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Environmental Accounting Disclosure, Green Process Innovation, and Environmental Management Accounting Improving Economic Performance

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Abtract

This study examines the effect of environmental accounting disclosure, green process innovation, and environmental management accounting on economic performance. This study analyzes 22 basic material sector companies listed on the Indonesia Stock Exchange in 2017-2021. Data were analyzed using panel data regression, with the selected model being the fixed effect model. The result indicates that environmental accounting disclosure, green process innovation, and environmental management accounting positively affect economic performance. Companies that carry out environmental accounting disclosures can reduce the negative impact of the company's operational activities to improve the company's economic performance. Companies that are increasingly innovative in their production processes can save energy and make production costs efficient to improve their economic performance. Companies that can implement environmentally friendly programs mean they can support long-term strategies that have an impact on improving the company's economy

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1. Introduction

One of the goals of establishing a company is to get the maximum profit and meet the expectations of the company's owners (Haryanto et al., 2018; Yulandreano et al., 2020; Vuković et al., 2022; Andreas et al., 2023). Stakeholders can assess the performance of a company by evaluating its economic performance. Economic performance contains a company's achievement value and financial condition, which can be described using financial ratios (Delen et al., 2013; Rosaline & Wuryani, 2020; Budiman & Krisnawati, 2021; Kılıç et al., 2022; and Andreas et al., 2023). The higher the economic performance of a company, the company will be considered capable of carrying out its business activities in obtaining the maximum possible profit (Ahmed et al., 2022; Nguyen et al., 2023; and Harmono et al., 2023).

In 2020 the Covid-19 pandemic hit the world and Indonesia. These events weakened the economic system, leading to decreased people's purchasing power and impacting the company's economic performance. One of them is a company in the basic materials sector, namely PT Timah Tbk. which experienced a decrease in income in 2020 compared to the previous year of 21.33%. The company's revenue for 2020 was 15.21 trillion rupiahs, while revenue in 2019 was 19.34 trillion rupiahs. This resulted in the company experiencing a loss by recording a net loss for 2020 of 340.60 billion rupiahs.

PT Argha Karya Prima Industry Tbk. (AKPI) experienced different conditions, which had a positive growth rate in 2020. AKPI is a company that experienced a 105.41% increase in net profit, namely 21.63 billion rupiahs, in January-September 2020 (Putri, 2020). When compared to the same period

in the previous year, the company's net profit was only 10.53 billion rupiahs. The increase occurred because the company reduced costs in energy use, such as converting clean water by recycling water from production residue and household waste and procuring infiltration wells.

Companies will do many things to get high profits. However, the company's operational activities can have negative impacts, especially environmental impacts. Legitimacy theory states that there is a "social contract" owned by the company with the community in which the organization operates and guarantees that the organization can operate sustainably within the limits of the norms prevailing in society (Economides, 2019; Didenko et al., 2020; and Gezgin et al., 2024). Mariyamah & Handayani (2020) explain that companies can experience legitimacy pressure if they carry out operational activities that do not follow society's rules. Environmental accounting disclosure, green process innovation, and environmental management accounting are predicted to influence economic performance.

Environmental accounting is a method for identifying, measuring, and allocating environmental costs and can be used as a tool for making busi (Latan et al., 2018; and Rosaline & Wuryani, 2020). Environmental accounting disclosure (EAD) can serve as a tool to communicate information about the performance of company operations that are related to the environment (Chasbiandani et al., 2019; Dewi & Wardani, 2022; Febriansyah & Fahreza, 2020; Putri et al., 2019) found that environmental accounting affects the economic performance of companies. However, Rosaline & Wuryani (2020) and Angelina & Nursasi (2021) found no effect of environmental accounting on the company's financial performance.

Green Process Innovation (GPI) is a strategy for using technology to benefit production processes that are friendly to the environment and function to produce products or services that do not have many negative social and environmental impact (Sari & Handayani, 2020). A company's application of GPI can improve product quality and expand markets (Wang et al., 2021). Fitriani (2015); Weng et al. (2015); Prajogo (2016); Tang et al., (2018); Mariyamah & Handayani (2019); Wang et al. (2021) state that GPI has a positive influence on the company's economic performance, while Sari & Handayani (2020) states that GPI cannot affect company performance.

Environmental management accounting is a form of management of environmental management and economic performance through implementing accounting systems related to the environment (International Federation of Accountants., 2005). Study conducted by Nengzih (2016); Christine et al. (2019); Somjai et al. (2020); Deb et al. (2023) gave results stating that Environmental management accounting (EMA) has a positive effect on economic performance. However, study conducted by Lanita & Rachmawati (2020) stated that EMA does not affect firm performance.

This study examines the effect of environmental accounting disclosure, green process innovation, and environmental management accounting on economic performance. These three variables are ecological factors. This study examines ecological factors because the organizations and its environment's reciprocal relationship.

2. Hyphotesis Development

Environmental Accounting Disclosures and Economic Performance

The company gains legitimacy from the government and community by preserving the environment and disclosing environmental responsibility (Cahyaningsih & Septyaweni, 2022). Environmental accounting disclosed by a company is one of the company's efforts to satisfy stakeholders and gain the trust of the community (Chasbiandani et al., 2019). Companies that disclose environmental accounting have a good reputation in the public eye because the company is considered a company that cares about the environment, so this can improve the company's economic performance. Environmental accounting is a form of company implementation committed to the impact of the company's operational activities on the environment by including environmental costs at the company's expense (Dewi & Wardani, 2022). This is in line with research conducted by Lu & Taylor (2018); Haninun et al. (2018); Chasbiandani et al., (2019); Putri et al. (2019); Febriansyah & Fahreza (2020); Al-Naser et al. (2021); Dewi & Wardani (2022); and Cahyaningsih & Septyaweni (2022) which state that EAD positively affects profitability.

H_1: Environmental accounting disclosure has a positive effect on economic performance.

Green Process Innovation and Economic Performance

Companies that apply green process innovation can optimize economic performance. GPI is implemented to improve the quality of operating and management activities in the efficient use of resources such as raw materials and energy (Wang et al., 2021). The contribution of an ecologically driven firm's innovation strategies can enhance firm performance (Prajogo, 2016). GPI is an operational activity of a company that, in carrying out its production process, pays attention to several aspects, namely energy saving, waste treatment, and resource optimization, and also considers the impact on ecology (Chen & Chang, 2013). Companies that apply GPI through efforts to save electricity and energy use will experience reduced production costs and increased profits (Fitriani, 2015). This is in line with research conducted by Fitriani (2015); Prajogo (2016); Tang et al. (2018); Xie et al. (2019); Mariyamah & Handayani (2019); and Wang et al. (2021) which state that GPI positively affects economic performance.

H_2: Green process innovation has a positive effect on economic performance.

Environmental Management Accounting and Economic Performance

Companies need to carry out internal controls and monitor the financial reporting process, especially those related to environmental costs (Liu, 2018; Huang & Huang, 2020; Syafira & Cahyaningsih, 2022; and Hamed, 2023). Environmental accounting, which permits the identification, measurement, and appropriate allocation of environmental costs to the process or related goods, helps managers to exercise control more readily and achieve cost reductions (Nengzih, 2016). The application of EMA by a company can function to optimize the company's economic performance by managing expenses used in operational activities. EMA can improve a company's economic performance by managing costs related to the environment (Afazis & Handayani, 2020). EMA is implemented to reduce pollution rates, grow value from cost savings used by companies, and increase performance in environmental aspects (Effendi, 2021). This is in line with research conducted by (Christine et al., 2019; Deb et al., 2023; Nengzih, 2016; Somjai et al., 2020) which state that EMA positively affects economic performance.

H_3: Environmental management accounting has a positive effect on economic performance.

3. Data and Methods

This study examines basic material sector companies listed on the Indonesia Stock Exchange in 2017-2021. The researcher chose the sample based on two criteria: companies that consistently publish annual reports and have complete data. Based on these criteria, a sample of 22 companies was obtained.

This study uses economic performance (ECO) as the dependent variable. ECO is information on the company's financial achievements, which can be described using annual financial ratios (Rosaline & Wahyuni, 2020). ECO is measured using the profitability ratio, namely Return on Assets (ROA). Profitability demonstrates a company's capacity to maximize the utilization of its resources in order to earn profits (Cahyaningsih & Lestari, 2021).

$$ECO = Net\ income / Total\ assets$$

Where: ECO= Economic performance

This study uses environmental accounting disclosures as the first independent variable. EAD is a form of the company's commitment to the environmental impact of its operational activities by including environmental costs at the company's expense (Dewi & Wardani, 2022). EAD is measured using a value of 1 for companies that disclose components of environmental accounting such as environmental costs, waste recycling costs, environmental research, and development costs. However, if the company does not disclose these components, it is given a value of 0.

Green process innovation is the second independent variable. GPI is a strategy for using technology to benefit production processes that are environmentally friendly and function to produce products or services that do not have many negative impacts on society and the environment (Sari, 2020).

$$GPI = ((energy\ expenses + raw\ material\ expenses)_{it} - (energy\ expenses + raw\ material\ expenses)_{it-1}) / sales_{it-1}$$

Where: GPI= Green Process Innovation

Environmental management accounting is the third independent variable. EMA functions to map all costs incurred, which are causal in nature and can reduce the quality of the environment (Effendi, 2021). EMA is measured by calculating the level of eco-efficiency.

$$EMA = value\ of\ product / environmental\ influence$$

Where: EMA= Environmental management accounting

Note: Value of product uses net sales, while environmental influence uses energy and raw material expenses (Madden et al., 2006).

This study conducted a classic assumption test so that the study's results were not biased. The researcher conducted a panel data regression analysis with the following equation.

$$ECO_{it} = a + \beta 1EAD_{it} + \beta 2GPI_{it} + \beta 3EMA_{it} + e$$

Whare: ECO= Economic Performance; EAD= Environmental Accounting Disclosures; GPI= Green Process Innovation; and EMA= Environmental Management Accounting.

4. Result

Table 1 presents the results of descriptive statistical tests for continuous and nominal variables. Continuous variables include ECO, GPI, and EMA, while the nominal variable is EAD. The company's mean ECO value from the basic material sector is 0.0340. This value indicates that the company's ability to manage assets for profit is relatively low at 3.4%. The maximum ECO value of 0.1219 means the company can manage its assets for profit at 12.19%. The minimum ECO value is -4.78%, meaning that the company still has a loss even though it has managed its assets.

Table 1. Statistic Descriptive

	ECO	EAD	GPI	EMA
Mean	0.034		0.061	1.655
Maximum	0.122		0.418	2.622
Minimum	-0.048		-0.308	0.885
Std. Dev.	0.034		0.152	0.382
Yes (1)		31 (32%)		
No (0)		65 (68%)		

The mean ECO of companies in the basic material sector increased during 2017-2021 (Figure 2). The highest mean ECO occurred during the Covid-19 pandemic in 2021. The conditions of the Covid-19 pandemic motivated companies to optimize their asset management to increase profits.

Companies in the basic materials sector that have disclosed environmental accounting are 31 observational data, while the remaining 65 observational data have not disclosed environmental accounting in their annual reports (Figure 3). This result indicates that most companies in the basic material sector do not have environmental cost components, waste recycling, and environmental research and development costs.

Figure 1. Economic Performance

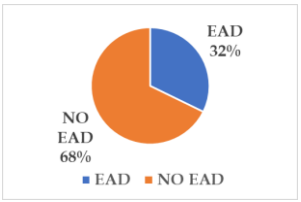

Figure 2. Environmental Accounting Disclosures

Figure 3. Green Process Innovation

Figure 4. Environmental Management Accounting

Companies in the basic materials sector that have disclosed environmental accounting are 31 observational data, while the remaining 65 observational data have not disclosed environmental accounting in their annual reports (Figure 3). This result indicates that most companies in the basic material sector do not have environmental cost components, waste recycling, and environmental research and development costs.

The average GPI of companies in the basic material sector is 0.061. This value indicates that basic material sector companies have a relatively low-efficiency level in using raw materials and energy in production. The maximum value of GPI is 0.418. This value indicates an increase in the company's ability to optimize energy use and use raw materials efficiently. The minimum GPI value is -0.308. This value indicates the company's ability to carry out environmentally friendly production processes has decreased so that its operational activities can impact the surrounding environment. The means of GPI in the basic material sector companies show a fluctuating pattern during 2017-2021 (Figure 4). The lowest mean GPI occurred at the start of the Covid-19 pandemic in 2020, while the highest mean GPI occurred in 2021. The conditions of the Covid-19 pandemic have motivated companies to produce higher-quality products with less raw materials and energy.

The mean value of the EMA is 1.655. This value indicates that companies in the basic material sector have managed the environment relatively well. The maximum value of the EMA is 2.622. This value indicates the company's ability to manage the

environment is relatively high. The company can evaluate and implement environmentally friendly programs supporting its long-term strategy. The minimum value of the EMA is 0.885. This value indicates the company's ability to manage the environment is still relatively low. The company has not been able to map all emission costs, natural damage, and all activities that can reduce the quality of the environment. The mean EMA of compani-es in the basic materials sector fluctuates during 2017-2021 (Figure 5). The highest mean EMA occurred at the start of the Covid-19 pandemic in 2020 but decreased in 2021. The conditions of the Covid-19 pandemic were able to motivate companies to increase the implementation of environmentally friendly programs but decreased in 2021 because the focus of company activities is on social activities.

Table 2 displays that companies that do not disclose environmental accounting are dominated by companies that have below-mean ECO. Thus, it can be interpreted that EAD has a positive relationship with ECO.

Table 2. EAD and ECO

Criteria	ECO Mean > 0.034	ECO Mean < 0.034	Total
EAD (1)	14	17	31
No EAD (0)	29	36	65
Total	43	53	96

Table 3 presents that below-mean GPI is dominated by companies that have below-mean ECO. Thus, it can be interpreted that GPI has a positive relationship with ECO.

Table 3. GPI and ECO

Criteria	ECO Mean > 0.034	ECO Mean < 0.034	Total
GPI Mean > 0.061	24	23	47
GPI Mean < 0.061	18	31	49
Total	42	54	96

Table 4 shows that below-mean EMA is dominated by companies that have below-mean ECO. Thus, it can be interpreted that EMA has a positive relationship with ECO.

Table 4. EMA and ECO

Criteria	ECO Mean > 0.0340	ECO Mean < 0.0340	Total
EMA Mean > 1.6546	21	20	41
EMA Mean < 1.6546	22	33	55
Total	43	43	96

Table 5 describes the results of the classic assumption test. The normality test of 110 observational data shows that the data is not normally distributed. Therefore, the researcher conducted an outlier test and found that 14 observation data were identified as outliers, so they were excluded. The normality test of the 96 observational data shows that the data are normally distributed. The data also shows that it passes the heteroscedasticity, multicollinearity, and autocorrelation tests.

Table 5. Classic Assumption Test

Test	Results	Decision
Normality	JB Prob. 0.932	Normal
Autocorrelation	DW = 1.996	Free
Heteroscedasticity	BPG Prob. 0.380	Free
Multicollinearity	VIF < 10	Free

Table 6 presents the panel data regression model test. Based on the Chow and Hausman tests, the selected panel data regression model is the fixed effect model (FEM).

Table 6. Panel Data Regression Model Test

Test	Results	Decision
Chow	Prob. 0.000	FEM
Hausman	Prob. 0.005	FEM

Table 7 shows that environmental accounting disclosure, green process innovation, and environmental management accounting positively affect economic performance. These results support H_1, H_2, and H_3. The Adj. R^2 value of 0.556 indicates that environmental accounting disclosure, green process innovation, and environmental management accounting can explain economic performance by 56%, while other variables explain the rest.

Table 7. Fixed Effect Model

	Coef.	Std. E.	t-Stat.	Prob.
C	-0.098	0.029	-3.372	0.001
EAD	0.021	0.009	2.322	0.023
GPI	0.035	0.017	2.068	0.042
EMA	0.074	0.017	4.366	0.000
Adj. R^2	0.556			
F-stat.	5.955			0.000

5. Discusssion

The Effect of Environmental Accounting Disclosures on Economic Performance

The result of the study shows that environmental accounting disclosure has a positive effect on economic performance. This result indicates that companies that disclose environmental accounting can improve the company's economic performance. Other conditions suggest that companies that do not disclose environmental accounting can reduce the company's economic performance.

This finding aligns with the theory of legitimacy, which states that companies should be able to provide reports on their social activities to ensure their survival. The success of environmental

accounting is not determined by the leeway given to costs. Still, its main goal is the ability and accuracy of company accounting data to suppress the environmental impact caused by business activities. Companies that carry out environmental accounting disclosures can reduce the negative impact of the company's operational activities to improve the company's economic performance. This result aligns with research conducted by Chasbiandani et al. (2019); Dewi & Wardani (2022; Febriansyah & Fahreza (2020). However, research from Angelina & Nursasi (2021); Rosaline & Wuryani (2020) does not support the findings of this study.

The Effect of Green Process Innovation on Economic Performance

The result of the study presents that green process innovation has a positive effect on economic performance. This finding proves that companies that innovate green processes by using raw materials and energy efficiently in their production processes can improve their economic performance. On the other hand, companies that cannot use raw materials and energy efficiently can reduce their economic performance.

This evidence supports the legitimacy theory. The application of green process innovation provides distinct advantages for companies, such as minimal company operating costs, minimum fuel use, electricity savings, and efficiency in machine use, which results in cheaper manufacturing cost savings. The decrease in manufacturing expenses will impact reducing overall operating expenses. A reduction in the company's operating expenses can encourage increased profits. Utilization of environmentally friendly technology in the production process can support increased company profits. Companies that are increasingly innovative in their production processes can save energy and make production costs efficient to improve their economic performance. The findings of this study are consistent with research conducted by Fitriani (2015); Prajogo (2016); Tang et al. (2018); Mariyamah & Handayani (2019); Wang et al. (2021). However, the study carried out by Sari & Handayani (2020) does not corroborate the results of this study.

The Effect of Environmental Management Accounting on Economic Performance

The result of the study shows that environmental management accounting has a positive effect on economic performance. This result implies that companies that can implement environmentally friendly programs can support long-term strategies that can improve the company's economy. However, companies that cannot manage the environment well will worsen the company's reputation and economic performance.

This finding supports the legitimacy theory. Sustainability goals can be achieved thanks to the synergy between managers and company owners. EMA describes how companies can reduce the ecological burden in the form of energy dependence and carbon footprint. EMA can efficiently meet organizational and environmental objectives by combining the productive capacities and capabilities of information technology, management, and accounting. EMA is useful for identifying the impact of company operations on ecological conditions (eco-control).

Implementing environmental management accounting enables the business to manage environmental costs that might have previously been challenging to manage due to their concealment in overhead expenses. Managers can more easily exercise control and achieve cost reductions thanks to environmental accounting, which enables the identification, measurement, and proper allocation of environmental costs to the process or linked products. Cost efficiency can be attained using cost control based on data from environmental accounting, which would boost the company's financial performance. This study's finding supports research conducted by Nengzih (2016); Song et al. (2017); Christine et al. (2019); Somjai et al. (2020). Deb et al., 2023; Meanwhile, the study conducted by Lanita & Rachmawati, 2020) does not align with the results of this study.

6. Conclusion and Suggestion

Conclusion

The test results show that environmental accounting disclosure, green process innovation, and environmental management accounting positively affect economic performance. This study contributes to the economic performance literature, especially in proving that companies that carry out environmental disclosures, companies that carry out green process innovation, and companies that carry out environmental management can improve their economic performance. These results imply that environmentally friendly companies can increase pu-

blic trust in companies so that companies can improve their economic performance.

Suggestion

This research is still limited to basic material sector companies. The variables used are still limited to environmental accounting disclosure, green process innovation, and environmental management accounting. For further research can be done on a wider range of companies. Research variables can be added such as performance, strategy, commitment, and environmental uncertainty.

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