

# The Effect of Environmental Management Accounting on Corporate Sustainability

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## ABSTRACT

The research aimed to examine the effect of Environmental Management Accounting (EMA) on corporate sustainability in mining, agriculture, construction and construction materials, energy, textile, and apparel companies in Indonesia from 2014-2018, it had 87 observations from 20 companies. EMA was measured by eco-efficiency energy. Meanwhile, corporate sustainability was measured by environmental and social factors. Content analysis was done to measure entity sustainability. The data were qualitative and quantitative in the form of annual reports and company sustainability reports based on the G4 of Global Reporting Initiative (GRI). The results show that there is a positive influence between EMA on corporate sustainability. The high value of the eco-efficiency of the companies indicates the low usage of energy. The low use of energy which certainly has a positive impact on environmental and social aspects as well as being a determining factor for corporate sustainability.

**Keywords:** Environmental Management Accounting (EMA), corporate sustainability

## INTRODUCTION

The challenges in the business world increase each year in line with the business change. In the current global industrial development trend, creating economic benefits is no longer the sole objective of industrial development. It should focus on the increased accentuation of compatible and sustainable economic and environmental and community development concepts. Entities have begun advocating using the concept of eco-efficiency to measure the relationship between economic value and environmental impact (Pai, Hu, & Liao, 2018). The concern for sustainability is increasingly important among organizations and their stakeholders throughout the world (Caiado, Dias, Mattos, Quelhas, & Filho, 2017).

Entities need to formulate strategies so that corporate sustainability is guaranteed. Four values to maintain corporate sustainability are human rights, labor, environment, and anti-corruption. Submission of the long-term values of entities in terms of financial,

environmental, social, and ethical is a core part of corporate sustainability (United Nations Global Compact, 2015). Achieving long-term values for shareholders and stakeholders will be an important key to the success of corporate sustainability. It is because shareholders and stakeholders have a large role in assessing the achievement of the entities. Entities need to constantly balance the economic achievement with social responsibility and environmental protection to maintain corporate sustainability in a highly competitive market (Tomšič, Bojnec, & Simčič, 2015). The economical, social, and environmental achievements are integrated with creating corporate sustainability. The leadership factor (people) also has a significant positive effect on corporate sustainability. Leaders need to create a profitable and collaborative environment for the process of innovation and investment in human resources. Then, human resources produce innovation, which has a significant positive influence on corporate sustainability. In turn, it has an impact on the economic achievement of the

entity (Tomšič et al., 2015). People are included in the social aspects that need the attention of the entity because it is one of the stakeholders that can affect corporate sustainability. A company should be aware of social welfare both for its employees and local citizens around the company (Székely & Vom Brocke, 2017).

Another factor is the environment (Arowoshegbe & Emmanuel, 2016). The world is currently facing new environmental challenges which are interconnected in various fields, including climate change, water, energy, biodiversity, and agriculture. An entity that relies on natural resources directly and through the supply chain needs to have an effort to address the environmental responsibilities of its business activities, pay attention to natural capital, and understand the relationship between the resources used (United Nations Global Compact, 2015). The three major factors that have been explained are the description of the triple bottom line concept. It is a tool to measure corporate sustainability (Arowoshegbe & Emmanuel, 2016). The environment, as an indicator of corporate sustainability, raises new concepts in accounting practices, especially management accounting, namely Environmental Management Accounting (EMA). Limited information on the environment that is not available in management accounting will affect management decisions. For example, the unavailability of information on environmental impacts resulting from the activities of the entity will produce decisions that will later negatively affect the image and corporate sustainability. Thus, The implementation of EMA makes companies get a competitive advantage and increase the value of the company (the value of corporate social responsibility) (Tanc & Gokoglan, 2015).

The presence of EMA helps the entity to measure the environmental impact of business activities and allocate costs related to income and savings derived from environmental activities.

In addition, Fuzi, Habidin, and Effendy (2016) conducted a review of the relationship between EMA and environmental achievements for the industry. EMA consisted of environmental costs, environmental safety, continuous improvement, management commitment, and The Structural Equation Modeling (SEM) approach was used to review the relationship between EMA and environmental achievements. It was found that EMA practices had a positive relationship with environmental achievement. This finding also showed that environmental achievements included material, energy, and natural resources.

To measure the extent to which EMA affects corporate sustainability, the research uses eco-efficiency indicators (World Business Council for Sustainable Development, 2015). It is one of the concepts used by an entity to declare itself as an environmentally friendly entity.

Environmentally friendly entities use less resources and lower environmental impacts such as emissions generated by the entity, water, and air

pollution than other entities. However, they produce the same output as other entities (Yook, Song, Patten, & Kim, 2017). EMA is projected with eco-efficiency indicators that focus on how the entity is environmentally friendly while still benefiting the entity. The goal is that the entity's long-term goal of corporate sustainability can be achieved.

Emphasizing measurement problems related to environmental aspects determines the relationship of eco-efficiency to the environmental achievements of the entity. The eco-efficiency concept combines key environmental performance indicators such as clean goods, pollution prevention, and waste minimization. In addition, the concept of eco-efficiency has advantages over other environmental performance measures. Eco-efficiency measurements can provide real environmental achievements of the entity under investigation regardless of the natural differences between the industrial sectors of this entity (Salem, Hasnan, & Osman, 2011).

As a measurement of corporate sustainability, the research uses the concept of the triple bottom line, those are people, planets, and profits. However, the researchers only use people and planet. The research finds out how the influence of EMA on corporate sustainability in five industrial sectors in Indonesia, they are the mining, agriculture, construction and material construction, energy, and textile and apparel sectors. The selection of the five industrial sectors is based on their direct contact with the utilization of natural resources. They also have a direct impact on the environment and the community around the industrial area. It is legally regulated in Act No. 23 of 1997 concerning environmental management. The entity has the responsibility for the environmental and community impacts from the business activities carried out (Republik Indonesia, 1997). Therefore, entities in the five industrial sectors need to implement eco-efficiency. It is expected that it can affect corporate sustainability. The hypothesis built on this research is as follows:

H1 : EMA influences corporate sustainability.

## METHODS

The research uses the panel data method with the common effect model approach. Panel data regression is a combination of cross-section data and time-series data. The same cross-section units are measured at different times (Erthur & Musolesi, 2017). In other words, panel data are from some of the same individuals that are observed in a certain period. This method is chosen to know the effect of variables from many periods. The data used are secondary data taken from the companies' annual financial report (annual report) and the G4 type of sustainability report from 2014-2018. Material for G4 aspects of Global Reporting Initiative (GRI) is in Table 1.

The G4 of GRI is a guideline to the company

for the disclosure of their information in economic, environmental, and social aspects. It is a tool to measure corporate sustainability. Table 1 informs that the company should convey through corporate sustainability reporting. This index is also a performance evaluation tool to improve and determine new targets and opportunities for the development of risk management skills related to transparency, accountability, and sustainability of the companies (Demirel & Erdogan, 2016).

Table 1 G4 Guidelines of Global Reporting Initiative (GRI)

No	G4 Guidelines of GRI
<b>1</b>	<b>Category: Environment</b>
<b>1.1</b>	<b>Aspect: Material</b> - G4-EN1: Material used by weight or volume - G4-EN2: Percentage of material used which is the recycled input material
<b>1.2</b>	<b>Aspect: Energy</b> - G4-EN3: Energy consumption in companies - G4-EN5: Energy intensity - G4-EN7: Reduction of energy requirements for goods and services
<b>1.3</b>	<b>Aspect: Water</b> - G4-EN8: Total water withdrawals by source
<b>1.4</b>	<b>Aspect: Biodiversity</b> - G4-EN13: Habitat protected and restored - G4-EN14: Total number of species in the International Union for Conservation of Nature and Natural Resources (IUCN) Red List and species in the national protected species list based on the level of risk of extinction.
<b>1.5</b>	<b>Aspect: Emissions</b> - G4-EN21: NOX (Nitrogen Oxide), SOX (Sulfur Oxide), and other significant air emissions
<b>1.6</b>	<b>Aspect: Effluent and Waste</b> - G4-EN22: Total discharged water based on quality and purpose
<b>1.7</b>	<b>Aspect: Compliance</b> - G4-EN29: Monetary value of significant fines and the total number of non-monetary sanctions due to non-compliance with environmental laws and regulations
<b>1.8</b>	<b>Aspect: Transportation</b> - G4-EN30: Significant environmental impacts from the transportation of products, goods, and materials for the operations, and transportation of labor
<b>1.9</b>	<b>Aspects: Other</b> - G4-EN31: Total environmental protection expenditure and investment by type

Table 1 G4 Guidelines of Global Reporting Initiative (GRI) (Continued)

No	G4 Guidelines of GRI
<b>2.</b>	<b>Category: Social</b>
<b>2.1</b>	Sub-Categories: Labor principles and decent work <b>Aspect: Employment</b>
<b>2.2</b>	- G4-LA1: Total number and rate of recruitment of new employees and employee turnover by age group, gender, and region - G4-LA2: Benefits of permanent employees
<b>2.3</b>	<b>Aspect: Industrial Relations</b> - G4-LA4: Notification period for the change
<b>2.4</b>	<b>Aspect: Occupational Health and Safety</b> - G4-LA6: Type and level of injury, occupational diseases, missing days, and absenteeism, as well as the total number of work-related deaths, region, and gender
<b>2.5</b>	<b>Aspect: Training and Education</b> - G4-LA8: K3 Occupational in Health - G4-LA9: Average hours of training per year per employee by gender and employee category - G4-LA10: A training program for career support skills - G4-LA11: Percentage of employees who receive regular performance reviews and career development, according to gender and employee categories
<b>2.6</b>	<b>Aspect: Diversity and Equality of Opportunity</b> - G4-LA12: Composition of governance bodies and division of employees seen by employee category by gender, age group, minority group, and other indicators of diversity
<b>3</b>	<b>Sub Categories: Human Rights</b>
<b>3.1</b>	<b>Aspect: Indigenous Rights</b> - G4-HR8: Total number of incidents of violations involving the rights of indigenous peoples and actions taken
<b>3.2</b>	<b>Aspect: Local Communities</b> - G4-SO1: Percentage of activities with local community engagement, impact assessment, and implemented development programs
<b>3.3.</b>	<b>Aspect: Anti-Corruption</b> - G4-SO3: Total number and percentage of activities assessed for risks related to corruption and identified significant risks - G4-SO4: Communication and training regarding anti-corruption policies - G4-SO5: Proven corruption incidents and actions taken

(Source: Global Sustainability Standards Boards, 2016)

About 20 companies are used as the sample. The companies are from mining, agriculture, construction and construction materials, energy, and textile and apparel. This research has a total of 87 observations from 2014-2018. Table 2 shows the criteria of the sample.

Table 2 Criteria of Sample

No	Criteria of Sample	Entity
1	Indonesian industrial entity	51
2	An entity that does not have an annual report	0
3	Industrial entities that do not issue sustainability report in Rupiah in 2014-2018	
4	Industrial entities that do not have complete data related to research variables in 2014-2018.	(31)
5	Number of research samples	20
<b>Total Observations</b>		<b>87</b>

The indicators in eco-efficiency are the economic and environmental achievements. It is outlined mathematically as follows:

$$\text{Eco-efficiency} = \frac{\text{product or services value}}{\text{environmental influence}} \quad (1)$$

In this research, product or service value is measured by net sales. Meanwhile, for environmental influence, it is measured by total energy consumption. The energy data are from corporate sustainability reporting.

The research uses content analysis to measure corporate sustainability. Content analysis presents a new perspective. Researchers better understand the phenomenon of the problem or inform practical action. The number of disclosures is measured by the number of pages, the number of words, and the number of sentences (Aras, Tezcan, Kutlu Furtuna, & Hacıoglu Kazak, 2017). Using sentences as a medium for coding is far more reliable than other units of analysis because it cannot reliably increase when words are used (Ahmad, 2018). Content analysis with a scoring approach or weighting in assessing environmental and social achievements is carried out and reported by the object of research. Each implementation and reporting of activities by the research object will be given a value of "1" and "0". If it is not, it will be disclosed. After weighing the values on all items, these values are accumulated to produce the total value of the entity. Then, it obtains an index with the following calculation:

$$\text{CSDI} = \frac{\text{Total corporate sustainability disclosed}}{\text{Sustainability Disclosure items}} \quad (2)$$

Corporate sustainability is explained using descriptive statistics. The lowest value, the highest value, average value, and standard deviation of corporate sustainability will be analyzed descriptively. This model is to test the effect of independent variables

on the dependent variable. It uses the equation as follows:

$$CS_{it} = \alpha + \beta_1 \cdot TPE_{it} + e_{it} \quad (3)$$

It means:

$CS_{it}$  : Corporate Sustainability

$\alpha$  : Constanta

$\beta_1 - \beta_4$  : Regression Coefficient

$i$  : Entity to  $i$

$t$  : Year to  $t$

TPE : Eco-Efficiency

$e$  : Error

## RESULTS AND DISCUSSIONS

In Table 3, the results of descriptive statistical analysis show the highest value for corporate sustainability of 4.464.298. It is obtained by PT Elegant Textile Industry and PT Sunrise Bumi Textile. The disclosure of sustainability reports for the environmental and social categories of the two companies amount to 86,6% in 2016. The two companies are in the same group. Moreover, the lowest value of -1,779176 is obtained by PT Pertamina in 2017, with a disclosure score of 16%.

The average value of corporate sustainability in the mining, agriculture, construction and material, energy, textile and apparel sectors is only 0,500655. It illustrates that 50% chance of entities can be sustainably seen from environmental and social aspects.

The eco-efficiency variable for energy represents a minimum at PT Holcim Indonesia. This result is due to the value of eco-efficiency of Rp162,00 for the total energy use of 584.130 gigajoules (GJ). This illustrates that for every Rp1,00, a company sales use 2,7 GJ of energy or that every 1 GJ of energy generates Rp162,00 net sales in 2016. The highest value is found in PT Petrosea Tbk. This company can save Rp1.971.081,00 for a total of 3.544.300 GJ of energy usage. In other words, the company uses 0,55 GJ of energy at every Rp1,00 of sales. The total use of this energy is still quite high. Meanwhile, the average value of the eco-efficiency variable is Rp68.418,00. This value illustrates that 82% of companies are efficient in using energy. Table 3 shows the result.

Table 3 Descriptive Statistic

Variable	Minimum	Maximum	Mean	Standard Deviation
Corporate Sustainability	-1,79176	4.464.298	0,500655	2,003011
Eco-Efficiency	162	1.971.081	68,418	2,368594

(Source: Data Processed Using Eviews 10)

This research uses a common effect model with the panel data model. Referring to Equation (3), the result is as follows:

$$CS_{it} = -1,4087255142 + 0,232597756252 + e_{it}$$

The constant of -1,4087255142 shows that if corporate sustainability is constant, the eco-efficiency is -1,4087255142. The eco-efficiency coefficient value of 0,232597756252 shows that every 1 increase in the value of corporate sustainability will increase the value of eco-efficiency by 0,232597756252. It means the more efficient the use of energy is, the greater the company's opportunity to be sustainable will be. It certainly has a positive impact on the environment, society, and the company.

Furthermore, to see whether there is an autocorrelation between the two research variables, an autocorrelation test is performed. The researchers use the Durbin-Watson (DW) test. The results of the DW calculation (d) is compared with the d-table value at  $\alpha = 0,05$ . The d-table has two values, namely the upper bound value (dU) and the lower bound value (dL). Table 2 shows that the DW test is 2,292287. Based on the DW test criteria, there is no autocorrelation in this research variable. The result is shown in Table 4.

Table 4 Durbin Watson Test

Model	Durbin Watson
1	2,292287

(Source: Data Processed Using Eviews 10)

For the hypothesis test, the research conduct t-test and f-test. Partial test using t-test is done to test the effect of each independent variable partially on the dependent variable. The alpha ( $\alpha$ ) used in this research is 0,05. If the p-value is  $> \alpha$ ,  $H_a$  is rejected, and  $H_0$  is accepted. In other words, the independent variable individually does not affect the dependent variable. Conversely, if the p-value is  $< \alpha$ ,  $H_a$  is accepted, and  $H_0$  is rejected. It means that the independent variable influences the dependent variable individually. In Table 5, the researchers can see the probability of  $0,0099 > 0,05$ . Thus, eco-efficiency in energy affects the environment and society as a measure of corporate sustainability.

Table5 T-Test

Variable	Coefficient	Std. Error	T-statistics	Probability
CS	0,232598	0,08818	2,63757	0,0099

(Source: Data Processed Using Eviews 10)

The f-test is also carried out with a significant level used (0,05). It is commonly used in social sciences research. If the p-value is  $< \alpha$ , there is an effect of the independent variable on the dependent variable. Given a p-value of  $0,009 < 0,05$ , this estimation model simultaneously has a significant effect. The result is in Table 6.

Table 6 F-Test

Variable	F-statistics	Probability
CS	6,9568	0,009928

(Source: Data Processed Using Eviews 10)

Based on the results of the data analysis that has been done, it is known that the hypothesis in this research is accepted. There is a significant positive influence between EMA projected by eco-efficiency on corporate sustainability. It is done in five industrial sectors in Indonesia from 2014-2018. The higher the value of the eco-efficiency of the company indicates the low the usage of energy by companies. Then, the low use of energy certainly has a positive impact on environmental and social aspects as well as being a determining factor for company sustainability. This research is supported by the results of Menoni and Morgavi (2014), Nikolaou and Matrakoukas (2016), and Solovida and Latan (2017).

The empirical evidence shows that there is a positive and significant influence between environmental strategy and the use of EMA. It can improve the environmental achievement of the entity. The results of the PLS analysis provide a strong argument that intangible assets, such as the entity's environmental strategy and the use of accounting practices, in particular, EMA can improve environmental performance. In terms of practical implications, these findings provide a deep understanding of how ISO 14001 certified entities in Indonesia improve environmental performance by implementing sound environmental strategies and using EMA (Solovida & Latan, 2017).

Related to stakeholder theory, excellence in sustainability depends on top management's commitment to this goal. It is expressed in the core business strategy and strengthened by the corporate governance of the entity. It provides a mechanism of preserving and developing the sustainability of the entity. In this case, governance is a key instrument to achieve corporate sustainability (Schrippe & Ribeiro, 2018).

The stakeholders' perspective takes a fundamentally different view from the existing research on business in the context of corporate sustainability. Most argue that business is about creating financial value. It implies that the entity only serves one group of stakeholders, namely shareholders (Schaltegger, Hörisch, & Freeman,

2019). The corporate sustainability is also influenced by economic, environmental, and social factors (Arowoshegbe & Emmanuel, 2016). Stakeholder theory helps to identify and overcome difficulties about the relationship between business success and environmental and social achievements (Schaltegger *et al.*, 2019).

Measuring the sustainability achievements of entities is needed to guide the improvement in sustainability. Although many indicators are reflecting different aspects of sustainability, the integrated indicators in all indicators are very important because of the relatively large number of indicators and interactions (Engida, Rao, Berentsen, & Lansink, 2018).

## CONCLUSIONS

The research provides scientific evidence that eco-efficiency can create corporate sustainability. Savings in the use of energy have a positive impact on corporate sustainability on environmental and social aspects. The results also give additional information for investors who will invest in a company. The investors should pay attention to not only the financial aspects of the company, but also social and environmental aspects. This information is obtained from the corporate sustainability report, as consideration for evaluating corporate sustainability. It can be concluded that eco-efficiency in energy use can affect corporate sustainability in environmental and social aspects.

The efficient use of energy in company activities can be one of the determining factors of whether a company can last long or not. For companies in the mining, agriculture, construction and construction materials, energy, and textile and apparel sectors that are directly in contact with the environment, it is very important to pay attention to the environment as their natural capital. The more efficient the use of energy is, the greater the company's opportunity to be sustainable will be. Excessive use of energy can affect climate change, high levels of emissions produced, and reduction in natural resources due to the exploitation of inefficient energy use.

This certainly has a positive impact on the environment, society, and company itself. To succeed in corporate sustainability, the balancing of company activities can improve their steps for environmental sustainability, continue their efforts related to labor practices, consider their interactions with all stakeholders, invest in their employee education about sustainability, and provide information in their sustainability reports.

The environmental and social aspects can also enhance the company's positive image. The company can label itself as an environmentally friendly company. The implementation of EMA makes companies get a competitive advantage and increase the value of the company (the value of corporate social responsibility).

Nevertheless, out of 54 companies registered in the GRI in five industrial sectors in Indonesia, only 20 companies disclose qualitative and quantitative data on sustainability reports. The rest only discloses qualitatively and does not report sustainability reports every year. It indicates that some companies in Indonesia not fully reported their sustainability reporting.

The research also has several limitations. First, the researchers only measure eco-efficiency for energy use. Second, each company uses different energy so that energy conversion needs a long time. Third, it is the limited research data. Fourth, there are other determinants of corporate sustainability, such as company profitability, which are not examined in this research. Profitability is included as one of the determinants of corporate sustainability in accordance with the triple bottom line concept. In the triple bottom line, there are planets, people, and profit as three determinants of corporate sustainability.

The limitations of this research can be used as a discussion for further researchers. For the researchers in the same field, they can examine eco-efficiency in the aspects of material and water use. Both aspects of eco-efficiency can also be a variable to measure corporate sustainability. Besides, they cannot only examine the effect of EMA on social and environmental aspects but also include financial aspects.

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