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THE EFFECT OF ENVIRONMENTAL COST AND CARBON ACCOUNTING ON PROFITABILITY WITH ENVIRONMENTAL PERFORMANCE AS A MODERATING VARIABLE IN MINING SECTOR COMPANIES LISTED ON THE INDONESIAN STOCK EXCHANGE

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Abstract

This research aims to prove whether there is an influence of environmental costs and carbon accounting on profitability performance of mining companies in Indonesia with environmental performance as a moderating variable. It is based on the emergence of research urgency as there is still a knowledge gap about environmental cost management and carbon accounting pratices which specifically affect profitability, especially in the mining sector which has unique challenges in its operations and environmental impact. This is causal, quantitative research and uses secondary data. There are 47 mining companies listed on the Indonesian Stock Exchange in 2021-2023 as a population. Research sample of 22 companies were selected using a purposive sampling technique with companies' criteria that present financial reports for 3 consecutive years, earn profits during the 2021-2023 period and presenr a sustainable report for the preriod of 2021-2023. This research uses hypothesis data testing for logistic regression analysis using Eview 12 software. The results of data testing show that environmental costs have a positive and significant effect on profitability (H1 accepted). Carbon Accounting has a positive and significant effect on profitability (H2 accepted). Environmental performance has a significant effect moderates the relationship between environmental costs and profitability (H3 accepted) and Environmental performance has a significant effect moderates the relationship between carbon accounting and profitability (H4 rejected)

Keywords: **Profitability, environmental costs, carbon accounting, environmental performance.**

1. INTRODUCTION

The era of globalization and increasingly tight business competition requires companies to not only focus on increasing profitability, but also on sustainability practices and social responsibility. Profitability reflects the company's competence in gaining profit from its equity, and has an important role in determining the company's value in the eyes of investors and other stakeholders. On the other hand, profitability is associated with the company's obligation to respond to environmental issues. Currently, stakeholders are starting to highlight social responsibility for corporate sustainability.

In this study, researchers have collected data to focus on the discussion of research related to increasing company profitability, which is one of the main elements for investors in assessing the effectiveness of management in generating profits from invested equity. The development of profitability will be used as the Y variable in this study. In this study, researchers collected data related to the average growth in profitability of mining companies listed on the Indonesia Stock Exchange in 2021-2023. In the context of financial and accounting research, company profitability

is often used as a dependent variable in various studies that aim to test the influence of external and internal factors on the company. Variables such as investment decisions, capital structure, dividend policy, innovation, have been widely studied in relation to company profitability. However, there are still corporate social responsibility practices and environmental performance that need to be studied further for their influence on company profitability. The use of company profitability as the main variable in financial research shows the importance of understanding what can influence a company's competence in generating profits for its shareholders (Derila, C at el. 2022).

Given the importance of corporate profitability in various aspects, research centered on the analysis of factors that influence corporate profitability becomes very relevant. This will not only enrich the academic literature on financial management and accounting but also provide practical insights for stakeholders in optimizing corporate financial performance. Thus, the background of this study aims to dig deeper into how various independent variables, both internal and external to the company, can affect ROE. The following is data on ROE growth of mining companies listed on the IDX in 2021-2023.

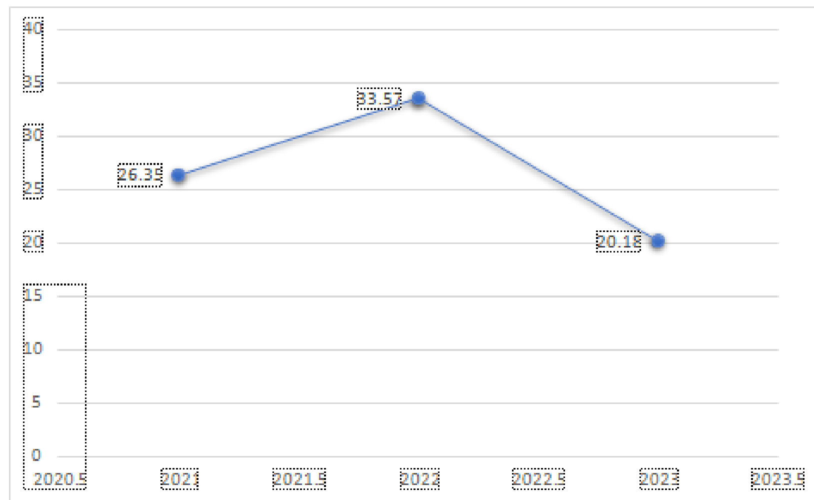

Figure 1.1 Graph of average ROE growth data for mining companies in JII 2021-2023 (Processed data 2024)

Based on Figure 1.1, it can be seen that there is an increase and decrease in ROE in 2021-2023 in mining companies. In 2021 it was 26.35%. In 2022 it also increased by 7.22%. And in 2023 it decreased by 13.39%. From the results of the study, in Figure 1 it can be concluded that in general, profit growth in mining companies listed on the IDX for the 2021-2023 period experienced a significant increase and decrease within the 3-year period.

In the last decade, global awareness of environmental issues has increased significantly, prompting companies and organizations to pay attention not only to their financial performance but also to their environmental performance. Environmental performance, as measured by indicators such as reducing greenhouse gas emissions, increasing resource efficiency, and managing waste, has become increasingly important in the overall assessment of a company's success. In response to these pressures, many companies have integrated sustainability and environmental practices into their business operations. In this context, environmental performance serves as an important mediating variable in understanding the relationship between various environmental initiatives and a company's financial or operational performance.

The background of this study acknowledges the importance of environmental performance not only as an ethical goal or regulatory compliance, but also as a factor that has the potential to improve a company's financial performance and reputation. Thus, environmental performance becomes a relevant moderating variable in research that examines the relationship between certain

environmental practices, such as environmental cost and carbon accounting, and financial outcomes such as Return on Equity (ROE).

Using environmental performance as a moderating variable allows research to explore how and why environmental initiatives can affect financial performance. For example, improvements in environmental performance can reduce operating costs through resource efficiency, improve a company's reputation among consumers and investors, and minimize legal and regulatory risks related to the environment. All of these factors can directly or indirectly affect ROE (Nababan, LM, & Hasyir, D. A, 2019).

Researchers use environmental performance as a moderating variable based on observations made by researchers on the phenomenon of corporate profitability. Where the better environmental performance ranking can have an impact on the company's reputation and create public trust. Public trust can increase stock value and sales so that it can affect profitability. In addition, good environmental performance will be able to reduce environmental costs incurred by the company in the future. Likewise, good environmental costs will be able to maximize the reduction of environmental impacts which can have a positive effect on environmental performance, in this case environmental performance can be a moderating variable that strengthens the relationship between independent variables and existing dependent variables.

In addition, it recognizes the challenges that companies face in integrating environmental practices into their business strategies. These include initial implementation costs, the need to change operational processes and challenges in measuring the direct impact of environmental initiatives on financial performance. By understanding the mediating role of environmental performance, research can provide insights into how companies can overcome these challenges and capitalize on the opportunities offered by sustainability practices and the Program for the Assessment of Corporate Performance Rating in Environmental Management (PROPER). PROPER is a tool introduced by the Ministry of Environment to evaluate and rank the level of compliance of companies with their environmental practices (Greenpeace, 2019).

2. IMPLEMENTATION METHOD

This study was conducted using a hypothesis test, namely to test whether there is an effect of environmental cost and carbon accounting on company profitability as measured by ROE, and moderated by environmental performance. The type of research in this study is causal research that uses secondary data and is quantitative. Secondary data is information obtained from existing sources such as the annual financial reports of companies listed on the Indonesia Stock Exchange. This study took samples from companies operating in the mining sector and listed on the Indonesia Stock Exchange in 2021-2023. The sample selection method used is purposive sampling, which is a method that selects samples based on certain predetermined criteria or characteristics. Data was collected using secondary data methods.

3. RESULTS AND DISCUSSION

Hypothesis Testing

Table 3.1 Statistical values of the Determination Coefficient

Cross-sections included: 22

Total pool (balanced) observations: 66

R-squared	0.113517	Mean dependent variable	12.06200
Adjusted R-squared	**0.085375**	SD dependent var	80.02593
SE of regression	76.53362	Akaike information criterion	11.55773
Sum squared residual	369015.9	Black criterion	11.65726
Log likelihood	-378.4050	Hannan-Quinn critter.	11.59706

F-statistic	4.033687	Durbin-Watson stat	
Prob(F-statistic)	**0.022471**		

Based on Table 3.1, the coefficient of determination (adjusted R-squared) is known to be R2 = 0.0853. This value can be interpreted that Environmental Cost (X1) and Carbon Accounting (X2) affect Return On Equity (Y) by 8.53%, the remaining 91.47% is influenced by other factors not examined in this study, including: ROA, NPM, and others.

Partial Test (t-Test)

Table 3.2. Statistical values of the t-test

Cross-sections included: 22

Total pool (balanced) observations: 66

Variable	Coefficient		t-Statistic	Prob.
E.C.	**9.689955**	3.881695	2.496320	**0.0152**
CA	**169.6921**		2.028794	**0.0467**
C	-139.0305		-1.941471	0.0567

Based on the results of table 3.2, it can be seen that:

1. Environmental Cost (X1) has a positive effect on Return On Equity (Y), with a regression coefficient of 9.689955 and is significant, with Prob. = 0.0152 < 0.05.
2. Carbon Accounting (X2) has a positive effect on Return On Equity (Y), with a regression coefficient of 169.6921 and is significant, with Prob. = 0.0467 < 0.05.

Moderation Testing

Table 3.3. Moderation Testing

Cross-sections included: 22

Total pool (balanced) observations: 66

Variable	Coefficient	Std. Error	t-Statistic	Prob.
E.C.	26.72746	8.346134	3.202375	0.0022
CA	1317.261	588.4358	2.238581	0.0289
EP	243.9917	124.6241	1.957821	0.0549
ECEP	**-5.220879**	2.252958	-2.317344	**0.0239**
CAEP	**-291.8618**	149.4599	-1.952777	**0.0555**
C	-1089.327	487.0044	-2.236790	0.0290

Based on table 5.10. above, the following moderation equation is obtained.

Y = -1089.327 + 26.72746X1 + 1317.261X2 + 243.9917Z – 5.220879X1Z – 291.8618X2Z + e

Noted that :

a. Environmental Performance (Z) is significant as a moderator of the relationship between Environmental Cost (X1) and Return On Equity (Y), with a Prob value of X1Z = 0.0239 < 0.05. The coefficient value of -5.2208 indicates a negative relationship in moderating environmental costs.
b. Environmental Performance (Z) is not significant as a moderator of the relationship between Carbon Accounting (X2) and Return On Equity (Y), with a Prob value of X2Z = 0.0555 > 0.05. The coefficient value of -291.86 indicates a negative relationship in moderating carbon accounting.

Discussion of Research Results

The influence of environmental costs on profitability

The results of testing the environmental cost variable on profitability proxied by ROE using the t-test obtained the results that the regression coefficient value was 9.689955, and the probability was 0.0152. With a significance value of 0.0152 <0.05, this indicates that the environmental cost variable has a positive effect on profitability in mining companies listed on the IDX which are the samples in this study. Investment in environmentally friendly technology and practices often leads to better efficiency in the use of energy and raw materials, for example the use of renewable energy or energy efficiency technology can reduce long-term operating costs, increase profit margins per unit of production, and ultimately increase profitability. In addition, managing and reducing environmental impacts can reduce legal and reputational risks. Fines or legal sanctions avoided by complying with environmental regulations can save costs, and building a reputation as an environmentally responsible company can attract investment, expand market access and increase sales and end up increasing profitability.

This study is not in line with the research of Asjuwita & Agustin (2020), Dewi (2023:56) which states that environmental costs have a negative effect on company profitability, because the environmental costs set cannot improve the environmental performance of the company. However, this study is in line with the Legitimacy theory which reveals how companies try to increase public trust or recognition. So that the company will try to provide information or other positive things to convince the public that the activities or activities carried out by the company are in accordance with the limits and norms of society.

With adequate environmental costs, companies can increase CSR activities towards the surrounding environment and this can provide a positive public view of the company and can increase the company's profitability and this research is in line with research by Okafor, TG, (2018), Nababan, LM & Hasyir, DA, (2019), Derila. CP, et al. (2020) which states that Environmental Cost has a positive effect on profitability.

(H1: environmental costs have a positive and significant effect on profitability, Accepted).

The impact of carbon accounting on profitability

The results of testing the carbon accounting variable on profitability proxied by ROE using the t-test obtained the results that the regression coefficient value was 169.6921, and the probability was 0.0467. With a significance value of 0.0467 <0.05, this indicates that the carbon accounting variable has a positive effect on profitability in mining companies listed on the IDX which are the samples in this study.

By measuring and reporting carbon emissions, companies can identify areas where energy efficiency can be improved. These steps often lead to reduced operating costs, which in turn increases profitability. In addition, companies that practice carbon accounting are generally better prepared for stringent environmental regulations.

By complying with stricter standards and regulations, they can reduce the risk of legal and fines that affect their profits. It was also stated that measuring and monitoring carbon emissions can help companies identify risks related to climate change, regulation, or energy price volatility. Better risk management can protect a company's long-term profitability.

This study is not in line with the research of Mariyah, S., et all (2023) which states that carbon accounting does not show a positive influence on company profitability, because the environmental costs set cannot improve the environmental performance of the company.

However, this study is in line with the legitimacy theory which states that a company is considered more sustainable if the public feels that the values upheld by the company are in line with the values of society. The carbon accounting process is part of creating a good corporate reputation. Companies that engage in social responsibility, as indicated by the disclosure of carbon emissions, will strengthen their legitimacy in the eyes of the public (Asmaranti, Y. et.al., 2018) and

this study is in line with the research of Wahyuningrum, IFS, et,al., (2024), Gusnadi, DHR & Nurhadi, (2023) which states that carbon accounting has a positive effect on profitability.
(H2: Carbon accounting has a positive and significant effect on profitability, Accepted).

Environmental performance has a significant influence in moderating the relationship between environmental costs and profitability.

The results of testing the environmental performance variable moderating environmental costs on profitability proxied by ROE using the t-test obtained the results that the regression coefficient value was -5.220879 and the probability was 0.0239. With a significance value of 0.0239 <0.05, this indicates that environmental performance has a significant negative effect in moderating the relationship between environmental costs and profitability in mining companies listed on the IDX which are the samples in this study.

The results of this study indicate that although mining companies listed on the IDX face high environmental costs to meet environmental standards and regulations, better environmental performance can actually worsen the impact of environmental costs on profitability in the short term, therefore companies need to be more careful in balancing between environmental costs and profitability management, and companies need to manage the relationship between environmental costs, environmental performance, and profitability with a more holistic and sustainable strategy, which not only focuses on reducing environmental costs but also on the long-term benefits that can be obtained from environmentally friendly policies and programs.

Good environmental performance can lead to significant operational efficiencies. For example, better waste management or more efficient use of resources can reduce overall production and operating costs, ultimately increasing a company's profitability. Companies with good environmental performance tend to have a better reputation with consumers, investors and regulators. This can lead to competitive advantages leading to increased sales or market share, as well as easier access to capital at lower costs. In addition, good environmental performance practices often involve more efficient use of energy and raw materials. This can directly reduce operating costs, increasing a company's profit margins.

This study is not in line with the research of Ramadhana, NM & Setiawan, MA, 2024 which states that environmental performance is unable to moderate environmental costs on profitability. However, this study is in line with the signaling theory which states that good environmental performance can provide signals about the company's performance in financial reports whose results are better than other companies, and these signals are responded to well by the public and capital market players, which results in increased company profitability. And this study is in line with the research of Siagian, AO, 2021 which states that environmental performance can moderate environmental costs on profitability.
(H3: Environmental performance has a significant effect moderates the relationship between environmental costs and profitability, Accepted).

Environmental performance has a significant effect in moderating the relationship between carbon accounting and profitability.

The results of testing the environmental performance variable moderating the relationship between carbon accounting and profitability proxied by ROE using the t-test obtained the results that the regression coefficient value was -291.8618 and the probability was 0.055. With a significance value of 0.055> 0.05, this indicates that the environmental performance variable does not have a significant effect in moderating the relationship between carbon accounting and profitability in mining companies listed on the IDX which are the samples in this study.
The results of the study indicate that environmental performance does not play a role in strengthening or changing the direction of the relationship between carbon accounting and profitability of mining companies listed on the Indonesia Stock Exchange (IDX). Although

companies implement carbon accounting to monitor their carbon emissions and environmental impacts, it does not have a direct effect on the company's ability to increase profitability through environmental management. In addition, for mining company managers, these results indicate that although it is important to comply with environmental regulations and implement carbon accounting, it does not have a direct impact on company profitability if other factors do not support it. For policy makers, this can be an input for designing more holistic policies that do not only rely on environmental management, but also other economic factors in supporting company performance.

Environmental performance generally refers to how companies manage their overall environmental impact, including resource efficiency and waste management. Meanwhile, carbon accounting focuses more on measuring, reporting, and reducing carbon emissions. These two aspects can go hand in hand or support each other, but do not directly moderate each other on profitability. The impact of carbon accounting on profitability can be more directly seen through reduced operating costs or strict regulatory compliance. On the other hand, environmental performance tends to have a broader, longer-term impact on reputation, market access, and innovation, which can affect profitability but in a different context. The mining industry often has unique challenges such as commodity price fluctuations, high production costs, and other operational challenges. These factors may have a greater impact on profitability than the implementation of carbon accounting or environmental performance individually.

This study is not in line with the research of Asjuwita & Agustin (2020), Pratama, D. & Sisdianto, E., (2023) which states that good environmental performance can have a positive effect on company performance, namely the profitability of a company. And also this study is not in line with stakeholder theory (Freeman, 1984), which states that corporate sustainability responsibility is an activity that has an impact on the attention and desires of stakeholders, especially investors and potential investors. Therefore, companies must provide corporate sustainability reports as important information to stakeholders that can increase profitability. However, the study is in line with the research of Ramadhana, NM, & Setiawan, MA, 2024 which states that moderating.
(H4: Environmental performance has a significant effect on moderates the relationship between carbon accounting and profitability, Rejected).

4. CONCLUSION

Based on the research results, it can be concluded that:

1. Environmental costs have a positive and significant effect on profitability in mining sector companies listed on the Indonesia Stock Exchange in 2021-2023.
2. Carbon accounting has a positive and significant effect on profitability in mining sector companies listed on the Indonesia Stock Exchange in 2021-2023.
3. Environmental performance has a significant effect in moderating the relationship between environmental costs and profitability in mining sector companies listed on the Indonesia Stock Exchange in 2021-2023.
4. Environmental performance does not have a significant effect in moderating the relationship between carbon accounting and profitability in mining sector companies listed on the Indonesia Stock Exchange in 2021-2023.

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