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ENVIRONMENTAL COST EFFICIENCY ANALYSIS TO IMPROVE THE QUALITY OF WASTE MANAGEMENT FROM AN ECONOMIC PERSPECTIVE

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Abstract : Evironmental cost holds an important role in minimizing waste disposal which is produced by manufacturing company. Eco Profit Ratio is used to see whether the costs being spent have already been efficient from economic perspective in waste management process to minimize pollution. This research is prepared by explaining the use of Eco Profit Ratio in order to know how large the efficiency from economic perspective of environmental costs. This research studies a case of CV Kokidi Sejahtera Printing in seven semester from 2017 to 2020 using a descriptive qualitative method. The ratio which used in this research is based on formula from Hansen and Mowen, by dividing the environmental profit with environmental conservation cost that the company has spent for waste management processing. The result of this research showed that the environmental cost of the company are classified as prevention cost. Meanwhile the eco profit ratio showed an inefficiency of the environmental cost that has been spent, in which the value is under zero.
Keywords : Environmental Cost, Eco Profit Ratio, Efficiency.

INTRODUCTION

In production activies of a company, it is inseperable from utilization of natural and human resources. The result of these resources utilization, especially natural resources, has the potentioal to damage the environment, whether in the form of natural damage such as deforestation, as well as environmental damage caused by uncontrolled waste disposal. To minimize the potential cause of environmental damage from company activities, various efforts are made, such as developing the principle of 3R (Reduce, Reuse, Recycle), socialization to the community both directly and through other social media, as well as the application of environmental protection rules from the government. In Indonesia, environmental regulations are implemented through Law No. 32 of 2009 on Environmental Protection and Management and Government Regulation No. 27 of 2012 on Environmental Permits. Based on these regulations, company whose business activities have the potential to pollute the environment are required to create waste treatment systems to minimize environmental pollution (KLH, 2017).

In 2012, Dumitru (Dumitru, 2012) released a paper discussing a certain topic of sustainable development in economic and financial analysis. The paper aimed to emphasize the importance of transition in obtaining maximum profits while still prioritizing the basic maintenance of ecological balance, as the writer introducing the term ECOPROFIT. The term itself used to explain the concept of evaluating the profit obtained and the impact on economic activities of an entity on the ecological balance. As the result, Dumitru finds each model of the development in this particular subject of topic is a

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challenge for researcher, as it caused by the complexity of the issues that raised in maintaining sustainable development.

Čuček, Drobež, Pahor, and Kravanja (Čuček, Drobež, Pahor, & Kravanja, 2012) performing a research regarding the use of eco-profit concept based on Life Cycle Assessment (LCA) in example on biogas processing, using the single and multi objective optimisation. Results of the research that have been performed shows that all the results obtained from either single and multi-criteria optimisation on biogas production is a sustainable alternative which provides an important eco-profit. In order to build the system for reducing the environmental certainly requires a cost, which we can refer to as Environmental Costs. In addition, efficiency level measurement also needs to be done to know the economic benefits obtained by the company, especially from environmental waste treatment. Therefore, measuring the level of environmental cost efficiency is important. The measurement can be done by using the eco-profit formula as described by Hansen and Mowen used in research done by Irawan *et al* (2016), which can be explained that the Eco Profit Ratio equals to Total Economic Gain divided by the Total Cost of Environmental Conservation. Based on this comparisons, if the environmental benefits obtained are greater than the costs incurred, then the more efficient the company on waste management process. Research showed that the company has not yet economically efficient in managing the environmental waste produced from the company activity, although the company obtained environmental benefits from the activities by doing retrenchment on resource usage.

Based on the research that has been done, CV Kokidi Sejahtera Printing was choosen as one of the companies who calculates the costs for waste treatment with the objective to reduce waste pollution caused by the chemicals used in printing production, such as paints and other chemicals, which potentially pollute the water on environment where the company stand. Therefore, the company needs to process the waste before finally disposing the used water to the environment. Environmental costs which has been spent by CV Kokidi Sejahtera Printing focused on the purchase of materials for filtering the chemicals substances from water used in printing production.

Based on the research background mentioned above, the purpose of this research is to know how the company, CV Kokidi Sejahtera Printing, categorize the environmental costs, also to know how much the ratio of efficiency from the environmental costs which has been spent by the company to manage the environment and minimizing the potential of harming the environment where the company stand.

The primary subject we need to understand regarding environmental costs is the definition if the cost itself. Horngren *et al* (2018:29) explained the cost as a form of resources which need to be expend or sacrificed in order to achieve certain objective. The objective can be explained as things that the company needs for the continuity of their activity or goals they planned to achieve in the future, whether it is in a form of goods or services. Based on the economical perspective, we can assume the cost mentioned above as in a form of financial currencies or money.

As we already comprehend with the basic definition of cost, we proceed to the definition of Environmental Cost, which can be explained as expenditures which the company have been spent in terms of managing the environment where the company stands to minimize the pollution caused by the company activities, starting from detecting

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the potential of environment polluting, costs for repairment if there is already pollution detected caused by the company activities, and to do prevention activities of waste pollution, which the report of environmental costs that has been spent could be used to help manager to make decision (Ikhsan, 2009:103; Susenohaji dalam Fitriyani, 2013:139; Hansen, 2007:780).

There are few core objectives of Environmental Costs from environmental perspective explained by Hansen and Mowen (2007:793): (1) minimize the use of hazardous materials; (2) minimize the use of raw or virgin meterials; (3) minimizing residues (solid, liquid, and gaseous); (4) minimize energy requirements for production and use of the product; and (5) maximize the opportunities to recycle. Hansen and Mowen (2007:780-782) also explained the categorize of environmental costs as follows: **Environmental Prevention Costs**, incurred costs of activities to prevent the production of contaminants and/or waste that could cause damage to the environment. **Environmental Detection Costs,** incurred costs of activities to determine if products, processes, and other activities within the firm already compliance with appropriate environmental standards. **Environmental Internal Failure Costs,** incurred costs of activities because contaminants and waste have been produced but not discharged into the environment. **Environmental External Failure Costs,** incurred costs of activities after discharging contaminants and waste int the environment. There are two category for this costs, they are **Realized external failure costs**, which incurred and paid for by the firm, and **Unrealized External Failure Costs (societal costs)**, which costs that caused by the firm but are incurred and paid of by a third party. The societal costs can be classifed as those resulting from environmental degradation, and those associated with an adverse impact on the property of welfare individuals.

Those categorization of environmental costs could help companies in order to manage their financial for environmental management and how substantial the allocation of budget for environmental management process. Apart from that, by using this category of environmental costs companies able to value how large the efficiency of environmental costs which have been spent. As Mardiasmo explained in his book (2009:133), efficiency measured by looking at the input and output value, where the bigger the output and input, the higher the effiency level.

Eco Profit Ratio In his study, Irawan *et al* (2016:102) applied an eco profit ratio formula from Hansen and Mowen which explained that environmental costs efficiency measured by using the environmental gain. The result of the calculation showed how rational the environmental protection activity in economical perspective. If eco profit ratio coefficient is higher than or equal to one, it can be told that the incurred environmental costs have been efficient in economical perspective.

The Environmental Gain explained into two categories, revenue and savings. Environmental revenue are received by selling recycled products which not used any further. As for environmental savings obtained by how substantial the savings of resources used in company activities, such as the energy usage, raw material, and water, where the measurement can be done by calculating the usage in current period with previous period to see the value of the savings (Ikhsan, 2008:99; Irawan *et al*, 2016:102). Environment Conservation costs explained as costs incurred in a certain periods. The formula described as follows:

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$$\textit{Eco Profit} = \frac{\text{Environmental Gain}}{\text{Environment Conservation Costs}}$$

Source: Irawan *et al* (2016:102) Journal of Environmental Cost Effectiveness in Efforts to Minimize Environmental Pollution.

Research Questions

Referring to the research background, author have composed few research questions which need to be thoroughly researched as follows : How the company categorized the environmental costs in environmental management process? How major the efficiency ratio of the environmental costs which the company have been spent?

METHODS

This research conducted by using a qualitative descriptive approach with purpose to collect data involving certain topic interest (Sekaran & Bougie, 2016:43). This research is part of a qualitative research, which not started from conducting hipothesis (Sugiyono, 2016:12) Focus of this research is to expose the use of eco profit ratio in valuating the efficiency of Environmental Costs incurred by the company. The data used in this research are CV Kokidi Sejahtera Printing Environmental Conservation Costs in semester periode from year 2017 to 2020. Collection of the data were done by observing the field of the company, interview process, and documentation. This research using Miles and Hubberman (1984) to analyze the data, by reducting the data, displaying the data, and conclusion drawing/verification (Sugiyono, 2016:91).

RESULTS AND DISCUSSIONS

CV Kokidi Sejahtera printing is one of the company who engaged in providing printing services to produce any kind of designs on fabrics. The company already obtained Environmental Management Statement Letter/SPPL as one of requirement to to carry out environmental management activities. It can be proved by the exclusive building made in the back of the factory where the waste of the production collected and processed before finally disposed to the environment. The company make sure that the water which have been through the filtering process will not harm the environment. The materials used in this filtering process are Ferrosulfate and Calcium. If the Ferrosulfate becomes rare in the market, the compny choose Alum (in Indonesia known as Tawas) as a subtitute for Ferrosulfate.

The expenditure for Environmental Management data collected per semesters with detail as follows :

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Table 1 : Environmental costs as of year 2017 – 2020 (Semester I)

Semesters	Environmental Costs
Year 2017, first semester	Rp1.952.000
Year 2017, second semester	Rp2.230.000
Year 2018, first semester	Rp2.170.000
Year 2018, second semester	Rp2.040.000
Year 2019, first semester	Rp2.280.000
Year 2019, second semester	Rp2.300.000
Year 2020, first semester	Rp1.050.000
TOTAL	**Rp14.022.000**

Source : CV Kokidi Sejahtera Printing, 2018. Updated in 2020.

Table 2 : Environmental Costs usage as of year 2017 – 2020 Semester I

Semesters	Environmental Costs Usage
Year 2017, first semester	Rp1.890.400
Year 2017, second semester	Rp2.026.400
Year 2018, first semester	Rp2.219.200
Year 2018, second semester	Rp1.931.200
Year 2019, first semester	Rp1.958.400
Year 2019, second semester	Rp2.260.000
Year 2020, first semester	Rp1.397.500
TOTAL	**Rp13.683.100**

Source : CV Kokidi Sejahtera Printing, 2018. Updated in 2020.

For seven semesters, CV Kokidi Sejahtera Printing have spend Rp14.022.000,- million rupiahs to bought materials for environmental management process needed. The company also have spend Rp13.683.100,- million rupiahs from the usage of the materials which already calculated based on economic perspective. The expenditure which the company have conducted only focused on buying materials for environmental management process, such as Ferrosulfate or Alum (when Ferrosulfate becomes rare in the market) and Calcium, which used for filtering process where the paint are separated from the water and cleanse it before finally dispose the water to the environment. The company does not gain any revenue from the waste process, neither the savings from the usage of resources in printing process.

There was a change of supplier for Ferrosulfate in January 2020, where the quality of the material provided are better than from previous supplier in waste process. The price

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of the material are a bit more expensive as it gives a better result of the waste process. Although, the usage of water for the printing process is still the same.
Here are the application of the eco profit formula for this case study, followed by result of the calculation :

Eco Profit Ratio :

$$\textit{Eco Profit} = \frac{\text{Environmental Gain}}{\text{Environmental Conservational Costs}}$$

Table 3 : Results of eco profit formula calculation

Years	Semester 1	Semester 2
2017	$= \frac{0}{\text{Rp}1.890.400,-}$ = **0**	$= \frac{0}{\text{Rp }2.026.400,-}$ = **0**
2018	$= \frac{0}{\text{Rp}2.219.200,-}$ = **0**	$= \frac{0}{\text{Rp}1.931.200,-}$ = **0**
2019	$= \frac{0}{\text{Rp}1.958.400,-}$ = **0**	$= \frac{0}{\text{Rp}2.260.000,-}$ = **0**
2020	$= \frac{0}{\text{Rp}1.397.500,-}$ = **0**	

Source : Processed by author, 2020

It can be seen from the results of the calculation which have been done, based from each semester value, the result for each semester ratio are zero. Further discussion will be explained in the next chapter of this paper.

Discussions

Based on the result from previous chapter, we can see that CV kokidi have variety of usage of environmental costs.The reason behind the variety was caused by the difference of orders which the company received. It is said that the more the company received orders from clients, the more of waste produced from the printing activities. Thus, affecting the use of materials for waste processing. The changes in supplier at first semester on year 2020, though the price of Ferrosulfate a bit higher than previous supplier, from Rp3.800,- to Rp4.500,- per kilogram, as it also gives a better result in the waste process, it does not affect the efficiency of the environmental costs. The main cause is that CV Kokidi received less orders from clients due to the spread of Covid-19 at the begining of year 2020. Other materials that have not yet used in the waste management process are stored as inventory for next production activity.

As for the research questions, author have tried to collect data from observing on the field, interview activity, and documentation for data regarding environmental costs that CV Kokidi have spend in order to give a brief explanation for the answers as for further discussions.

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Research question 1 : How the company categorized the environmental costs in environmental management process?

Based from result of the observation done by author, CV Kokidi has been conducting waste management from printing activities by building a specific area to process the waste before it can be disposed to the environment, it can be seen that the waste management activities are focused to **minimize the residue disposal** to the environment. It is compatible with Hansen and Mowen explanation regarding the purpose of Environmental Costs. In order to achieve the purpose, thus, the company focused on buying the materials for filtering the water from the chemical substance caused by the printing activities, such as Ferrosulfate or Alum, and Calcium. Those materials are effective to separate the chemical substance, such as paints and other chemical substance used in the printing process, resulting a clean water in the last step of the filtering process. To improve the quality of the water, few of water hyacinths, common known as *eceng gondok*, were planted at the last part of waste process. Based from the expenditure which the company focused on environmental management process, it can be categorized as **environmental prevention costs**. It is also compatible with Hansen and Mowen explanation regarding the categorization of environmental costs, where the company mostly focused the environmental cost to prevent the production of contaminants and/or waste that could cause damage to the environment.

Research Question 2 : How major the efficiency ratio of the environmental costs which the company have been spent?

By analyzing the result of the ratio calculation, it can be seen that the company have a value of **zero** on each semester the company have been managing the environmental management process from first semester of year 2017 to first semester of year 2020. Since the value of the ratio are under point one, it can be explained that the environmental costs which the company have spend are **not yet rationally efficient from economical perspective**.

The cause of inefficiency is that the company does not received any environmental gain, whether it is from selling the recycled product or retrenchment on resource usage. The reason why the company does not do retrenchment for the resource usage is because the volume of the water used in printing activities might affect the quality of the printed design on the fabrics. That is why, the company choose not to do savings on the usage of the water. As for the environmental revenue, CV Kokidi does not do the recycling process to receive any income. Although, there are some potential in recycling the water that have been processed through filtering, which can be recycled and reused in the printing process in order to save the usage of water resource. Thus, the company might able to get environmental gain from the water savings process. From the research that have been done, author realized that there are several limitations regarding the focus and scope of this research. Firstly, this research only focused on one aspect, which is the use of eco profit ratio to value the efficiency of environmental costs. Author believed that there are also several formula that can be used to evaluate the efficiency of environmental costs. Secondly, the scope of this research is only one company in the level of CV, in hope that this research could help company or firm at the

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same level or SMEs in understanding Environmental Costs and the use of eco profit ratio. Last but not least, author have not yet calculate the potential if CV Kokidi Sejahtera Printing choose for the recycled water to be used in printing process and how the recycled water will be treated in calculation, whether it is treated as environmental revenue or as savings. This topic of interest of Environmental Accounting still become a sensitive topic to be researched, due to the involvement of company sustainability in conducting their business activity, especially with company who are still unaware of Environmental Costs and how to managed it. Even though, it is possible for this topic of research to be conducted in the future, as the research regarding the topic of Environmental Management Accounting (EMA) and Environmental Accounting (EA) already performed by several researchers. Those could help to add references for further research and development of knowledge regarding this topic, not to mention also to help company or firm to manage the environmental costs.

CONCLUSIONS

Based on the research being done above, we can conclude that based on the classification of environmental costs according to Hansen and Mowen, CV Kokidi Sejahtera Printing has focused on the environmental prevention costs. This argument is supported by the expenditure of environmental costs being focused on the procurement of materials in order to purify water being used in printing activities, before eventually being disposed of in the environment. Calculation of eco-profit ratio done previously shows that CV Kokidi Sejahtera Printing has not, from an economic perspective, been efficient in managing its production waste. The cause if this innefficiency is the minimum profit from the environmental gain received by the company.

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