

# Eco-Efficiency and Sustainable Development as Efforts to Produce Environmentally Friendly Product: An Exploratory Case Study

**B. Basuki<sup>1</sup>**

Faculty of Economics and Business  
Universitas Airlangga, Surabaya, Indonesia

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## Abstract

The issue of climate change, global warming and environmental damage caused by the production process lead to many changes in manufacturing technology, in the understanding of environmental concern or environmental awareness. Eco-efficiency is a concept that requires companies to concern the environment, and is then forwarded to the concept of sustainable development which requires current generations think and act for not passing the environmental damage to future generations. This study was aimed to answer whether a go-international company has environmental awareness, how they understand, interpreted, and applied these eco efficiency and sustainable development concepts. The research methodology used is Yin's non positivist exploratory case study research in PT. Semen Indonesia. The results showed that although the company has already understood and implemented eco-efficiency, and other environmental friendly program, such as Japanese 5<sup>s</sup> S (*Seiri, Seiton, Seiso, Seiketsu, and Shitsuke* mean Tidiness, Orderliness, Cleanliness, Standardization, and Discipline); Triple Bottom Line (Profit, People and Planet), and other programs. The implementation of such programs leads to the application of sustainable development concept. The research's implications is academically it will enrich management accounting literature by introducing environmental-based management accounting, and push academicians to restructure the content of management accounting subject as well as it will inform companies to aware to possible environmental problem in their production process.

**Keywords:** *eco-efficiency, environmental accounting, sustainable development.*

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## Introduction

Issue of global warming is becoming increasingly widely discussing issue. The issue was raised because of the many natural disasters caused by climate change, such as pollution, melting and rupture of icebergs in Antarctica, perforation of the ozone layer, reduced the extent of the ice field in Arctic, prolonged snow storms and heat waves that hit both northern and southern hemispheres. Climate changes often make the industrial sector as the accused sector for contributing to all disasters and

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<sup>1</sup> Email [basuki@feb.unair.ac.id](mailto:basuki@feb.unair.ac.id)

environmental degradation and reduction of the natural resources. Allegations mainly to companies that operate without considering to the impact of its operations on the environment, natural and social environment, and companies that lead to damage to the environment either caused by the input or output operations.

To increase the countries' concern in the impact of environmental degradation, several national and international conferences have been held. It started with the Earth Summit at Rio de Janeiro, Brazil on 1992, followed by a Convention held in Kyoto, Japan on December 11, 1997 which resulted in a working protocol, known as the Kyoto Protocol. The Kyoto Protocol, as the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), is aimed for fighting global warming. This Protocol is an international environmental treaty with the goal of stabilizing the concentration of greenhouse gases in the atmosphere that would interfere the climate system. The Protocol entered into force on 16 February 2005 and now more than 190 countries have signed the Protocol. In 2005, the United Nations Environment Programme also held a conference on the environment at Bangalore India, and continued in 2007 at Leverkusen, Germany, 2009 at Daejeon, Korea, and 2011 at Bandung, Indonesia. The point in the ratification of the Kyoto Protocol is government and environmental agencies in each country members agreed to reduce the amount of emissions as much as 5.2% of emissions in 1990, and ensure that each country issued a policy that existing industry must implement the environmentally friendly activities.

The need to obtain the products and services that are environmentally friendly both for consumers and manufacturers is a necessity. World Business Council for Sustainable Development describes Eco-Efficiency as: "creating more goods and services with ever less use of resources, waste, and pollution" (Lehni, 2000). Moreover, Hansen & Mowen (2007, p.778) defined eco-efficiency concept as "Essentially maintains organizations that can produce more useful goods and services while simultaneously reducing negative environmental impacts, resource consumption, and costs." This concept includes three aspects: first, improve economic and environmental performance as a complementary aspect. Second, the environmental performance can no longer be seen as a "donation and goodwill" of the company, but it must be part of the competition. Third, eco-efficiency is a supporter of sustainable development efforts.

Company's environmental performance is inevitable in today highly competitive condition. To achieve good performance, companies now must be more creative than before. Porter & Linde (1995) conducted case study research in 100 companies of dozen countries concluded that internationally competitive companies heavily rely on the continual improvement and innovation rather than on cheap inputs or large scales. It means that to be competitive in many aspects they eager to spend for innovation and improvement. Moreover, "properly designed environmental standard can triggered innovation that may partially or more than fully offset the costs of complying with them" (Porter & Linde, 1995, p.98). In order to response to environmental regulation, furthermore, innovation can take 2 forms: companies get smarter to deal with pollution and innovation address the environmental impacts and simultaneously improved the affected products (Porter & Linde, 1995, p.101).

In this circumstance, any company intend to be listed in the international stock market must consider the environmental impact of their products and services, both physical

and social environment. Nowadays it is a necessity for companies to start concerning to “social responsibility” for their environment. Bebbington & Gray (2011) said “The companies which previously respected for their contributions in the industrial technologies and economies were later shunned for causing significant harms to their environments”. Simultaneously, the implementation of eco-efficiency based on Environmental Management Accounting in Indonesia also still need to be encouraged, so that there should be a research in this subject, particularly in Surabaya and surrounding areas, or East Java.

This research was conducted in a company producing potential environmental impact products. Why in Surabaya? Because as the second biggest cities in Indonesia and as a gate of the East Indonesian economy, a lot of large scale companies operated in Surabaya, and potentially those companies related to the environment. Therefore, the selection of study sites the city of Surabaya is justified.

This research was conducted at PT. Semen Indonesia (PT. SI) which is headquartered in Gresik. The selection of PT. SI is because the company is the biggest cement factory in Indonesia and its products have a potential impact on both social and physical environments. In the production process, cement requires huge electrical energy, needs large water consumption, and the sufficient absorption of resources, as well as generates considerable dust that have potential pollution for surrounding environmental. Therefore, the selection of research sites in logically justified.

Based on the above background, some problems will be answered are: (a). How does PT. Semen Indonesia (SI) define and implement eco-efficiency in their efforts to produce environmentally friendly products? (b). How do those activities can be interpreted as an effort to achieve sustainable development? The aims of this study, moreover, were: (a). Knowing, evaluating, interpreting, and analysing the process of eco-efficiency implementation in the company; (b). Knowing that the implementation of eco-efficiency is a company’s attempt in achieving sustainable development.

Academically, the contribution of this research will enrich management accounting literature by introducing environmental-based concepts that has been implemented in certain company. Sequentially, it will push academicians to accommodate the new environmental issues. In terms of the company's management policy, the results of this research may contribute to company for giving more pay attention to eco-efficiency that has become a world issue, so that it will help the company in making strategic go-international decision.

### **Literature Review**

The need for a substantial response from the company regarding environmental issues in the world is increasingly widespread. This need is not only expected from the company, but also from various sectors, such as business, government, professional, as well as academics.

The Exxon Valdez tanker accident in the 2000s at Canada, for example, became the widest environmental impact accident, took years and cost millions of dollars when spilled oil was cleaned up from the sea. Accidents in the mining company at New

Zealand in 2010 that caused 29 miners died, or mining accidents at Chile in 2011 in which 33 miners trapped for 69 days underground, and created a very spectacular rescue effort (Coetze, 2010). Pollution case of Buyat Bay at Indonesia in 2004 reminds to the similar case occurred at Minamata Bay, Japan in 1953. The case of “Lapindo Mud”, well known as the “Sidoarjo Mud Volcano”, became the most popular environmental case in the last decade renowned throughout the world. Of Gas wells drilled by PT. Lapindo Brantas in Porong, Sidoarjo, mud gushed out and never stopped since May 27, 2006 till now 2016 brought a result of the sinking of 18 villages and the expulsion of thousands of residents with a loss of billions of IDR.

Due to the currently catastrophic events, then companies are required to pay attention to the environmental impact of the production process. Therefore, companies produce products/ services must be environmentally friendly companies. Moreover, the demands of society has led to sustainable development in which future generations will be bet, in order not to become a victim and inherit our mistakes today for not being intelligent in managing our environment.

### **Theoretical Overview**

Environmental Accounting became a concern since 1990s with the publication of *The Greening of Accountancy* by the Chartered Association of Certified Accountants (ACCA). Green Environmental Accounting based on the US Environmental Protection Agency (US EPA) definition is a function that describes that the environmental costs must be considered by stakeholders in an effort to reduce or avoid costs, and at the same time to improve environmental quality (Tode, 2010).

In 1992 the Department of Ecology Washington State, USA, published guidelines for “how to develop accounting system for pollution prevention” (Gray, 2003, p. 32). Washington State government began to regulate how companies which have potential to pollute environment in their production process must clearly disclose it in their reporting system. The underlying concept is a simple statement: “the polluters must pay”. Anyone who in their activities have potentially to pollute environment, then he must pay to the State, and then the State is responsible for cleaning up the environment. In developed countries like Australia, for example, the price of diesel fuel is much more expensive than the price of leaded gasoline (in Indonesia called as Premium), and unleaded gasoline (Pertamax); it is because diesel contributes more pollution than both premium and pertamax. On the other hand, the price of unleaded fuel is the cheapest one because of the lowest contribution in polluting environment. In 2007, the government of California prohibited supermarket plastic bag, this is because the high level of difficulty of destruction of plastic in nature. Some literatures say that the plastic naturally destroyed after 100 years. Currently in developed countries such as Australia, America, and Europe, supermarket is no longer providing plastic bags for their customers, and they ask their customers to bring their own bag or buy eco-friendly bags.

Furthermore, in line with the issue of environmental accounting, a concept called eco-efficiency was introduced. Hansen & Mowen (2007) states that eco-efficiency increases efficiency by improving environmental performance through six stages, namely: a). Customer demand for cleaner products, b). Better employees and greater productivity, c). Lower cost of capital and lower insurance, d). Social benefits leading

to improve image, e). Innovation and new opportunities, and f). Cost reduction and competitive advantage. Having cost reduction and competitive advantage as the final goal, the company implemented eco-efficiency will be able to compete and have a competitive advantage because it has a lower cost compared with its competitors.

Eco-efficiency is related to activities undertaken by the company in order to produce the goods or services that are useful and environmentally friendly, and at the same time reducing the negative impact on environment, and reducing the consumption of resources. In addition, the World Business Council for Sustainable Development (WBCSD) defines Eco-Efficiency as “creating more goods and services with ever less use of resources, waste, and pollution” (Lehni, 2000). Eco-efficiency is an emerging phenomenon in developed countries in which the level of environmental concern has been relatively high. Awareness of physical and social environment is very strong at all because it will affect the performance of the company in the future. Kaplan & Norton (2004, p.165) states “We recognize companies’ responsibilities to employees, citizens, and reviews their communities because failure to perform adequately on regulatory and social process puts at risk the company’s ability to operate, grow, and delivering future value to shareholders”. This phenomenon is being transmitted to the developing countries in which its environmental awareness still considered relatively low. Firms in developing countries want to sell their products abroad, or listed in the international stock markets, then inevitably and the like or dislike having to start concerned with environmental impacts of their products.

The implementation of eco-efficiency in the company’s activities is expected to reduce cost which is subsequently became one of the attributes to excel in competition. Furthermore, Kaplan & Norton (2004, p.165) stated “Reducing environmental incidents and employee safety and health also improve productivity and lower operating costs”. On the other hand, according Nidumolu, Prahalad, & Rangaswami (2009) a few companies in the world believe that the more environmental friendly company, the higher the effort to achieve, the more expenses to be incurred, and will ultimately result in reducing the company’s competitive advantage. The demands of environment-friendly society have an impact on rising costs and declining competitive advantage, then the company must have a sustainable development program based on innovation. Stages of eco-efficiency consist of six phases as shown in Figure 1 below:

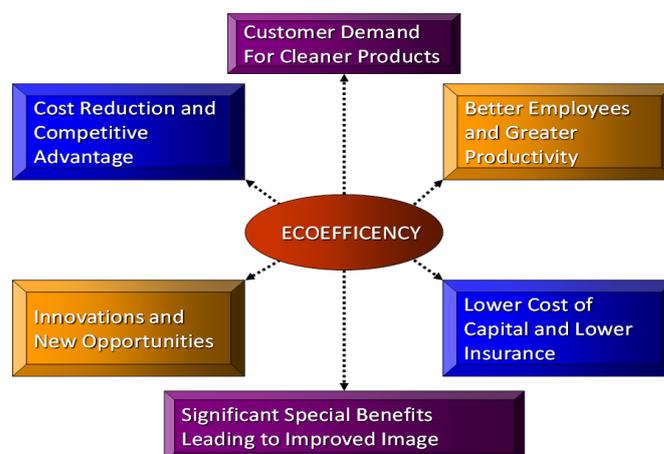


Figure 1. Eco-efficiency (Hansen and Mowen, 2007 p. 779)

The WBCSD has identified seven elements in which a business can improve its eco-efficiency: (1). Reduce material intensity; (2). Reduce energy intensity; (3). Reduce dispersion of toxic substances; (4). Enhance recyclability; (5). Maximize the use of renewable; (6). Extend product durability, and (7). Increase service intensity (Lehni, 2000, p.15). Seven of these elements should be applied by the company, so that efforts to achieve sustainable development can be realized.

### **Sustainable Development**

Sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Hansen & Mowen, 2008, p.779) and Lehni (2000). Something that has to be done by companies in Indonesia is linking eco-efficiency to sustainable development. We must not sacrifice the future of our generations; it is necessity that current generation are responsible for the fate of the next generation. We must not repeat the case of Buyat Bay, and the case of Minamata in which environmental pollution has impacts on birth defects in the future generations. The destruction of Porong environment by the Mud Volcano, the deprived population of ancestral lands, the loss of trillions of rupiahs that burden both, company and the government’s budget, should not be happened again in the future. Sustainable development initially requires a high initial cost that may affect in declining of company’s competitive advantage. Especially, companies in developed countries derive the pressure on environmental issues differently than firms in developing countries. However, Nidumolu, Prahalad & Rangaswami (2009, p.57) stated: “Making our operations sustainable and developing ‘green’ products place us at a disadvantage vis-à-vis its rivals in developing countries that do not face the same pressures”. This is a contradictory situation; on the one hand consumers are demanding products that are environmentally friendly. On the other hand when the company will meet these demands, it will lead to increased costs, and certainly customers are not willing to pay more for these products. Therefore several company executives in the USA suggested “become sustainable as a corporate social responsibility, divorced from business objectives” (Nidumolu, Prahalad & Rangaswami, 2009, p.57). The three of them proposed 5 stages of sustainable development that will lead company to compete and to innovate in production activities, but remain achieve the ultimate goal of eco-efficiency: cost reduction and competitive advantage.

Several companies in the United States have increasingly concern to the demands of people to be more aware to their environments hence they compete for the growing green. However, although the best approach for companies to be growing green and toward sustainable development has not been found, Unruh & Ettenson (2010, p.96) proposed three intelligent strategies toward sustainable products called as the “3-A: Accentuate, Acquire, and Architect”. This approach as a result of the 10 case study carried in companies that have already implemented green policies. Accentuate is a strategy that seeks to explore the environment aspect should be applied in the company’s attributes in order to produce environmentally friendly products and services. This strategy made by Arm & Hammer in producing baking soda. Acquire is done by buying the brand from labelled green or environmentally friendly company, for example when Unilever acquired Ben & Jerry; L’Oreal bought Body Shop and Colgate-Palmolive bought Tom’s of Maine. The Architect is for companies that have a good history in of innovation, such as, when Toyota built Prius (Unruh & Ettenson, 2010, p.96).

### Previous research

Harun (2011) examined the influence of environmental performance toward financial performance in mining, energy, oil and gas companies, and manufacturing in Indonesia. Environmental performance is measured using environmental performance rating called PROPER developed by the Ministry of Environment, while financial performance is measured by using the Earning per Share (EPS). The results showed no significant effect of environmental performance to financial performance. Sarumpaet (2005) examined the influence of environmental performance PROPER to the financial performance as measured using Return on Assets (ROA). While Alisyahbana & Jusuf (2004) examines how green accounting is able to measure sustainable development by using certain indicators. Cummings *et al.* (2010) stated that since 2008 the Australian Government has adopted the Emission Trading Scheme (ETS), which is designed so that the companies in Australia are able to manage the excess of carbon emissions resulting from their business. Hence, in the event of environmental damage caused by the company, funds have already available to pay such damages. The idea behind this adoption, according to Cummings *et al.* (2010) cites several authors (Lehman, 1996; Milne 1996; Gray, 2008, and Andrew *et al.*, 2010), derived from the neo-classical economic approach to change the behaviour of individuals and organizations: that the behaviour of individuals and organizations can be changed and adjusted in line with the changes in environment and technology. Yakhou & Dorweiler (2004) examine the environmental accounting as a major and important component of the business strategy in the United States. The study focuses on the integration of environmental policy with a policy issued by the government business entities. The company in its business strategy must consider capital costs incurred for the provision of pollution control devices that prevent environmental impacts ugly.

The above studies, despite using different research approaches, involved many aspects of the company's operations and the environment; talked about the company's activities that affect the environment, and discussed impact of environmental performance on financial performance, as well as talked how the government's policy in addressing the environmental impacts caused by company's operational activities. This study, moreover, want to see how a company respond to demands for the environmental awareness; how the company is trying to meet the public demand for environmentally friendly products, and the demands of stakeholders about clean environment.

### Research Methodology

This study explores the non-positivist mainstream approach using exploratory case study research, because the researchers wanted to explore how the response of company in addressing new phenomena in manufacturing technology. According to Eisenhardt (1989, p.534), case study is "a research strategy which focuses on understanding the dynamics present within single setting". Yin (2001) and Dul & Hak (2007) stated research design using case study consists of at least 3 of 5 following components: 1). Study about research question; 2). Its unit of analysis; 3). Proposition (if any); 4). Logic linking data to proposition/question; 5). Criteria to interpret the findings.

The formulated research questions are as follow: 1. How does company respond to environmental issues? 2. How company interpret the concept of eco-efficiency? 3. How does company apply these concepts? 4. How company interpret the concept of sustainable development? 5. How is the implementation of eco-efficiency and sustainable development? The unit of analysis in this study is a “perception, understanding and behaviour of corporate leaders regarding eco-efficiency and sustainable development concepts reflected in the company’s policy in its operational activities, and the company’s efforts to minimize and prevent impacts on the environment, as well as the company’s efforts to prevent the occurrence of environmental cost.” Since this an exploratory study, researcher consider not to formulate proposition. Logical linked between data and the question is shown as follows:

The data collected consists of:

- a. Data relating to the company’s policy on environment. This data inform how the company’s policy on environmental issues related to the production process and its environmental impact. This data was obtained by conducting interviews with top management, such as, General Manager of Research & Development and Quality Assurance and staffs.
- b. Data documentation relating to company’s reporting provides information about how the company record and report all expenses associated with the environment.
- c. Observing the activity, especially with regard to environmental issues.

To analyse data, researcher use data triangulation from various data sources:

- a. In data triangulation process, there is possibility to reduce data that has been obtained, especially less useful or saturated data. Data triangulation between data sources such as interviews with data documentation is in order to “test” validity and reliability of the data collection method.
- b. Once the data is believed to be “valid and reliable”, analysis and research results were written in accordance with the case study research rules.

Key informants are the General Manager of Research & Development and Quality Assurance of PT. SI: Mr. Rudi Hermawan, ST and Head of Product Development and Energy Saving Mr. Bagus Wisnuaji and also Head of Education and Training Ir. Aris Sunarso, MM. Interview transcription process from audio into written form has been made, and irrelevant data have been reduced. Another data source such as hardcopy of documentation is retrieved from PT SI’s website.

## **Results**

PT. Semen Indonesia (formerly Semen Gresik) was established in Gresik on 7 Agustus 1957 by the first President of the Republic of Indonesia, President Soekarno, with an installed capacity of 250,000 tonnes of cement per year, and until end of 2012 the capacity grew to about 28.5 million tons/year. On December 20, 2012, through the Company Extraordinary Shareholders General Meeting (ESGM), officially changed the name of PT Semen Gresik (Persero) Tbk, become PT Semen Indonesia (Persero) Tbk. Replacement of such name was the first step in realizing the establishment of the

Strategic Holding Group targeted and believed to be able to synergize all operational activities, and maximize the full potential to ensure the achievement of operational and financial performance.

The research's results show that:

1. PT. SI is already very advanced in understanding, defining, and implementing eco-efficiency in order to produce environmentally friendly products. The company is not only interprets the concept, but they do the efforts, many environmental programs and activities to address current environmental issues.
2. PT. SI activities are to reduce environmental impacts and save the energy by introducing many innovations such as the use of waste heat recovery generation (WHRG), the use of risk husk, and city garbage. The company is not only reducing city garbage and making the city clean, but also reducing the CO<sub>2</sub> emission as well as reducing electricity cost consumed by production process. It leads to the implementation of sustainable development.

## Discussion

The following discussion adapted to the stages in the above-mentioned concept.

### 1. Customer Demand for Cleaner Products

The advanced manufacturing environment, where the company has been very in tight competition, requires companies to put customers on a very important position. The company tried to capture what the customer needs, and then producing goods/services to make customer satisfied. Hence, the company will be very concerned about what demanded by customer. One of them is the products purchased by customers must be environmentally friendly products.

In PT. Semen Indonesia (SI) demand from customer for cleaner products and environmental friendly almost nothing. The demands mostly come from shareholders of PT. SI: 51% owned by the government, and the remaining 49% owned by the public. The public owners mostly come from abroad, namely the United States. The US shareholders who already have a high environmental awareness demand that the process of producing cement must be environmentally clean. Rudi said as follows: *"..., yes there is demand from customer but is not too high. It more came from shareholder. Our shareholders are 51% owned by the government, while the rest own by public and nearly half abroad, in America. Their demand is very high."*

Shareholders that already have a high environment awareness concerns about the environment impact of the product. The environmental impact will caused significant losses to the company. Meanwhile, the demand from society usually is problem of dust released in the cement production process. Public concern to cement products is more to the good quality products at affordable prices rather than dust pollution. Rudi said further:

*"They, shareholders, ask how the environment management. For them if there is an environmental problem would be very high losses if the plant to should be shut down. Losses could be billions of rupiahs. So the concern is in the shareholder, their demand is quite high. Complaint from public mostly is dust problem."*

Dust problem is inevitable, because the cement production surely generate dust. The company's effort is that dust does not exceed the allowable threshold. Rudi & Bagus said that sometimes dust issues often boarded by the third party interests. *"Dust issued is milled limestone"* (Rudi). *"For public, if it happened they will latterly complain, and some NGOs will participate to blow it up"* (Bagus).

PT. SI tried to control over environmental pollution. In an effort to prevent air pollution, the entire company production facility is equipped with dust catcher equipment, such as: Electrostatic Precipitator (EP), cyclone, conditioning tower, and bag house filter. In addition to the use of proper equipment, PT. SI also provides a buffer zone, planting of trees in the area of green belt around raw materials, and built green barrier inside and around the plant in order to reduce air pollution. To anticipate the possibility of environmental impact, PT. SI has implemented the concept of Triple Bottom Line with 3 P's (Profit, People, and Planet). The company also implements green industry as a commitment to environment, and concern for the quality of environment as part of the implementation of 3P philosophy. PT. Si tried to balance between Profit (economic performance), People (improving people's lives), and Planet (keeping the environment), expressed in the company's policy, as follows:

Managing and controlling all activities that provide benefits to stakeholders to always obey the rules and regulations, perform better environmental management, including pollution prevention of occupational accidents and occupational diseases, always pay attention to the significant impacts, risks, and best practices of Good Corporate Governance in realizing the vision of "Being a leading cement company in Indonesia and Southeast Asia". (Source: Internal)

Rudi added as follows:

*"We aware that we have a 3P's philosophy: Profit, People and Planet that guide us since 6 years ago. I always benchmark, directly or through website, and some meetings that I attended, I saw that concern to the environment in Europe is very high. Semen Indonesia without being told to do so, have our own initiative to do what we ought to do. Then we arrange the step, we arrange strategy even before the government decided to become a regulation."*

Looking at above fact, it appears that **PT. SI is already very advanced in understanding one aspect of eco-efficiency**. The company not is only interprets the concept, but they do the efforts, programs and activities to address these demands. This is not so surprising since PT. SI has already long enough interacted with the world and international market, listing in the international stock exchanges, as well as acquiring a Viet Nam cement plant Thang Long.

## 2. Better Employees and Greater Productivity

The most pollution in the cement factory is dust. Surprisingly, having been accustomed to enjoying the dust, then no employees need to file a complaint. However, as multinational company, PT. SI has adopted its business partner's habit, as well as its competitors, in facing the possibility of contamination. The Japanese 5-S concept (*Seiri, Seiton, Seiso, Seiketsu, and Shitsuke*) mean Tidiness, Orderliness,

Cleanliness, Standardization, and Discipline was adopted and modified to 5 R. In applying the 5R concept, PT SI applies a standard called House Keeping Rate (HKR). Below is the answer to about whether there is an employee demand on a clean work:

*“I’ve been 11 years in the factory. No one complain about dust, dust is our daily live. Just like those in the fish market, the longer we stay the lesser smell is. However, we always do monitoring, we improve our 5R. We socialize the 5S Japanese to employees. I and employees do benchmark to Holcim Cement, we saw their cleanliness and we try to apply in our own factory. Clean is synonymous with comfortable, but is not easy to make clean plant in one year. We have a measuring instrument called House Keeping Rate (HKR). It becomes our KPI here. We demand that all work units have 75 point of HKR.” (Rudi).*

House Keeping Rate as a key performance indicator of cleanliness has 0-100 scale. Start in 2012 the company set the scale of 75. It has been increased from the previous year standard of 70 HKR. Division R & D annually sends a team of assessors to all divisions, even to three SI factories (Gresik, Padang, and Tonasa), including to the administrative office in Jakarta. In assessing the cleanliness, the company is divided into three segments, namely offices, semi offices, and factories. Standard 75 HKR is applied throughout the company. Of course 75 HKR for office is different from 75 for semi offices, and factories. The difference lies in the assessed parameters between segments. Therefore in assessing the performance of cleanliness in each division, then the comparison is: office compared to office, semi office to semi office, and factory to factory.

Assessment model appeared to be particularly performance-based; and the performance of current month will have an impact on the next month employees’ salaries. Assessment to the cleanliness level was started in 2014. When one division do not reach the standards set by company, it will lead to the decreased in employee salaries in the division. The decrease in HKR has an impact on salary reduction. Decision to form HKR as KPI is also resulted from benchmark of R & D division to Holcim Cement that has already using the European standard of cleanliness. In Holcim if the standard is not achieved, then the employee can be fired, while SI has not. Rudi stated: *“I have always do benchmark with European companies such as Holcim. The policy clears, and it directly from Europe. Employees who do not obey the company rules are asked to out. But we have not implemented such a policy. We are start as traditional state-owned enterprises and now we lead to go as them.”*

In selecting and evaluating of detection and control environment tools, PT. SI has set up and used very sophisticated tools. This policy is determined by top management because SI are already well aware if there is leakage emissions happened, then the production process must be stopped. This condition only affects nothing but a very big loss. One minute leakages have an impact on long enough halt of production process. And it will take more than 1 hour to revive it including warming-up the machine, and that means hundreds of millions of rupiah losses.

The company has also implemented Environmental Monitor Program which monitored environmental activities that are conducted regularly in an effort to comply with Environmental legislation. Monitoring is done routinely for the following

aspects: factory chimney air emissions; ambient air quality; the level of environmental noise; dust concentration plant area; work climate; quality of waste water; and sea water; and monitoring the presence of underground water. Examination of the parameters of Environmental Quality Standards is routinely performed either by internal company or a competent independent body. The examination was conducted at several sampling points according to the provisions specified. Implementation of this program will prevent the possibility of termination of production process. Termination of production affects only none, but a loss. Bagus stated: *“Only one minute leak, then plant must be stopped, and that means a great loss. One hour stopping means 300 tons of products, if one ton equal to 1 million IDR losses we can calculate how much the losses are.”*

Based on the interview mentioned above combined with documentation PT. SI, **it can be concluded that PT. SI has committed acts that caused by the “demand for clean products from customers and shareholders, and a comfortable place to work of employees”**. Even though company did not explicitly referred to the eco-efficiency concept, but **substantially the second stages eco-efficiency has been applied by the company.**

### 3. Lower Cost of Capital and Lower Insurance

Problems often arise in companies which its production could potentially affect the environment is facing of public claim about environmental pollution. Pollution can be ‘smoke, used water, odour, air, noise, and others. Sometime factory emit no potentially damaging waste to the environment, but because of encouragement of the irresponsible third parties, then the public file either financial or non-financial claim. Some claims are actually inappropriate and untruth, however SI still tried to fulfil the claim. Rudi said: *“So far, yes there is a claim. Community members have various issues and problems, including political issues, such as the election of head of village or local government. At the election time there will be a lot of claims, it’s always said on behalf of community, for the community purpose and such.”*

The facts show that claims often boarded with some interests include political issues. When elections of government officials or candidates legislative come, then certain candidates raised the environmental issue followed by submitting a claim to the company. Thus, it would appear that the candidate is “care on the environmental problem”, and appear “defending the interests of people”, so they deserve to be chosen. But whether it is a pure case or case of particular interest of certain political party, the company continues to spend money and resources to help people regardless it cannot be proved that the damage caused by the company’s activity. Bagus said:

*“We still help because we looked around the factory. We have to share our enjoyment with public. We hope if there is problem happening to the factory, they will participate to help us due to the benefits that they have already received. But it is not easy. Sometime community asked to be accepted as our employees. But the company have certain requirements to be met. And also we are not likely to accommodate number of people. For example, we may needs 1,000 people, while the people there were 30,000 people. We may not bear all. So we stimulate CSR program”.*

As stated in the previous paragraph that the management carried out Environmental Management Program. This program is efforts to prevent water and air pollution, as well as building "Culture of Green Production" in the plant operation. According to Bagus, cement industry produces no waste except dust. In addition, SI even utilizes waste from other industry, such as silica, to be reprocessed as a substitute for clay. Furthermore Rudi added: *"The use of silica is for replacing clay. By using silica, we get 2 benefits. First, the environmental pollution problem is resolved, and second we have alternative materials. Cement is the most perfect incinerator. The regular incinerator heat is 500-1000 degrees, and it still produces waste. In cement production we have 1500 degrees, so that all heavy metals disintegrate into clinker."*

Due to the lack of waste circumstances, the company is not trying to insure the activities related to the handling of environmental pollution. The company had developed other environmental management program called resource conservation program. This program makes the company pay attention to the efficiency of using natural resources and energy. Resource conservation measures, through the following programs:

### **Energy Efficiency**

Efficiency has become a prerequisite for excellence in increasingly business competition in the global era, including in the cement industry competition. Energy for SI is one of fairly large component expenditure in the production process. SI initiates to build a power plant by using the heat energy of exhaust gas or waste heat recovery generation (WHRG) in factory of Tuban and Tonasa. In the framework of energy security, the company conducted an energy efficiency program by conducting audits and management of electrical energy and heat, and the use of Alternative Fuels and Materials (BBMA). These alternative fuels can be heat energy that can be harnessed to generate electricity. Rudi states:

*"The energy we produced is heat. We are conducting a study of how heat will be utilized as a power plant. We have already successfully developed it in Semen Padang. From one factory in the first year we could produce 8.5 megawatts. Such power is used to drive our turbine to reduce the burden of electricity. We are still calculating for Tuban factory, it might be possible we can produce 25 megawatts. This is an expensive investment, but we have to do it. Now it still expensive one, but in the future the price of electricity most likely will increase. From the sperspective of environmental, the use of waste heat will reduce electricity expenses. So if we could generate 25 MW by our own energy saving, the cost of the PLN electricity is automatically reduced."*

Bagus added: *"We can produce 4 times bigger between 25-28 megawatts. It was our yesterday calculation. And this will we be applied in Tuban."*

According to Aris, the cost of electricity is so big about 60% of the total production cost, and the rate varies from one plant to another plant. Aris said: *"The cost of electricity for the year 2007-2008 reached IDR 36-38 billion for 3 plants. Besides, we also use other fuels such as coal; we use about 1000 tons of coal with the price Rp. 500,000/ton."* Aris continues *"The biggest cost in cement industry is energy; approximately 61% is energy, while material about 12-16%. So, all innovation will*

*reduce energy consumption. Furthermore, we are increasingly used advanced technologies so that power consumption is going to reduce."*

Looking at what has been done by PT. SI, **it appears that all efforts to prevent the pollution have a double-edged sword impact.** On one hand, **the effort prevents environmental pollution,** and on the other hand, **these efforts have resulted in substantial energy savings.** Ultimately, by all these savings, the cost will decrease, and in the future will affect profit, influence pricing policy, and other policies.

#### **4. Significant Social Benefits Leading to Improved Image**

Company policies relating to the environment will makes good corporate image increases in the eyes of the community and shareholders. As already mentioned above, some company's policy regarding environment actually have preceded the government policy. For example: carbon-handling problems. SI has been implementing carbon credit which is an elaboration of the Kyoto Protocol that has been ratified by many countries, including Indonesia. In the Kyoto Protocol, companies in the developed countries are required to reduce emissions of carbon dioxide (CO<sub>2</sub>) it with the use of their advanced technology. Or the second way by buying the CO<sub>2</sub> produced by companies of developing countries. PT. SI still seeks subsidies from the government for it.

Impact of this policy have 2 sides, first, the CO<sub>2</sub> emissions continuously decline from year to year; and second, the excess of CO<sub>2</sub> can be sold to developed countries. The use of CO<sub>2</sub> as an alternative fuel requires a very expensive investment, but on the other hand it will increase the company's image in the eyes of foreign investors. In the future when fossil-based fuels increasingly scarce, the use of CO<sub>2</sub> becomes a smart choice. The increasing of company's image in the eyes of public and investors become very important. Rudi explains: *"We spent IDR 60 billion just for that. The impact is a better image. We have to do the same thing as our European competitor did"*.

Bagus added: *"Actually, most demands come from shareholders, although now the government has just started. For the government this is inevitable condition they have to start with the rules on CO<sub>2</sub>."* CO<sub>2</sub> emissions targeted company is determined by comparing to more advance company. Benchmarking is done with other countries and other companies. Aris explains:

*"We even call consultant want to know how does India condition? We also study in Europe. Then, we understand that our challenge is how to reduce greenhouse gases. We learn processing of hazardous materials (B3) and non-B3. We reduce the amount of waste we generated. We benchmark water conservation, and find out how to reduce our water consumption"*.

PT. SI has developed Project Clean Development Mechanism (CDM) since 2009, as a form of participation on joint efforts to overcome the effects of global warming. Various efforts to improve the environmental performance continue to be done by building a green-minded corporate environment and the various forms of the company's concern for environmental quality. **The image of PT SI increases because of its environmental awareness.** PT. SI was awarded the PROPER GOLD in 2012 from the Ministry of Environment. In addition, PT. SI is also awarded GREEN

Industry from the Ministry of Industry and the Indonesia Green Awards 2011 of Magazines Business & CSR.

## 5. Innovation and New Opportunities

Innovation is one of the company's efforts to increase performance over time. Innovation consists of two categories: incremental and breakthrough innovation. Incremental innovation is a business/activity to find and eliminate the main causes of a problem and to ensure no recurrence of the problem, through Quality Control (QCC), Suggestion System (SS), 5S Program and Total Productive Maintenance (TPM). Breakthrough innovation, furthermore, is an attempt to discover, plan, and implement new ideas that have significant positive impact through the application of Innovation Management in a corporate environment. PT. SI also introduced a management innovation known as the Indonesian Cement Innovation Management (MI-SI) is governance includes promotion, stimulation, initiation, implementation, documentation and appreciation of innovation in SI in order to increase competitiveness, sustainability and the Company value.

Many innovations have been carried out by PT. SI relating to the environment, such as the construction of Green Power that utilizes exhaust gas, municipal solid waste (bio-gas) etc. Such a development is done in Gresik and then followed by similar development in Semen Padang. The construction of this power plant was in cooperation with JFE Engineering Corporation June Ogawa, as a step to increase the efficiency of energy use in the production process. Actually, the company requires considerable energy availability. Power plant projects that harness the energy of exhaust gas is expected to have large enough multiplier effect for the company, as well as the surrounding community. This is the company's participation in the national energy-saving movement. This further confirms that SI is a pro-environmental (green corporate) company in accordance with the concept of Go Green.

To recover low-temperature exhaust gas as in Tuban and Tonasa, SI planned to use the Organic Rankine Cycle (ORC) system. Gresik municipal waste is also used by the company as environmentally friendly plants. Trash will be separated between plastic waste and paper, and waste that can be decomposed to become compost. The project is expected to commence in January 2014. Rudi explains:

*"We have another project that is garbage of Gresik city. We spend around IDR 10-15 billion. We separate city garbage into 2 parts: compost, and paper and the non-biodegradable plastic; we will make an alternative fuel. By applying this technology we help local government to deplete city garbage. That our CEO's commitment. Temporarily the project is still in Gresik, then if successful we will developed elsewhere".*

Beside such city garbage, PT. SI also uses rice husks as an alternative innovation. Rice husks were purchased from farmers, and burned as fuel to produce heat energy and simultaneously produces CO<sub>2</sub> which can be sold to the developed countries. Currently, investments by the company to make fuel from husk is quite expensive with the rate of returns are still small. However, for the sake of protecting the environment, this policy is maintained by the company to anticipate fuel needs in the future. Aris added:

*“We invest quite expensive around 6 million US dollars. Actually the calculated IRR is not feasible, but the project must be run as our environmental awareness. However, if I looked at one day due to the scarcity of fossil fuels, the increase of fuel price in 5-10 years, this will be a good choice. So we start first before someone does. The husk suppliers come from our own society”.*

To appreciate innovations, companies engage activities known as by the Semen Indonesia Award on Innovation (SI-AI). Through SI-AI is expected to create a new culture to innovate, increase competitive advantage, and improve consolidation in SI environment, and simultaneously providing an appreciation to employees, business unit and corporate that has positive impact on improving the company’s performance. SI-AI is carried out every year, and consists of three groups of innovation, namely: (a). Raw materials and products, (b). Technology and production processes, and (3). Business processes. The results of SI-AI activities have been implemented and monitored periodically to ensure that **these innovations bring the impact to increased efficiency in company.**

## **6. Cost Reduction and Competitive Advantage**

The last part of the concept of eco-efficiency is cost reduction that will have an impact on the company’s competitive advantage. This cost reduction is caused by energy savings due to innovations in the production process as described in the previous paragraphs.

Efficiency from electricity cost savings, for example, is an energy cost saving resulted from the operation of Tuban plant and Tonasa IV plant could reach IDR 24 billion per year, meanwhile its construction requires an investment of IDR 115 billion. Estimated payback period of the power plant is only 56 months or 4.7 years. The cost of generating electricity using Waste Heat Recovery Generation (WHRG) is only about IDR 100/kWh, while the price of electricity from PLN Rp 900/kWh. The price disparity is wide enough. Power plant using waste heat gas will make the company more efficient due to the very large energy cost savings. This would be more profitable for SI, especially in achieving corporate profits.

Rudi explains: *“As I stated earlier that the heat produced by cement production is used for generating electricity, it means saving for SI. Furthermore, the use of municipal waste as an alternative fuels is also a saving.”* Bagus added that some programs that have an impact on the cost savings have been implemented by SI, and luckily competitors have not implemented yet. *“And one of our competitive advantages is we implement such programs before our competitors do. We do water conservation by utilizing excavated and reservoir. So, our target is the use of rain fed water above 40% and we do not use much underground water anymore. We also reuse the used water in the factory”*

Some innovative programs not only generate cost savings and cost reduction but also generate environmental benefits such as selling CO<sub>2</sub> to developed countries. PT. SI currently has a stockpile of 100,000 tons of CO<sub>2</sub> generated from 2 years activities. The price per tonne of CO<sub>2</sub> is originally around \$ 10-15 per ton. Bagus explained as follows: *“We still keep it because the price drops to \$ 1/ton, decrease from \$ 10-15 last year. Yesterday we offered \$ 3-4 per ton.”*

It appears that PT. SI is not merely interprets the eco-efficiency concept, but it has already implemented the concept. This proves that the environmental awareness shown by the company bring a favourable environmental impact. First is the recognition from shareholders about the company's environmental awareness. Second, it improves the company's image as an environmentally friendly company, third it results environmental benefits in the form of cost reduction as well as other income from waste treatment, as well as selling of excess CO2 emissions.

### **Sustainable Development**

Sustainable development is a concept as a continuation of eco-efficiency concept which believes that the current generation activities will not pass down the environmental damage both the social and physical environment to the next generation. PT. SI made efforts to comply with the sustainability principle. Rudi said about this concept:

*"We've did it over the past 10 years. As I said earlier, I always benchmark. We also saw the Cement Sustainable Initiative (CSI). There are four programs that will we do: 1). Implementing environmental management system. One of resource conservation is energy efficiency. We have to innovate in order the energy consumption of electricity and heat per ton product decrease year after year. We produce different types of cement by utilizing high calorific value waste. 2) Control of emissions and greenhouse gas reductions. 3) Waste treatment and hazardous and non-hazardous materials treatment".*

Sustainable development is a moral responsibility to future generations of the nation. In implementing sustainable development PT SI did several programs such as Environmental Management Program, Resource Conservation Program, Water Conservation Program, and Resource Conservation Program, etc.

PT. SI implement the Environmental Management Program activities in preventing pollution by building "Green Production Culture" for example the Water Pollution Control: slabbing concrete, drainage, and oil trap operation, followed by periodic monitoring of water quality, either by internal company or by an independent laboratory. The company also gave attention to the efficiency of the use of natural resources and energy to maintain the continuity and availability. In addition to the activities carried out within the framework of responsibility for the natural environment, companies also do so in the context of social responsibility to the environment such as the Partnership and Community Development (PKBL), and CSR.

Partnership Program activities focused on the implementation of economic responsibility. In 2012 PT. SI Partnership Program funds amounting Rp150,09 billion, the number of the partners increased 31.9% from 18.027 units to 23.452 units. Economic aspect activities are focused on the development pattern of assistance made through distribution, managerial coaching and promoting sustainable products through exhibitions partners in and outside the country, with the aspects of equality, independence, professional and ethical. Some of the activities undertaken include: the development of dairy farms, computer assembly of education and training, the training of young entrepreneurs solid, sturdy female home entrepreneurship training, entrepreneurship training for boarding schools, as well as the development of oyster mushroom cultivation.

Community Development Program is focused on the implementation of social responsibility and environmental fields. Corporate responsibility in the social field aimed to create "positive emotional relations" with the community on an ongoing basis. Areas of community development activities in the field of social enterprise undertaken in the form of Community Development activities include, the provision of public facilities, religious, educational, health, arts and culture, emergency response and sports, nature conservation. Social responsibility in the field of environment is to support sustainable community development and environmentally friendly manner. PT. SI very aware that the achievement of financial and social work will not be effective without the support of concern for environmental sustainability.

### **Conclusion**

PT. Semen Indonesia interprets and implements the concept of eco-efficiency very well even though they did not mention it as eco-efficiency. The company adopts some concepts of modern manufacturing technologies, such as the Japanese 5S concept converted into 5 R; the company also applies the 3 R and 4 R environmental management concepts, a 3-P concept that requires companies not only think about profit, but also prevent people and the planet from environmental damage. The implementation of eco efficiency produce clean environment and simultaneously reduce cost and improve company's image.

PT. SI has also adopted the concept of sustainable development that is preventing the current generation to all-out explore the resources at the expense of future generations. Corporate Social Responsibility and Partnership is a concrete manifestation of sustainable development programs. The company's innovation is not only gains benefit for company but also for community and surrounding society. The company helps government to reduce city's garbage and create energy saving and energy alternative.

The research implications are understandings for academicians to do more efforts in introducing environmental awareness to students. The content of management accounting subject must be restructured to enrich and give strong focus to environment aspect, so that will increase environmental awareness to students. To other companies that have potentially harmed the environment, this study might be used for benchmarking. Considering clean environment will not only improve their image as "environmental friendly company" but will also reduce their cost and may have an additional benefit by selling their CO<sub>2</sub> inventory to the developed countries under the Kyoto Protocol scheme.

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