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Environmental Costs and Their Impact on the Financial Performance of PROPER-Rated Manufacturing Companies: The Mediating Role of Environmental Performance

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A B S T R A C T

This study examines environmental costs' impact on the financial performance of manufacturing companies and the mediating role of environmental performance. Using a quantitative approach, the data are obtained from financial statements, sustainability reports of manufacturing companies listed on the Indonesia Stock Exchange, and PROPER reports issued by the Ministry of Environment and Forestry. Panel data regression and the Sobel test are employed for mediation analysis. The findings indicate that environmental costs not significantly affect environmental performance, and environmental performance does not significantly influence financial performance, either directly or as a mediating variable.

INTRODUCTION

Corporate objectives have evolved beyond the pursuit of maximum profit toward ensuring business sustainability and fulfilling social and environmental responsibilities (Shayan et al., 2022). This shift implies that accounting reports should go beyond economic performance by also highlighting environmental and social outcomes. Corporate progress is increasingly determined by the ability to balance economic, social, and environmental goals simultaneously, as firms that successfully manage both financial and environmental performance tend to enhance their competitiveness as evaluated by stakeholders (Chen et al., 2024)

A company's economic condition is often assessed using financial performance indicators, especially profitability, as these measures demonstrate management's ability to generate profits from operations within a defined period (Ass, 2020). Profitability also serves as a key signal for shareholders and investors, as firms with higher profits are generally perceived as having greater investment potential (Jayathilaka, 2020; Sari & Sedana, 2020)However, recent developments show that investors no longer focus solely on profitability but also consider companies with strong environmental reputations or "green" practices (Hapsari et al., 2021).

To demonstrate environmental responsibility, companies incur environmental costs associated with initiatives to prevent, mitigate, or remediate adverse environmental impacts resulting from their operational activities (Shabbir & Wisdom, 2020). These costs include pollution control, waste management, environmental restoration, and other related activities, either directly or indirectly affecting firm operations (Santoso, 2018). Although environmental costs are often viewed as reducing short-term profits, they may generate long-term benefits such as energy efficiency, improved productivity, sustainable environmental management, and enhanced corporate image (Setiadi, 2021). Proactive environmental management can strengthen public trust and corporate reputation, which may ultimately influence sales performance and financial outcomes (Asjuwita & Agustin, 2020; Majid et al., 2022).

Within the framework of legitimacy theory, companies are required to align their operations with societal norms, regulations, and stakeholder expectations as a means of sustaining legitimacy and supporting long-term organizational survival (Derila et al., 2020; Akhter et al., 2023). When firms gain social acceptance, community involvement increases, which may positively affect corporate income and financial performance (Deegan, 2004). However, empirical studies investigating the relationship between environmental costs and financial performance has produced mixed findings. While some studies report a significant effect of environmental costs on profitability, (Festus & Philip, 2017; Khan & Gupta, 2023; Nguyen & Manh Dung, 2019; Suandi & Ruchjana, 2021) others find no significant relationship (Azizah & Cahyaningtyas, 2023; Dewi & Wiyono, 2023; Huseno, 2018; Murniati & Sovita, 2021). This inconsistency highlights a research gap, suggesting that no definitive conclusion has been reached regarding the relationship between environmental costs and financial performance.

One plausible explanation for this gap is that environmental costs do not directly influence financial performance but instead affect environmental performance first. Environmental performance indicates how effectively a company manages its environmental impacts while adhering to environmental management systems (Angelina & Nursasi, 2021; Pelu et al., 2022). Improved environmental performance may enhance corporate reputation, attract environmentally conscious investors and consumers, and ultimately contribute to improved financial performance (Sugandini et al., 2020; Yao et al., 2019). Several studies support this argument by demonstrating a positive relationship between environmental performance and financial performance (Dewi & Wiyono, 2023; Nuryaningrum & Andhaniwati, 2021).

Manufacturing companies provide a particularly relevant research context due to their substantial contribution to Indonesia's economic growth and their significant environmental impact caused by hazardous industrial processes (Fahira & Yusrawati, 2023; Shan et al., 2024) the existence of the PROPER program as a governmental instrument to assess corporate environmental performance, evidence indicates that manufacturing firms still struggle to achieve high environmental ratings (Kementerian Lingkungan Hidup dan Kehutanan, 2024). This condition raises concerns about whether envi ronmental initiatives have effectively translated into improved financial outcomes.

By concentrating on manufacturing companies listed on the Indonesia Stock Exchange that take part in the PROPER program, this study contributes to the existing body of literature, offering a distinctive institutional and regulatory setting. By positioning environmental performance nvironmental performance in a mediating role, this research enriches legitimacy theory by empirically explaining the indirect mechanism through which environmental costs influence financial performance. The study also provides practical insights into why environmental expenditures may not immediately enhance profitability, thereby contributing to knowledge enrichment and policy-relevant discussions on sustainable corporate practices.

LITERATURE REVIEW

Legitimacy Theory

This study adopts legitimacy theory as its theoretical foundation, which posits that companies must conduct their operational activities in accordance with societal values, norms, and expectations in order to obtain social acceptance and maintain business sustainability ((Dowling & Pfeffer, 1975; Deegan, 2004). In this context, firms are not only economically accountable but also bear social and environmental responsibilities, which are reflected in environmental management practices, environmental cost disclosure, and improvements in environmental performance (Buana & Nuzula, 2017; Derila et al., 2020).

Enviromental Costs

Environmental costs are defined as corporate expenditures aimed at preventing, reducing, and remediating the negative environmental impacts of operational activities, including pollution control, waste management, and environmental restoration costs (Santoso, 2018; Shabbir & Wisdom, 2020).

Although environmental costs are often perceived as reducing short-term profits, several studies suggest that allocating environmental costs can generate long-term benefits in the form of enhanced corporate reputation, increased public trust, and improved operational sustainability (Asjuwita & Agustin, 2020; Setiadi, 2021).

Environmental Performance

Environmental performance represents the extent to which a firm effectively manages and mitigates its environmental impacts through effective environmental management systems (Angelina & Nursasi, 2021; Pelu et al., 2022). In Indonesia, environmental performance is assessed through the Corporate Performance Rating Program (PROPER) issued by the Ministry of Environment and Forestry (Kementerian Lingkungan Hidup dan Kehutanan, 2021). PROPER ratings serve as an important indicator of a a company's commitment to environmental compliance obligations and responsibilities.

Financial Performance

Meanwhile, financial performance is represented by profitability, measured through Return on Assets (ROA), which captures a firm's effectiveness in converting assets into profits (Gitman & Zutter, 2015; Kasmir, 2016). Investors tend to favor firms with high profitability levels; however, environmental considerations are increasingly incorporated into investment decision-making (Sari & Sedana, 2020; Sukesti et al., 2021).

Based on legitimacy theory and prior empirical findings, despite extensive research, the relationships among environmental costs, environmental performance, and financial performance remain inconclusive. From the perspective of legitimacy theory, environmental cost allocation serves as a mechanism for maintaining organizational legitimacy as a strategic effort to gain social acceptance and maintain legitimacy from stakeholders; however, such expenditures do not always translate directly into improved financial outcomes. Earlier empirical studies report contradictory results concerning the influence of environmental costs on financial performance, as well as the role of environmental performance in enhancing corporate profitability. This inconsistency indicates that environmental performance may function as an intervening mechanism through which environmental costs influence corporate financial performance. Therefore, environmental performance is considered a potential mediating variable in the link between environmental costs and financial performance, as supported by prior studies (Dewi & Wiyono, 2023; Nuryaningrum & Andhaniwati, 2021).

Hypothesis

Based on the conceptual framework, the research hypotheses are formulated as follows:

H1: Environmental costs have a positive effect on environmental performance in manufacturing companies.

H2: Environmental performance has a positive effect on financial performance in manufacturing companies.

H3: Environmental costs have a positive effect on financial performance in manufacturing companies.

H4: Environmental costs have a positive effect on financial performance through environmental performance in manufacturing companies.

METHODOLOGY

This study utilizes a quantitative research design using numerical data to analyze the relationship between environmental costs and financial performance, with environmental performance serving as a mediating variable. The research is designed as explanatory research, aiming to test causal relationships among variables and to examine both direct and indirect effects on environmental costs on financial performance, focusing on manufacturing companies listed on the Indonesia Stock Exchange between 2018 and 2022.

This research relies on secondary data collected from firms' annual financial statements and sustainability reports, as well as environmental performance data sourced from the PROPER program issued by the Ministry of Environment and Forestry of the Republic of Indonesia. Financial performance is measured using the profitability ratio Return on Assets (ROA), environmental costs are calculated as a percentage of environmental cost to profit, and environmental performance is measured using PROPER ratings converted into scores ranging from 1 to 5. The study applies purposive sampling criteria—data availability, PROPER participation, and environmental cost disclosure—to obtain 130 firm-year observations.

Panel data regression and path analysis used in this study for assessing the mediating effect of environmental performance. Panel data regression is applied since the study combines time-series data covering the 2018–2022 period with cross-sectional data from manufacturing firms. The analysis applies Common Effect, Fixed Effect, and Random Effect models, with model selection based on the Chow, Hausman, and Lagrange Multiplier tests. Hypothesis testing uses t-tests and F-tests at a 5 percent significance level, and R^2 measures explanatory power. The Sobel test is further employed to assess the mediating effect of environmental performance.

RESEARCH RESULT

Descriptive Analysis of Variables

Descriptive statistical analysis was conducted to describe the characteristics of each research variable. The results show that the average financial performance of mining companies is relatively low, with a high level of variation among firms, indicating that only a few companies achieve strong financial outcomes (Deegan, 2014; Gray et al., 2019).

Environmental costs also display substantial variation, despite a low average value, suggesting differences in managerial commitment and compliance with environmental regulations across companies (Burritt & Schaltegger, 2010; Qian et al., 2018). In contrast, environmental performance falls within a moderate category and shows relatively low variability, likely due to standardized regulatory requirements and oversight mechanisms (Lankoski, 2016).

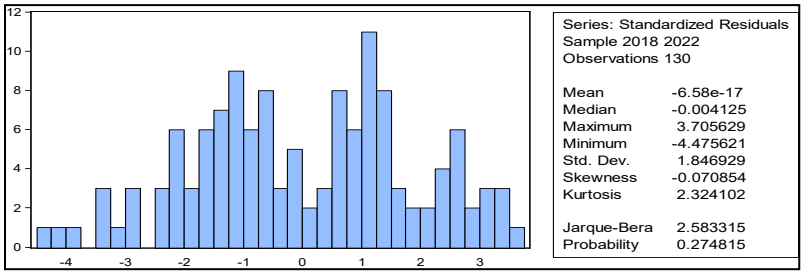
Overall, the results indicate that financial performance and environmental costs vary considerably among companies, while environmental performance remains relatively uniform, providing a basis for further hypothesis testing.

Table 1. Descriptive Analysis of Variables

Variable	Min	Max	Mean	Std. Dev
FP	0.0027	9.7602	0.9745	1.7189
EC	0.0003	23.6375	0.3846	2.3796
EP	2.0000	5.0000	3.0461	0.5407

Classical Assumption Tests

Figure 1. Normality Test



The Jarque–Bera probability value is 0.275 (> 0.05), indicating that the data are normally distributed and that the normality assumption is satisfied**.**

Panel Data Regression Analysis

Panel data regression analysis is employed to examine the effects of independent variables on the dependent variable, both directly and through a mediating variable. The dataset combines time-series and cross-sectional data, requiring the selection of the most appropriate panel regression model. The analysis considers three estimation models—CEM, FEM, and REM—with model selection based on the Chow, Hausman, and Lagrange Multiplier tests using EViews 13.

The Chow test is first applied to compare CEM and FEM. If the p-value is less than 0.05, FEM is preferred; otherwise, CEM is selected. If FEM is indicated, the Hausman test is subsequently conducted to determine whether FEM or REM is more appropriate. A p-value below 0.05 favors FEM, while a p-value equal to or above 0.05 supports REM.

Table 2. Model Selection Results

Model Test	Model Comparison	Probability Value	Decision Criterion	Selected Model
Chow Test	CEM vs FEM	0.0000	p-value < 0.05	FEM
Hausman Test	FEM vs REM	0.5946	p-value > 0.05	REM
Lagrange Multiplier Test	CEM vs REM	0.0000	p-value < 0.05	REM

Since the results indicate REM as the most appropriate model, the Lagrange Multiplier test confirms that REM is superior to CEM. Accordingly, the Random Effect Model (REM) is selected as the best estimation approach for analyzing financial performance.

Regression Analysis

The Random Effect Model (REM) is employed in the panel data regression analysis to assess the direction, magnitude, and significance of the effects of the independent variables on the dependent variable across firms and over time.

Table 3. Panel Data Regression Results

Variabel	***Random Effect Model***		
	Koef	**t-st**	**Prob**
(constant)	-1.6106	-1.7201	0.0878
EC	-0.0929	-1.3215	0.1887
EP	-0.2153	-0.2535	0.8002
Prob. F-statistic		0.4205	
Adj R^2		0.0373	
Obs		130	

The F-statistic probability of 0.4205 (> 0.05) indicates that environmental costs and environmental performance do not simultaneously affect financial performance. Partial tests show that environmental costs (p = 0.1887) and environmental performance (p = 0.8002) also do not significantly influence financial performance. The adjusted R^2 value of 0.0373 indicates that only 3.73% of the variation in financial performance is explained by the model.

In addition to the main regression analysis, this study includes an intervening variable to examine the mediating role of environmental performance in the relationship between environmental costs and the dependent variable. The regression results are presented in the following table.

Table 4. Results of Panel Data Regression for the Intervening Variable

Variabel	*Random Effect Model*		
	Koef	t-st	Prob
(constant)	1.0157	28.218	0.0000
EP	-0.0121	-1.7554	0.0816
Prob. F-statistic		0.0959	
Adj R^2		0.0138	
Obs		130	

Based on the Random Effect Model (REM), environmental costs do not have a significant effect on environmental performance. This is indicated by the F-statistic probability of 0.0959 and the partial test probability of 0.0816, both exceeding the 5% significance level. Although the coefficient is negative (–0.0121), the relationship is not statistically significant. The adjusted R^2 of 0.0138 shows that environmental costs explain only 1.38% of the variation in environmental performance, with the remainder influenced by other factors.

Hypothesis Testing

Hypothesis testing is conducted using t-tests, F-tests, and the Sobel test. The t-test examines partial effects, the F-test evaluates simultaneous effects, and the Sobel test assesses mediation effects. All three hypotheses are rejected, as environmental costs and environmental performance do not significantly affect

environmental performance or financial performance. The F-test results indicate no significant simultaneous effects among the tested variables.

Sobel Test

Figure 2. Sobel Test Result

	Input:		Test statistic:	Std. Error:	*p*-value:
a	-0.012184	Sobel test:	0.2509578	0.01045616	0.80184674
b	-0.215369	Aroian test:	0.21861182	0.01200327	0.82695244
s_a	0.00694	Goodman test:	0.30384306	0.00863622	0.76124746
s_b	0.849375	Reset all	Calculate		

The Sobel test produces a p-value of 0.8018 (greater than 0.05), indicating that environmental performance does not serve as a mediating variable in the relationship between environmental costs and financial performance.

Coefficient of Determination (R^2)

The adjusted R^2 of 0.0373 suggests that environmental costs and environmental performance together account for only 3.73% of the variation in financial performance, whereas the remaining 96.27% is influenced by other factors beyond the scope of the research model.

DISCUSSION

Environmental Costs Impact on Environmental Performance of Manufacturing Companies

The results indicate that environmental costs do not have a significant effect on the environmental performance of manufacturing companies. This finding is supported by previous studies showing that environmental expenditures do not automatically improve environmental performance unless they are integrated with operational strategies and process innovation. Other studies emphasize that green investments generate tangible environmental benefits only when accompanied by green process innovation, regulatory support, and well-developed environmental management accounting (EMA). Without these elements, environmental spending tends to be symbolic or merely a legitimacy tool (Haque & Ntim, 2020; Schaltegger et al., 2020).

Several studies also reveal that manufacturing firms often allocate environmental costs only to meet minimum regulatory requirements, resulting in limited actual environmental performance improvements (Al-Shaer & Zaman, 2019; Testa et al., 2020). The effectiveness of environmental costs depends heavily on managerial commitment and internal environmental control systems. Thus, this study reinforces the view that environmental costs, when not strategically managed, are insufficient to significantly enhance environmental performance (Chen et al., 2021).

From the perspective of modern legitimacy theory, firms tend to use environmental expenditures primarily to maintain social legitimacy rather than as a core mechanism for improving environmental quality (Michelon et al., 2020). Furthermore, weak monitoring systems hinder firms' ability to convert environmental spending into measurable environmental outcomes (Hummel &

Schlick, 2020). Without a sustainability-oriented organizational culture, environmental costs become merely administrative burdens rather than drivers of real environmental improvement (Latan et al., 2020).

Environmental Performance Impact on Financial Performance of Manufacturing Companies

The findings indicate that environmental performance does not have a significant impact on the financial performance of manufacturing companies. This supports the argument that the financial benefits of environmental performance are long-term, indirect, and highly context-dependent. Previous studies suggest that the relationship between environmental and financial performance is non-linear and influenced by firm characteristics such as industry type, firm size, and business strategy (Trumpp & Guenther, 2019; Busch & Lewandowski, 2018).

Environmental performance contributes to financial performance only when it leads to operational efficiency or reputational gains among investors and consumers (Friede et al., 2019; Li et al., 2020). However, in many manufacturing firms in developing countries, these benefits are not immediately realized (Buallay, 2019; Yu et al., 2021). This implies that environmental performance has not yet become a key determinant of financial performance during the study period.

The time-lag effect also explains the insignificant relationship, as financial benefits from environmental improvements typically emerge over the medium to long term (Zhang et al., 2020; Huang & Kung, 2021). Additionally, markets and investors in developing countries often prioritize short-term financial indicators, limiting the positive impact of environmental performance on profitability (Broadstock et al., 2021). Without effective disclosure and communication, environmental performance fails to generate reputational or economic value (Garcia et al., 2020).

Environmental Costs Impact on Financial Performance of Manufacturing Companies

The study concludes that environmental costs have no significant impact on the financial performance of manufacturing companies, a finding that is consistent with trade-off theory, which argues that environmental expenditures may increase operational costs and reduce short-term profitability. Environmental costs do not generate direct financial benefits unless they are directed toward productive investments such as eco-friendly technologies or energy efficiency initiatives (Xie et al., 2019; Tang et al., 2020).

Firms that perceive environmental costs merely as obligations tend not to experience improvements in financial performance (Zhou et al., 2020; Zhang et al., 2021). Without integration into business strategy and innovation, environmental expenditures fail to enhance profitability (Alipour et al., 2019; Agyemang et al., 2020).

This insignificance also reflects the dominance of compliance-based environmental management, where environmental costs are treated as legal

obligations rather than strategic investments, potentially reducing cost efficiency and short-term profitability (Testa et al., 2020). Only strategically oriented and productive environmental expenditures have the potential to improve financial performance (Zhou et al., 2021).

Environmental Costs Impact on Financial Performance Mediated by Environmental Performance

The mediation analysis show that environmental performance does not act as an intervening variable in the relationship between environmental costs and financial performance. This suggests that environmental expenditures have not been sufficient to significantly improve environmental performance, thereby failing to indirectly enhance financial performance. Mediation occurs only when environmental spending results in tangible environmental improvements that are positively recognized by stakeholders (Endrikat et al., 2020; Yu & Zhao, 2021).

Several studies emphasize that economic benefits from environmental performance are delayed and depend on green innovation and strong institutional support (Albertini, 2020; Broadstock et al., 2020). Without green innovation and robust governance, environmental performance cannot function as an effective intermediary between environmental costs and financial performance (Pham et al., 2022).

In Indonesia, environmental management practices tend to focus on minimum regulatory compliance, with environmental reporting remaining largely administrative. As a result, environmental performance improvements are insufficient to influence investor perceptions or stakeholder responses. Consequently, environmental performance does not effectively mediate the relationship between environmental costs and financial performance (Broadstock et al., 2020; Yu et al., 2021).

CONCLUSIONS AND RECOMMENDATIONS

Drawing on the findings of the hypothesis tests and the related discussion, this study concludes that environmental costs have no significant impact on the environmental performance of manufacturing firms. In addition, environmental performance is not proven to have a significant effect on companies' financial performance, either directly or as a mediating variable. The findings also reveal that environmental costs have no meaningful influence on financial performance, and that environmental performance does not function as a mediating variable in the relationship between environmental costs and financial performance. Thus, during the period of observation, Environmental costs and environmental performance have not demonstrated a significant role in enhancing the financial performance of manufacturing companies.

ADVANCED RESEARCH

This study has certain limitations, as the relatively brief observation period may be insufficient to fully reflect long-term impacts, and the use of secondary data may not fully reflect actual environmental practices. Additionally, this study does not include other relevant variables such as green innovation or corporate governance. Future research should use longer periods and incorporate additional variables to obtain more comprehensive results.

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