Adopting Environmental Management Accounting (EMA) in Indonesia

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Abstract: This paper will explain the guidance and benefits of using Environmental Management Accounting (EMA) for the companies in Indonesia. First this paper will explain the definition of EMA. EMA is one of type tools that used for assessment of sustainable aspects of innovations. Furthermore, it will explain the guidance of EMA. The new guidance for EMA is issued by the International Federation of Accountants (IFAC). Two types of information from EMA for internal decision making are physical information and monetary information. Finally, it will explain the benefits of using EMA. There are three benefits of using EMA including compliance efficiency, eco-efficiency and strategic position. In conclusion, it is important for companies in Indonesia, especially for mining, manufacturing companies, to use Environmental Management Accounting (EMA) in their operation.

Keywords: environmental management accounting (EMA)

1. INTRODUCTION

An environmental issue has been increasing overtime in consideration and debate since past decades. The world is recently facing with climate change where the gigantic natural disasters appeared in parts of the world alerted the severe of problem. At the same time, all stakeholders; e.g. households, governments, non government, and business organizations, were pushed to involve in searching for problems’ solutions that ‘public green’ has been broadly aware (Sirisom, Sonthiprasat, 2011). There are tools that could be occasionally used within assessment of sustainable aspects of innovations as Environmental Management Accounting (EMA) or Environmental and Material Flow Cost Accounting (MFCA), or Sustainable Accounting (SA). This paper focuses on Environmental Management Accounting as one of tools for assessment of sustainable aspects of innovations. Based on Burrit and Saka (2006) says that Environmental Management Accounting (EMA) is relatively new environmental management tool initially designed to trace and track environmental costs and physical environmental flows. According to the goal of environmental management, management accountant, then, focus on preparing environment-related information which is termed environmental management accounting (EMA). In decision-making theory, managers search for relevant information to increase certainty that EMA propose to help managers regarding of preparing relevant information to manage environmental performance as well as economic performance(IFAC, 2005).
2. THE DEFINITION OF ENVIRONMENTAL MANAGEMENT ACCOUNTING

Management accounting identifies, generates, and presents information relevant to:

a. Formulating a business strategy,
b. Planning and controlling activities,
c. Supporting decision-making efforts,
d. Using resources efficiently,
e. Performing improvement and value enhancement,
f. Safeguarding tangible and intangible assets, and
g. Implementing corporate governance and internal controls.

Environmental accounting can include both management accounting (e.g., cost of pollution control equipment, revenues from recycled materials) and financial accounting (e.g., reporting on an organization’s environment-related liabilities). EMA, then, focuses on environment-related information that is used for internal decision-making efforts. The EMA guidance uses the EMA definition developed by the United Nations Division for Sustainable Development, which states that:

“EMA is broadly defined to be the identification, collection, analysis, and use of two types of information for internal decision making:

a. “Physical information on the use, flows, and fates of energy, water, and materials (including wastes), and
b. “Monetary information on environment-related costs, earnings, and savings.”

Thus, the definition spells out two important aspects of EMA, quantitative physical information (as in kg, joules, meters, lbs, etc) and monetary information. Such information is of primary importance because to manage and reduce the potential environmental impacts of an organization’s products, the firm must have accurate data on the amounts of waste and emission, both in physical as well as monetised amounts. Many companies are currently reporting on the physical quantities of resources used and waste generated. This definition of EMA is similar to the definition of conventional management accounting, but has several key differences as follows.

1. EMA places particular emphasis on accounting for environmental costs.
2. EMA encompasses not only environmental and other cost information, but also information on physical flows and fates of materials, water, and energy.
3. EMA information can be used for any type of management activity or decision making within an organization, but is particularly useful for activities and decisions with significant environmental components and/or consequences.

Table 1 : What is Environmental Management Accounting?

<table>
<thead>
<tr>
<th>Source</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Graff et al., 1998</td>
<td>Environmental management accounting is the way businesses account for the material use and environmental costs of their business. Materials accounting is an means of tracking material flows through a facility in order to characterize inputs and outputs for purposes of evaluating both resource efficiency and environmental improvement opportunities. Environmental cost accounting is how environmental cost are identified and allocated to the material flows or other physical aspects of a firm’s operations.</td>
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<tr>
<td>IFAC, 1998</td>
<td>Environmental management accounting is the management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices. While this way include reporting and auditing in some companies, environmental management accounting typically involves life-cycle costing, full cost accounting, benefits assessment, and strategic planning for environmental management.</td>
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Environmental management accounting (EMA), as a part of environmental accounting, has been claimed as a beneficial tool to overcome limitation of conventional management accounting to better understanding and quantifying environment-related issue for decision making process (Burritt et al., 2002; de Beer and Friend, 2006).

**The Guidance of Environmental Management Accounting**

As shown in Figure 1, physical inputs include the materials that are intended to become part of an organization’s final product or by-product, as well as materials that are used to develop the product, but that do not become part of the final product (i.e., non-product outputs, including waste and emissions).

Material inputs that are incorporated into a final product include the following:

- **Raw and auxiliary materials** are the major product components (e.g., wood used in furniture manufacturing), while auxiliary materials are minor components (e.g., glue used in furniture manufacturing). Water can sometimes become part of an organization’s final product (e.g., food manufacturing), as can energy.

The guidance recommends that such materials be covered separately in their individual category.

a. **Packaging materials** are used to ship the organization’s final product, and can be purchased or created onsite.

b. **Merchandise** includes items that are purchased and directly sold again as products, with little or no processing.

Generally, there are fewer environment-related costs and impacts associated with merchandise.
The materials used by an organization that are not intended to become part of a final product include:

a. *Operating materials* that an organization uses that are not associated with the final product (e.g., office supplies, cleaning supplies). By definition, such materials automatically become a form of non-product output (i.e., waste and emissions).

b. *Water* includes all of the water an organization uses from all sources. Water has a separate category because 1) it is especially important from an environmental standpoint, and 2) water information is often managed differently from other materials flow information in accounting systems.

c. *Energy* includes all of the energy that an organization uses, including electricity, gas, coal, fuel oil, district heating and cooling, biomass, solar, wind, water, etc. Energy is in a separate category for the same reasons as water.

As mentioned above, organization outputs include products and by products and their packaging, and the non-product outputs of waste and emissions. Non-product outputs include:

a. Solid waste,
b. Hazardous waste,
c. Wastewater, and
d. Air emissions.

As illustrated in Figure 1, non-product outputs are generated in two ways. First, material inputs can become waste or emissions due to poor equipment efficiency and maintenance, inefficient operating practices, production losses, product spoilage, poor product design, or other reasons. Second, waste and emissions are generated by the use of material inputs that were never intended to become part of the final product (e.g., operating materials, water, energy).

### Table 2: Environment Related Cost Categories in Environmental Management Accounting

<table>
<thead>
<tr>
<th>Cost Categories</th>
<th>Type of Cost</th>
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</thead>
<tbody>
<tr>
<td>Purchase costs of natural resources and other materials that are converted into products, by product and packaging.</td>
<td>• Raw and auxiliary materials&lt;br&gt;• Packaging materials&lt;br&gt;Water and energy incorporated into product and or by product</td>
</tr>
<tr>
<td>Purchase costs of energy, water and other materials that become waste and emissions.</td>
<td>• Raw and auxiliary materials&lt;br&gt;• Packaging materials&lt;br&gt;• Water&lt;br&gt;• Energy&lt;br&gt;• Processing costs of raw and auxiliary materials up to the point where they are converted into waste and emissions</td>
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<tr>
<td>Cost of preventive environmental management activities</td>
<td>• Depreciations of equipment used for waste prevention and other environment management activities&lt;br&gt;• Operating materials, water, and energy usage&lt;br&gt;• Internal personnel costs&lt;br&gt;• External services&lt;br&gt;• Other costs</td>
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Table 2: continue

<table>
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<tr>
<th>Costs Categories</th>
<th>Types of Costs</th>
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<tbody>
<tr>
<td>Waste and Emission Control Costs</td>
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<tr>
<td>• Cost for handling, treating and disposing waste and emissions</td>
<td>• Depreciation of waste handling disposal equipment</td>
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<tr>
<td>• Remediation and compensation costs related to environmental damage</td>
<td>• Operating materials costs (e.g. chemicals for onsite wastewater treatment facility)</td>
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<tr>
<td>Control related regulatory compliance costs</td>
<td>• Water and energy cost relating to waste handling disposal</td>
</tr>
<tr>
<td>• Depreciation of waste handling disposal equipment</td>
<td>• Internal personnel associated with waste handling disposal</td>
</tr>
<tr>
<td>• Operating materials costs (e.g. chemicals for onsite wastewater treatment facility)</td>
<td>• External services (e.g. consultants, attorneys)</td>
</tr>
<tr>
<td>• Water and energy cost relating to waste handling disposal</td>
<td>• Fees and taxed (e.g. waste disposal fees, emissions fees)</td>
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<td>• Internal personnel associated with waste handling disposal</td>
<td></td>
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<td>• External services (e.g. consultants, attorneys)</td>
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<td>• Fees and taxed (e.g. waste disposal fees, emissions fees)</td>
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<tr>
<td>Research and Development Costs</td>
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<tr>
<td>• Costs of research and development related to environmental issues</td>
<td>• Depreciation of equipment used for waste prevention and other environment management activities</td>
</tr>
<tr>
<td></td>
<td>• Operating materials, water, and energy usage</td>
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<td></td>
<td>• Internal personnel costs</td>
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<td></td>
<td>• External services</td>
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<td></td>
<td>Other costs</td>
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<tr>
<td>Less Tangible Costs</td>
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<tr>
<td>• Environment related costs (and benefits) that cannot typically be found in an organization’s collective information systems</td>
<td>• Productivity of an organization</td>
</tr>
<tr>
<td></td>
<td>• Potential liability for violating environmental regulations and liability assigned by the judicial system</td>
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<td></td>
<td>• Cost of future regulations</td>
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<td></td>
<td>Image and stakeholder relations</td>
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Adapted from IFAC, 2005

Table 2 presents the environment related cost categories addressed by EMA. Such information can help managers manage both their organization’s environmental performance and its associated economic performance. This EMA cost compilation is one of the most important goals of the international guidance document, and includes cost categories that are widely accepted, as well as emerging best practice.

The environmental cost or expenditure are classified based on historic development of awareness for environmental cost categories as follows (UNSD, 2001):


The first category consists of all costs to conventionally treat, dispose and clean-up extant waste and emissions.
2. Prevention and environmental management. The second class covers annual costs incurred for preventing waste and emissions.

3. Material purchase value of non product output. The third block constitutes the cost of wasted material because of inefficient production. Wasted materials are assessed based on their purchase value or material consumed value.

4. Procession costs of non product output. The last category comprises labor hours, depreciation of machinery and operating materials, and financing costs. They will be added to environmental cost scheme based on the respective production cost pro rata changes.

5. Environmental revenues. Environmental revenues draw from sales of waste or grants of subsidies.

The guidance notes that the following factors are driving increasing interest in EMA:

a. Increasing pressure from stakeholders interested in environmental issues,

b. Increasing importance of environment-related costs, and

c. Increasing recognition of problematic accounting practices.

Decision makers especially managers using the EMA technique have a superior analytical framework for identifying cost savings and for considering a fuller range of costs in manufacturing processes, product redesign or new product offerings. The success or failure of its application leads to at least three possible outcomes in the following (Gale, 2006):

1. EMA has pioneering significance as a modernization strategy in cleaner production by yielding better cost and benefits figures on which decisions can be made, and

2. EMA has a long term capacity to promote the transition towards corporate sustainability through institutional reflexivity; or

3. EMA fails to take root and calls into question ideas of modernization in the solution to environmental and sustainability problems.

Environmental management accounting represents a combined approach which provides for the transition of data from financial accounting, cost accounting and material flow balances to increase material efficiency, reduce environmental impact and risk and reduce costs of environmental protection. EMA is performed by private or public corporations, but not nations, and has a financial as well as physical component.

EMA metrics for internal decision-making include both: physical metrics for material and energy consumption, flows, and final disposal, and monetarised metrics for costs, savings, and revenues related to activities with a potential environmental impact.

Key application fields for the use of EMA data are (Jasch, 2003):

1. Assessment of annual environmental costs/expenditures;

2. Product pricing;

3. Budgeting;

4. Investment appraisal, calculating investment options;

5. Calculating costs and savings of environmental projects;

6. Design and implementation of environmental management systems;

7. Environmental performance evaluation, indicators and benchmarking;

8. Setting quantified performance targets;

9. Cleaner production and Ecodesign projects;

10. External disclosure of environmental expenditures, investments and liabilities;

11. External environmental or sustainability reporting;

12. Other reporting of environmental data to statistical agencies and local authorities.
Based on the figure 2 above, we can see that the position of environmental accounting related to financial data and internal decision support. Based on Jasch, 2003, Environmental Management Accounting represents a combined approach which provides for the transition of data from financial accounting, cost accounting and material flow balances to increase material efficiency, reduce environmental impact and risk and reduce costs of environmental protections.

**Decision making theory**

Decision making theory attributes that uncertainty leads managers to a search for additional relevant information to increase certainty (Eisenhardt, 1989; Simon, 1987). Eisenhardt (1989) reveal that decision makers rapidly access and interpret all real-time information and use tactics to accelerate analysis of information and alternatives during the decision process.

With the real-time information and multiple simultaneous alternatives, more information needs to be used to make decision. Based on IFAC, 2005, EPA, 2995) mention that in decision making theory, managers search for relevant information to increase certainty that EMA propose to help managers regarding of preparing relevant information to manage environmental performance as well as economic performance.

The findings are consistent with decision-making theory and EMA literatures that EMA provides useful environmental information to enhance firm performance and EMS (Environmental Management Systems) implementation. The findings might contribute to EMA literature and implicate to environmental regulators and implementers as a reference for their decision-making in related issues (Sirisom and Sonthiprasat, 2011).

3. **THE BENEFITS OF USING ENVIRONMENTAL MANAGEMENT ACCOUNTING**

EMA benefits can be divided into three broad categories:

1. **Compliance efficiency** — Cost-effective compliance with environmental regulations and corporate policies;
2. **Eco-efficiency** — Simultaneous cost savings and environmental impact reductions as energy, water, and materials are used more efficiently; and
3. Strategic position — Developing and implementing effective and environmentally sensitive programs to ensure an organization’s long-term strategic position.

Figure 3 below shows that Environmental Management Accounting (EMA) have three broad areas such as compliance efficiency, eco efficiency and strategic position. The first broad is compliance with environmental legislations as compliance efficiency. The second broad is EMA supports the reduction of cost and environmental impacts of a company’s activities (eco efficiency). Eco efficiency is a measure that brings together monetary and physical information about the environment performance of companies, and changes in performance over time. The last broad, a company’s long term strategic position is from EMA evaluation and implementation of cost effective and environmentally sensitive programs. The figure 3 is reproduced from EMA guideline of International Federation of Accountants (IFAC, 2005).

Source: Adapted from Guide to Corporate Environmental Cost Management (Berlin: German Environmental Ministry, 2003).

Figure 3: Uses and Benefits of EMA

Burritt and Saka (2006) assess benefits of EMA implementation as to eco-efficiency in some companies in Japan. Utilizing material cost flow analysis enabled Tanabe Seiyaku to identify costs of waste processing and losses from processes on large raw material. The cost analysis has benefited Tanabe Seiyaku on cost saving as well as relevant monetary and physical
environmental information. Evaluation on Nippon Oil, Ricoh, Canon Schweiz and Hitachi revealed that they have employed eco-efficiency measures to further improve their environmental management. In addition, Hitachi and Fujitsu have factored in eco-efficiency measures into product development stage. Implementing eco-efficiency indicator has assisted them to use more efficient energy and resources in developing their products.

4. CONCLUSION AND SUGGESTIONS

Many companies in several countries especially developed countries take EMA to implementation due to various reasons, for instance regulations, voluntary adoption, eco-efficiency improvement, decision usefulness (Burrit and Saka, 2006). Companies, particularly those in the developed world, are now recognizing that it is good business sense to be environmentally responsible.

Further, there is increasing evidence that a company’s environmental performance has a positive influence on its economic performance. In other words, it pays to be ‘green’ — that waste minimization and energy efficiency schemes can and will result in substantial economic benefits to the company.

Accordingly, environmental matters are now regarded as strategic issues that go beyond mere compliance of environmental regulations. Thus, integrating environmental accounting into mainstream corporate accounting is essential. In conclusion, it is better for companies in Indonesia to implement Environmental management accounting in their companies, because increasing awareness of environmental issues by stakeholder implies that organizations can no longer ignore environmental impacts of their activities.

Environmental management accounting, as part of environmental accounting, may assist managements to address this issue, particularly by providing related environmental information for decision making purpose.

In conclusion, Environmental management accounting (EMA) is management accounting which focus on physical information on the flow of energy, water, product and materials as well as monetary information on environmental costs and revenues and projects related to environmental protection.

There are several suggestions for manufacturing companies in Indonesia. First suggestion, the companies in Indonesia especially manufacturing companies should increase their awareness on the economical and environmental benefits of implementing EMA. They should concern to environment impact in their operation activities, because the stakeholders also increase their awareness for the environment.

By implementing EMA, the companies will increase their shareholders value and also improve companies’ reputation. The second suggestion, manufacturing companies, which is implementing EMA, it is easier for manufacturing firms especially to quantify related environment for decision making process for instance emissions treatments as well as wasted material. Final suggestion, EMA will have significant and relevant costs are incorporated for decision making process.

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