens, and deter ESG investment. Thus, emerging economies need balanced incentives, institutional capacity, and sustainability strategies. Ultimately, EC alone cannot drive EP without a supportive macro-ecosystem—policy, regulation, stakeholder pressure, and mature ESG infrastructure (Niu, 2024)

V. CONCLUSION AND RECOMMENDATION

Based on the research results, it can be concluded that environmental costs do not have a significant influence on the Environmental Performance of companies in Indonesia. This shows that even though companies allocate funds for environmental activities, these funds do not always reflect increased sustainability performance, but are often only used as a legitimacy tool. Differences in research results could be due to the regional context (Indonesia vs developed countries), the effectiveness of CSR management, and the quality of reporting. So your results make sense for the Indonesian context, where reporting is still often a formality.

In addition, this research finds that profitability (ROE) has a significant negative influence on Environmental Performance. This means that the higher the profitability of a company, the lower

the attention to sustainability aspects. This supports the view that companies that focus on short-term profits tend to neglect investing in sustainable business practices. Company size is proven to be a control variable, so larger companies tend to have more resources to implement sustainability practices and are more vulnerable to regulatory and stakeholder pressure.

Suggestion for Regulators: The government and financial authorities need to tighten regulations regarding the use of environmental fees so that they are not only a means of legitimation, but actually contribute to improving Environmental Performance. Transparency in reporting the use of environmental costs also needs to be improved. For Investors & Stakeholders: Investors and shareholders can be more active in assessing company sustainability by not only looking at sustainability reports, but also assessing the real impact of the company's environmental policies. ESG (Environmental, Social, and Governance) can be an important factor in making investment decisions.

For Companies: Companies with high profitability should not only focus on increasing profits, but also allocate a portion of their profits to improve long-term business sustainability. Small and medium companies also need to be given incentives to be more active in sustainable business practices. For Further Research: This study still has limitations, especially in terms of other factors that might influence Environmental Performance, such as corporate governance or pressure from consumers. Future research can expand the variables used and use panel data methods with wider samples. Although the sample size limits broad generalization, it offers high practical significance for Indonesian mining regulators as it reflects dominant market players. Future research should expand to smaller firms and longitudinal designs.

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