



The Effect of Implementing Environmental Management Accounting on Environmental Performance (Empirical Study of Public Companies Based on the Company Performance Assessment Programme in Environmental Management / PROPER Listed on the Indonesian Stock Exchange for the 2016-2017 Period)

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ABSTRACT

This research examines the effect of implementing environmental management accounting on environmental performance. Environmental management accounting is measured by the effectiveness and efficiency of environmental cost control in looking at the effect on improving environmental performance as measured by the PROPER score. The population in this research are public companies that use renewable resources and carry out operational activities from 2016 to 2022. The data analysis technique used in this research is comparative and quantitative analysis using multiple linear regression analysis using SPSS version 25. This research uses a sample of 42 companies. Samples were selected from 2016 to 2022 using the purposive sampling method. The results of this research show that the effectiveness and efficiency of environmental cost control as a measuring tool for the implementation of environmental management accounting have a positive and significant effect on environmental performance as measured by the PROPER score.

Keywords: Environmental Management Accounting, Effectiveness, Efficiency, Environmental Performance

Introduction

Concerns about environmental risks like climate change and greenhouse gas emissions, as well as the fact that corporate performance is now measured by environmental metrics in addition to financial ones, have made corporate social and environmental responsibility a hot topic in recent years. As a result, stakeholders are pushing managers to assess environmental performance and provide greater attention to environmental challenges. (Latan & Solovida, 2017)

The Law of the Republic of Indonesia No. 32 of 2009 on the protection and management of the environmental environment and the Law No. 40 of 2007 on Limited Enterprises were enacted by the Indonesian government to implement environmental management. Article 74, paragraph 1 of the latter law states that "Enterprises that carry out their business activities in the field and/or related to natural resources are obliged to carry out social and environmental responsibility." PERMEN KEMENLH No. 3 of 2014, the Ministry of Environment's No. 03 of 2014 government regulation, served as the basis for this law until it was changed to the Republic of Indonesia's Minister of Environment and Forestry's No. 1 of 2021 regulation on the Programme of Assessment of the Performance of Companies in Environmental Management (PROPER). ISO 14001, which is applicable to businesses that implement environmental management systems that relate to environment management procedures and indirectly indicate the level of performance of the environment, has sparked the creation of environmental standards that must be followed not only in Indonesia but throughout the world. Mowen & Hansen, 2007).

One of the environmental accounting ideas utilised in controlling the environmental expenses experienced by Poduk and the processes created by the organisation is environmental management accounting. According to the International Federation of Accountants (2009), environmental management accounting assists managers in determining and allocating environmental expenses to the appropriate product or process. According to IFAC, because environmental accounting gives information on the actual flow of materials, water, and energy utilised, businesses may enhance performance via effective environmental management.

Solving environmental challenges is one of the things that gives businesses a competitive edge. A corporation that is labelled as "green" by society and its employees—who are already sensitive to environmental issues—gains the respect of its stakeholders. Mowen & Hansen, 2007). This is consistent

with other studies by Aragon-Correa et al. (2008) and Henri & Journeault (2010) demonstrating a favourable relationship between environmentally friendly activities and business success.

The PROPER grade is used to assess how well the business is managing its environmental impact. The PROPERS initiative seeks to improve the enterprise's participation in environmental governance while generating a stimulus effect in accordance with environmental laws and contributing to the preservation of natural resources, energy efficiency, and community development. This study aims to examine the effect of environmental management accounting in public firms on enhancing environmental performance based on survey data.

Theory Basis and Hypothesis Development

Natural Resources Based View Theory

The methodology used in this study is based on natural resources, as described in Hart (1994). If a business can establish an advantage backed by resources that are challenging for other businesses to replicate, it will be able to sustain a competitive edge. Three interconnected initiatives make up NRBV: sustainable development, better product management, and pollution avoidance. Reduced input needs, streamlined procedures, and decreased costs associated with obligations and compliance are just a few of the ways that minimising or removing pollutants from industrial processes may boost efficiency (Hart & Dowell, 2011).

Environmental Management Accounting

Environmental Management Accounting is a component of corporate environmental strategy and internal-oriented management accounting that gives managers the data they need to organise, carry out, decide, and regulate organisational environmental activities. (2018) Qian et al. By incorporating environmental considerations into the corporate management accounting system, environmental management accounting aims to overcome the limitations of traditional management accounting. Data and physical information are also connected to the environmental components of environmental management accounting, in addition to financial data and information.

Environmental Costs Reports

Environmental Cost Reports, according to Hansen & Mowen (2007), provide information on the relative distribution of environmental costs that is helpful for enhancing and managing environmental performance. Comprehensive environmental expenditures are broken out by category in good environmental cost reports. Information on the environmental effect of expenditures that offers information about the profitability of the business and information on the relative amount of expenses paid for each category are two key pieces of information that the firm will receive from environmental cost reporting by category.

According to Hansen & Mowen (2007), environmental costs are categorized as follows:

- a. Costs associated with environmental prevention,
- b. Cost environmental detection,
- c. The expenses of Internal environmental faults
- d. The expenses of external environmental faults

Environmental Performance

An enterprise's ability to create a positive environment is measured by its environmental performance. The Corporate Performance Assessment Programme in Environment Management, or PROPER rating, which is formally issued by the Ministry of Environment, is the test tool used to assess the environmental performance in this study. Because an overview of organizations' environmental management compliance levels is already available, utilizing PROPERS for environment performance evaluation is simpler. The five (five) color ranges that make up this correct grading are gold, green, blue, red, and black.

Hypothesis Development

Prior studies by Aragon-Correa et al. (2008) and Henri & Journeault (2010) demonstrate a favorable relationship between environmentally friendly activities and business success. The use of environmental management accounting and corporate environmental performance are positively and significantly impacted by organizational resources, according to other research (Amir et al., 2020; Asiaei et al., 2022; Fuadah et al., 2021; Jermstittiparsert et al., 2020; Latan et al., 2018; Phan et al., 2017; Solovida & Latan, 2017; Zandi & Lee, 2019). Ong et al. (2020) found no connection between environmental performance and environmental management accounting. Effective environmental management is essential to achieving improvements in environmental performance. Here, accounting for environmental management is used as a tool to assist environmental management. (Ikhsan, 2009)

H1: Environmental performance is positively impacted by the efficacy of environmental management.

H2: The performance of the environment is positively impacted by environmental control efficiency.

H3: Environmental performance is positively impacted by environmental control's efficacy and efficiency at the same time.

Methodology

Research design

This study's sample selection process used the purposive sample approach, which involves choosing samples based on predetermined standards. The following were the research's criteria:

1. From 2016 to 2022, companies that are listed on the Indonesian Stock Exchange adhere to PROPER.
2. Businesses that, from 2016 to 2022, submit annual reports and sustainability reports in tandem.
3. Businesses that include budgetary items for 2016–2022 environmental management expenses.

Operational Definitions and Variable Measurement

Dependent Variable

Environmental performance is the research's dependent variable. Enhanced environmental performance is the intended outcome of environmental control. Environmental performance measures how successfully a business manages the interactions between its operations, goods, or services and the environment. It demonstrates how well the business manages a number of different aspects, including organizational structures, stakeholder relations, regulatory compliance, and environmental impacts (Lober, 1996). The Company Performance Assessment Program in Environmental Management, or PROPER rating, is an official publication of the Ministry of the Environment. The environmental performance in this study is tested using the same test instruments.

Independent Variable

The use of environmental management accounting, which is assessed by the efficacy and efficiency variables, which gauge the company's handling of environmental expenses, serves as the independent variable in this study. Not just financial data and information, but also physical data and information are environmental components that environmental management accounting should be concerned with (UNDS, 2001). Financial data, specifically environmental costs, tends to be more prevalent in general since management is more interested in knowing if the expenses are reasonable and can really enhance environmental performance rather than being too high. Because management may utilize this information to make better financial decisions while still considering the quality of environmental decisions, environmental costs are one of the criteria that determine the effectiveness of environmental management accounting (Ong et al., 2020). Environmental cost effectiveness and efficiency ratio analysis is used by Hansen & Mowen (2007) to measure the implementation of environmental management accounting (EMA). Imanina Burhany et al. (2020) use a calculation method to measure the same thing.

Data Analysis Method

The present study employs a multiple linear analysis model to assess the degree of influence or correlation between two or more variables, as well as to illustrate the direction of the relationship between the independent and dependent variables. Specifically, the model is used to measure the impact of the environmental cost control effectiveness and efficiency variables on environmental performance. The model utilized in multiple linear regression analysis is as follows:

$$Y = \alpha + \beta X_1 + \beta X_2 + e$$

Details:

Y	= Environmental Performance (PROPER)
α	= Constant Value
β	= Regression Coefficient Value
X1	= Effectiveness of Environmental Control
X2	= Environmental Control Efficiency
e	= Standard Error

4. Results and Discussion

Research Population

Table 1 - Research Sample Determination Process

A publicly traded business that was registered with PROPER and listed on the Indonesian Stock Exchange between 2016 and 2022

No	Criteria	Total
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1	Public companies that are listed on PROPER and the Indonesian Stock Exchange from 2016 to 2022.	24
2	Public companies that are listed on PROPER and the Indonesian Stock Exchange did not submit consecutive corporate sustainability reports from 2016 to 2022.	(6)
3	Companies that do not include environmental management expenses in their budget for the years 2016–2022.	(12)
The number of research samples determined		6
The whole sample set used for the study (×7)		42

24 public firms were registered on the IDX and took part in PROPER throughout the study period, based on the sample selection above. Following the use of the purposive sampling technique, a total of 42 samples from 6 organizations were identified as acceptable for use as study objects for the 2016–2022 research period.

Result of Descriptive Statistical Analysis

Table 2 – Result of Descriptive Statistical Analysis

	Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std. Deviation
Effectiveness (X1)	42	15	89.00	46.98	21.253
Efficiency (X2)	42	.03	3.08	.9121	.82648
Environmental Performance (Y)	42	3	5	3.579	.53793
Valid N (Listwise)	42				

The efficiency variable (X1)'s descriptive statistical computation for the 2016–2022 period indicates that the average or mean is 46.98%, as can be shown from the test results above. At PT Aneka Tambang Tbk, the minimum effectiveness value from 2016 to 2022 was 15 (15%) in both 2016 and 2021. Additionally, by PT Pertamina Gas Negara Tbk in 2022, the maximum value of efficacy for the 2016–2022 period was 89 (89%). In the meantime, the efficiency variable (X2)'s average for the 2016–2022 period is 0.91%, according to the descriptive statistical computation. 2020 and 2021 will see PT Pertamina Gas Negara Tbk's minimal efficiency value of 0.03%. Additionally, PT Bumi Resources Tbk had the highest efficiency for the 2016–2022 timeframe, at 3.08%. The PROPER rating gives the Environmental Performance (Y) variable an average or mean value of 3.57 and a standard deviation of 0.54. According to this average value, the typical sample firm has a score of 3.57 or 3, or it has been assigned a blue PROPER grade. This indicates that the typical mining company that is registered on the IDX has completed the necessary environmental management tasks in compliance with the laws and guidelines. appropriate. PT Bumi Resources Tbk achieved the highest environmental performance ranking in 2020 with a score of 5, or Gold. With a PROPER score of 3 in both 2016 and 2017, PT Bumi Resources Tbk, PT Timah Tbk, and PT Pertamina Gas Negara Tbk have the lowest environmental performance rating, respectively, with a score of 3 in 2016–2018.

Classical Assumption Test Results

1. Normally Test Results

Table 3 – Normally Test Results

One-Sample Kolmogorov-Smirnov Test		Unstandardized Residual
N		42
Normal Parameters ^{a,b}	Mean	.0000000
	Std. Deviation	.61459768
Most Extreme Differences	Absolute	.148
	Positive	.148
	Negative	-.077
Test Statistic		.148
Asymp. Sig. (2-tailed)		.021 ^c

Table 3 indicates that the significant value of Asymp. Sig. (2-tailed) for the Kolmogorov-Smirnov test is 0.021. This indicates that less than 0.05 is the significance value. This indicates that the model's data is not regularly distributed. The Normal P-Plot image illustrates how the number of sample-representative points in the regression model are dispersed along the diagonal, which depicts the pattern of the normal distribution. The results of the regression model's normality test indicate that the data is not distributed regularly. Ajijja (2011) states that when there are more than thirty data sample observations, the normalcy test is required. If the error term is similar to or near a normal distribution, this may be ascertained using the normality test. The sampling error term's distribution is almost normal if there are more than thirty observation data points. Given that the study data have a non-normal

distribution and total 42, the normality test can be disregarded, in accordance with the Central Limit Theorem's premise that data more than thirty is not required (Ajija, 2011).

2. Multicollinearity Test Results

Table 4 - Multicollinearity Test Result

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Efektivitas (X1)	.930	1.076
	Efisiensi (X2)	.930	1.076

Table 4 above illustrates that each variable has a tolerance value more than 0.1; the effectiveness variable (X1) is 0.930, while the efficiency variable (X2) is also 0.930. In addition, the multicollinearity test results above indicate a VIF value < 10 , namely 1.076 for the effectiveness variable (X1) and 1.076 for the efficiency variable (X2). Thus, the independent variables in this study do not exhibit any signs of multicollinearity based on the tolerance and VIF values shown by this test.

3. Heteroscedasticity Test Results

Table 5 - Heteroscedasticity Test Result

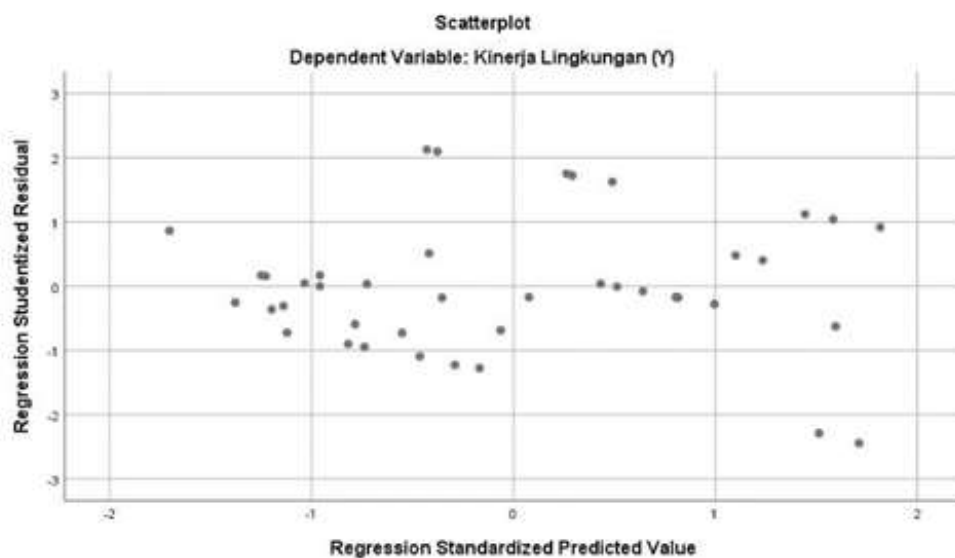


Fig. 1 - Grafik Scatterplot

The scatterplot graph above illustrates how the dots are distributed above and below the 0 on the Y axis, without a consistent pattern (Ghozali, 2016). This suggests that heteroscedasticity is not present. Therefore, it can be concluded that there are no heteroscedasticity issues with the regression model used in this investigation.

Hypothesis Test Results

1. Coefficient of Determination

Table 6 – Coefficient of Determination

Model	Model	R Square	Adjusted Square	R	Std. Error of the Estimate	Conclusion
1	.221 ^a	.049	.047		4803.27009	The independent variable affects the dependent variable by 0.049

Table 6 shows that the achievement of the coefficient results (adjusted R2) is 0.049 or 4.9%. This means that the independent variable in this study, namely TPIK (X), can influence the dependent variable or stock price (Y) by 4.9%. While variables and other factors outside this research model explain the remaining 95.1%.

2. Autocorrelation Test

Table 7 – Autocorrelation Test Results

	Unstandardized Residual
Test Value	-.07596
Cases < Test Value	21
Cases >= Test Value	21
Total Cases	42
Number of Runs	17
Z	-1.406
Asymp. Sig. (2-tailed)	.160

According to the autocorrelation test results obtained with the aforementioned Run Test technique, the significance value of Asymp. Sig. (2-tailed) is 0.160. This indicates that Asymp. Sig. (2-tailed) has a significance value larger than 0.05, indicating that the data in this research are randomly distributed and do not exhibit autocorrelation symptoms. As a result, more testing may be conducted.

3. Hypothesis Testing

Coefficient of Determination Test

Table 8 – Determination Coefficient Test Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Results
1	.488 ^a	.238	.199	.63016	The dependent variable is influenced by the independent variable by 0.238

The result above indicates that the R square value is 0.238, indicating that variables X1 and X2 have a simultaneous 23.8% effect on variable Y. Therefore, it can be said that the efficiency variable (X2) and effectiveness variable (X1) combined have a positive influence of 23.8% on the environmental performance variable (Y), with other variable models accounting for the remaining 76.2%.

Simultaneous Significance Test

Table 9 – F Test Results

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.849	2	2.425	6.106	.005 ^b
	Residual	15.487	39	.397		
	Total	20.336	41			

The F test results show a level of significance of less than 0.05, or 0.005, and the estimated F value is more than the F table, or $6.106 > F$ table 3.232, according to the analysis findings of the SPSS 25 software. It follows that H3, which is concerned with how the effectiveness and efficiency variables jointly impact the environmental performance variable in a positive way, is accepted. Consequently, it may be said that H3 is acceptable.

Partial Test

Table 10 – T Test Results

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.	Result
		B	Std. Error	Beta				
1	(Constant)	3.843	.332			8.568	.000	
	Effectiveness (X1)	.010	.005	.302		2.083	.044	Accepted
	Efficiency (X2)	.800	.246	.472		3.258	.002	Accepted

a. Dependent Variable: Environmental Performance

The analysis conducted using the SPSS 25 program yielded results indicating that the effectiveness variable (X1) had a significant influence on the environmental performance variable (Y) with a significance value of $0.044 < 0.05$ and a calculated t value of $2.083 > t$ table 2.023. These findings support the hypothesis that effectiveness has a positive impact on environmental performance. Consequently, it may be said that H1 is approved. Aside from that, the results of the analysis using the SPSS 25 program indicate that the t-count value is $3.258 > t$ table 2.023 and the significance value for the impact of the efficiency variable (X2) on the environmental performance variable (Y) is $0.002 < 0.05$. These findings support the hypothesis that the analysis's

findings support the positive influence of the efficiency variable on the environmental performance variable, or H2. Consequently, it may be said that **H2 is acceptable**.

Discussion

Following the SPSS 25 program analysis test, the following linear regression equation was found:

$$Y = 2,483 + 0,010 X_1 + 0,800 X_2 + e$$

The independent variable has a unidirectional influence on the environmental performance variable, as indicated by the constant value of 2.483. This demonstrates that the financial performance value is 2.483 if all of the effectiveness (X1) and efficiency (X2) variables have a value of 1% or have not changed. For the efficacy variable (X1), the regression coefficient value is 0.010. The effectiveness variable and environmental performance have a positive or unidirectional influence, as shown by this value. This indicates that the environmental performance variable will rise by 0.010 for every 1% increase in the effectiveness variable. Considering that other variables are held constant, This is also the case for the efficiency variable; that is, if you examine the efficiency variable's regression coefficient value, which is positive at 0.800. This demonstrates that, if all independent variables are held constant, an increase of 1% in efficiency will result in an increase of 0.800 in environmental performance.

According to the multiple linear regression test findings, the efficacy variable has a coefficient value of 0.010 and a significance value of 0.044. The positive direction is shown by the coefficient value of 0.010. The first hypothesis is supported as the significance level value is less than alpha ($0.044 < 0.05$). According to the PROPER score, environmental performance is positively impacted by the efficiency of environmental cost management. This is consistent with the findings of Hansen & Mowen (2007) and Basuki & Irwanda (2018), who claim that a company's ability to avert environmental harm is a sign that environmental failure may be reduced and environmental performance can be raised. The efficiency variable's coefficient value is 0.800, according to the findings of the linear regression test, with a significance value of 0.002. The positive direction is shown by the coefficient value of 0.800. Hypothesis 2 is supported as the significance level value is less than alpha ($0.002 < 0.05$). This suggests that the PROPER score's assessment of environmental performance benefits from the efficacy of environmental cost management. This is consistent with the ratio size assertion (Amaliya & Burhany, 2022). An improvement in the company's environmental performance is influenced by the overall amount of environmental expenditures spent. The firm's environmental performance declines when the ratio of the overall environmental expenditures spent by the company is smaller. On the other hand, a company's environmental performance will rise in proportion to the overall amount of environmental expenditures incurred.

A significant value of 0.005 was found in the partial test results to determine the impact of environmental cost management's efficacy and efficiency on environmental performance. The computed value was higher than the table value of $6.106 > 3.232$. The computed result of 6.106 indicates a rising trend. As hypothesis 3 is accepted, the significance level is less than alpha $0.005 < 0.05$. This indicates that environmental performance is positively and significantly impacted by the efficacy and efficiency of environmental cost management. This is consistent with the findings of Vasile & Man (2012), Velasquez et al. (2015), and Yahya et al. (2016), who all report that the company's environmental costs have been effective in improving environmental performance while maintaining efficiency—that is, the amount spent is not excessive in relation to other costs. Effective environmental management is essential to achieving improvements in environmental performance. In this instance, accounting for environmental management is used as a tool to assist environmental management (Ikhsan, 2009). The field of environmental management accounting encompasses both financial and physical issues. The corporation controls the environmental expenses spent in order to assess the efficacy and efficiency of environmental costs using the financial data provided by environmental management accounting. While considering the quality of environmental decisions, management may enhance its financial decision-making process by using the efficacy and efficiency of environmental costs. (Imanina Burhany et al., 2020; Hansen & Mowen, 2007). According to research, environmental management accounting affects a company's environmental performance (Amir et al., 2020; Asiaei et al., 2022; Fuadah et al., 2021; Jermstittarsert et al., 2020; Latan et al., 2018; Phan et al., 2017; Solovida & Latan, 2017; Zandi & Lee, 2019).

5. Conclusion and Suggestion

Conclusion

The conclusion from the results of the multiple linear regression analysis is that the coefficient value of the efficiency variable is 0.010 with a significant value of 0.044, based on the findings of observations and research from the study previously provided and explained. The positive direction is shown by the coefficient value of 0.010. The first hypothesis is supported as the significance level value is less than alpha ($0.044 < 0.05$). According to the PROPER score, environmental performance is positively impacted by the efficiency of environmental cost management. The efficiency variable's coefficient value is 0.800, according to the findings of the linear regression test, with a significance value of 0.002. The positive direction is shown by the coefficient value of 0.800. Hypothesis 2 is supported as the significance level value is less than alpha ($0.002 < 0.05$). This indicates that environmental performance, as determined by the PROPER score, is positively impacted by the effectiveness of environmental cost management. The partial test findings, which examine how environmental cost management's efficacy and efficiency affect environmental performance, produced a computed value that is higher than the table value of $6.106 > 3.232$ as well as a significant value of 0.005. The computed result of 6.106 points in the right direction. As hypothesis 3 is accepted, the significance threshold is less than alpha $0.005 < 0.05$. Therefore, it can be said that the efficiency and effectiveness variables combined have a 23.8% positive influence on the environmental performance variable, with other variable models accounting for the remaining 76.2%.

Suggestion

The researcher makes the following recommendations as an improvement attempt for more research, which are based on the results and limitations of this study that are explained:

1. In order to gather and generate more valid and accurate research, it is advised that future study lengthen the observation duration, finish the number of research samples, and do more thorough index calculations.
2. It is advised that more research be done in different industries, with new factors included, or by combining this study with other methodologies. In order to provide a fresh perspective on the variables that may affect how environmental management accounting is applied to enhance environmental performance.

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