

## **Can the Eco- efficiency represent Corporate Environmental Performance?**

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### **Abstract**

*This paper discusses on the relationship between the corporate environmental performance and the eco-efficiency concept. It based on an extensive review of the related literature for the purpose of justification of using eco-efficiency concept as proxy of corporate environmental performance. It also highlights on the main used definition in the environmental related studies, and the differences between these definitions. Moreover, the paper emphasizes the measurement issue with regard to environmental aspects. The paper concluded that the eco-efficiency concept incorporates the main environmental performance indicators such as clean production, pollution prevention, and waste minimization. Additionally, the eco-efficiency concept has advantages over other environmental performance measures; this due to that eco-efficiency measure can give the real environmental performance of the corporations under investigation regardless of the nature differences between the industrial sectors of these corporations.*

**Key words:** environmental performance, measurement issues, eco-efficiency concept.

### **1. INTRODUCTION**

Since ancient time, there has been a growing interest in the role of the corporations in the society, and particularly, in the damage they being done to the natural environment (Ahmad, 2004). In 1972, the United Nations Conference on the environment represented the first international conference that addressed the environmental issues in a comprehensive fashion. It resulted in 109 recommendations related to the environmental issues should be taken by the governments (Balboa, 1973). Twenty years later, the Earth Summit on Environment and Development (Brazil) was the first time that leaders from more than 170 countries agreed that there is a need to protect the environment and not damage it (Quarrie, 1992). Such events have made the governments pay attention to the natural environment and maintain it. Additionally, the emergence of global environmental problems such as green gas emission and climate change that need an urgent solution have led to increased awareness of the society about the influences of corporations' activities on the environment.

Nowadays, companies become accountable for and responsible to manage their impacts on the environment. Thus, corporations have to measure and assess their environmental performances, and determine the actual levels of such performances. In such cases, there is an urgent need to create the perfect measures, which can represent the actual levels of the environmental performance of the corporation. By doing so, it becomes likely to determine the environmental performance's level for any company, and consequently, becomes possible to make comparisons between the environmental performances across companies. Moreover, this gives the ability to investigate the relationship between the environmental performance and other performance indicators of the corporation.

### **2. DEFINITIONS OF THE ENVIRONMENTAL RELATED ASPECTS**

In the area of environmental science, there are several definitional terms have been used to study the environmental related aspects in the corporations. Although these terms have been used as synonyms to each other, still there are differences between the focuses of these terms. This section aims to distinguish between the main used terms in the literature. It focuses on the differentiation between corporation's environmental responsibility, its environmental management, and its environmental performance. The concept of corporate environmental responsibility refers to the company's duty to pay attention to the issues related to the conservation of natural resources (Mazurkiewicz, 2004; Ngwakwe, 2009; Surroca, Tribó, & Waddock, 2010; Vives, Enterprise, & Sub-Dept, 2005; Wingard & Vorster, 2001). Several definitions have been offered to represent the corporate environmental responsibility concept.

For instance, corporate environmental responsibility is defined as “the duty to cover the environmental implications of the company’s operations, products, and facilities; maximize the efficiency and productivity of its resources for future generations” (Mazurkiewicz, 2004). The definition focuses mainly on explain how corporate environmental responsibility can contribute to the issues related to the conservation of natural resources. According to Vives, et al.(2005), corporate environmental responsibility is “the activities geared towards the reduction of the environmental impact of the operations, including such things as reducing waste and the consumption of natural resources, recycling, putting in place environmental management systems and the likes” (p.4). This definition encompasses the key features of corporate environmental responsibility’s activities, which represented by the minimization of waste, rationalization of the consumption of natural resources, recycling and the adoption of environmental management system. More so, Surroca, et al.(2010) define corporate environmental responsibility as “the broad array of strategies and operating practices that a company develops in its efforts to deal with and create relationships with its numerous stakeholders and the natural environment” (p.2). This definition focuses on identifying corporate environmental responsibility as the environmental strategies that should be developed by the company towards its operations.

In line with previous definitions, this study defines corporate environmental responsibility as the duty of the corporation to mitigate its impacts on the natural environment. The implementation of such duties is known as an environmental management, which refer to the technical and organizational activities undertaken by the corporation for the purpose of reducing their environmental impacts on natural environment (López-Gamero, Molina-Azorín, & Claver-Cortés, 2009; Wagner, 2007). López-Gamero, et al.(2009) emphasizes the necessity of distinguishing between environmental management and corporate environmental performance. While environmental management as noted above related to the activities taken by the corporation to minimize its environmental impacts, corporate environmental performance represents the outputs of environmental management activities. This consistent with the definition by Lankoski(2000), when defined corporate environmental performance as “ the level of harmful environmental impact caused by a firm so that the smaller the harmful environmental impact the better the environmental performance and vice versa” (p.10). Furthermore, Wagner (2003) defined corporate environmental performance as “ the results of an organization’ management on its environmental aspects” (p.10).

### **3. CORPORATE ENVIRONMENTAL PERFORMANCE MEASUREMENT**

This section discusses the issues of measurement from two points: the first point is related to the levels of measurement or the corporation’s levels that represent the focus of measurement, and the second point includes the representative issue, which refers to the actual components that can represent the holistic picture of the corporate environmental performance.

#### **3.1. Levels of measuring corporate environmental performance**

The environmental performance of the corporation can be assessed using different aspects of the corporation related indicators. According to van Berkel (2007), these indicators can be classified into three classifications as following:

**3.1.1 Operational performance indicators**, include greenhouse gas emissions or water usage. These indicators focus on two parts of productive outputs namely, (1) intensity indicators, which explain the environmental influences of productive out puts (e.g. kg greenhouse gas emissions or water consumption per ton of products), (2) efficiency indicators that refer to the level of efficiency in utilizing natural resources (e.g. kg of metal produced per ton of greenhouse gasses emissions). It is clear that the efficiency and intensity are the inverse of each other.

**3.1.2 Management performance indicators**, which refer to the corporation’s ability to manage its environmental aspects. This includes environmental policies or conformance with environmental management system such as ISO14001.

**3.1.3 Condition indicators**, which refer to the picture of the natural environment surrounding the corporation. It includes things such as the oxygen concentration, or the level of noise at residential locations, etc.

#### **3.2 Representative issues**

Corporate environmental performance has been measured by the results of different activities. For instance, pollution prevention activities have been seen as indicators of corporate environmental performance (Cohen, Fenn, Naimon, & Service, 1995; Hart & Ahuja, 1996; Konar & Cohen, 2001; López-Gamero, et al., 2009;

Ngwakwe, 2009; Stanwick & Stanwick, 1998; Wagner, 2007), energy and water usage (Wagner, 2005). The legal aspects such as the number of penalties (Cohen, et al., 1995; Ngwakwe, 2009) and the number of environmental lawsuits (Konar & Cohen, 2001) have been considered as indicators of CEP. Additionally, it has been argued that the eco-efficiency concept can represent the outputs of corporate environmental activities (DeSimone & Popoff, 2000; Journeault, 2010; Wagner, 2003). The eco-efficiency concept emphasizes that corporations can achieve the efficiency in both economic and ecologic aspects in the same time. This can be achieved by the following principles (DeSimone & Popoff, 2000; Wagner, 2005); reduction of the material intensity of goods and services, reduction of the energy intensity of goods and services, elimination of toxic dispersion, enhancing materials recyclability, maximizing sustainable use of renewable sources, extension of product durability, and an increase of the service intensity of goods and service. The definition of corporate environmental performance still varies across studies. Thus, it becomes difficult to identify general relationship between different indicators of corporate environmental performance and economic performance (Wagner, 2003)

### 3.3 Eco-efficiency concept and corporate environmental performance

The eco-efficiency concept was introduced in 1992 by the World Business Council for Sustainability Development (WBCSD). The WBCSD defines the eco-efficiency as “*the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity through the life-cycle, to a level at least in line with the earth’s estimated carrying capacity*” (Bidwell & Verfaillie, 2000; van Berkel, 2007). According to Bidwell & Verfaillie (2000), the eco-efficiency combines the basic economic and environmental components, which are critical for enhancing the realization of resources usage and reducing the emissions. In other words, eco-efficiency emphasizes on achieve more value from the lower inputs of materials and energy and with reduced emissions (Hukkinen, 2001). It is also identified as the adoption of management philosophy that stimulates the search of environmental improvements that yield parallel economic benefits (Phungrassami, 2008) Indeed, eco-efficiency means less environmental impacts per unit of product or service value (Arundel & Kemp, 2009).

These environmental impacts are summarized into seven principles as following (Arundel & Kemp, 2009; Bidwell & Verfaillie, 2000; DeSimone & Popoff, 2000; van Berkel, 2007; Wagner, 2003):

- Reduction of the material intensity.
- Reduction of the energy intensity.
- Reduction of toxic dispersion.
- Enhancement of materials recyclability.
- Maximum sustainable use of renewable resources
- Extension of product durability.
- Maximum service intensity of products.

Arundel & Kemp (2009) provided a more detailed picture of the some relevant components of the eco-efficiency represented by the following aspects:

- Quantity of product produced or sold, net sales or value added as output indicators
- Energy consumption from renew non-renewable sources
- greenhouse gas emissions: these include CO<sub>2</sub>, Methane CH<sub>4</sub>, Nitrous Oxide (NO<sub>2</sub>), hydro- and Perfluoro Carbon (HFCs, PFCs)
- Other emissions to air: Nitrogen Oxide, Sulphare Dioxide
- Total waste, broken down in toxic, and non-toxic waste

### 3.4 Measuring corporate environmental performance using the eco-efficiency concept

Although the eco-efficiency concept is introduced as a tool for achieving the sustainability at all (Bidwell & Verfaillie, 2000), there are several studies agree that such concept can measure the environmental performance of the corporation (Guenster, Derwall, Bauer, & Koedijk, 2005; Sarumpaet, 2006; Schaltegger & Burritt, 2000; Wagner, 2003, 2007). This due to the fact that the eco-efficiency concept can incorporates the environmental influences of the corporation’s activities. For instance, Arundel & Kemp (2009) note that eco-innovation that represents the innovation in the environmental prevention issues can be measured on the basis of eco-efficiency performance data. It also has been argued that the eco-efficiency is aligned with other preventive environmental practices such as cleaner production, pollution prevention, and waste minimization (van Berkel, 2007). This because of the improvements in such practices will be reflected in improvements in eco-efficiency scores. For instance, Dowell, Hart, & Yeung (2000) note that the eco-efficiency is the proxy of the corporation’s ability to minimize pollution by enhancing the level of production and manufacturing processes.

By doing so, the concentration will be on good environmental performance from changes in operational efficiency, rather than by adopting standards of pollution control at the end of pipe (Guenster, et al., 2005). Moreover, the ultimate aim of cleaner production is making more efficient use of natural resources (such as raw material, energy and water), and reducing the wastes and emissions at the sources. The mentioned functions of cleaner production clearly show that eco-efficiency embraces cleaner production concepts (Yap, 2005). He added that cleaner production's components (efficient use of raw material, pollution prevention, source reduction, waste minimization, internal recycling and reuse) can be derived from the eco-efficiency concept. Such thought comes in line with Quariguasi Frota Neto, Walther, Bloemhof, van Nunen, & Spengler (2009)'s definition, who defined the eco-efficiency as the ratio of total value added and damage function, aggregating the environmental pressure into a single damage score. Such definition considers the eco-efficiency as a toll to assessment the environmental performance of the corporation. Eco-efficiency is good for the environment since it represent the environmental activities, which are the first steps towards proactive environmental practices (Aragón-Correa, Hurtado-Torres, Sharma, & García-Morales, 2008; Lehni & Development, 2000).

From the forgoing analysis, it is clear that the eco-efficiency concept combines the most environmental aspects into one single indicator. This gives this concept advantages over other measures of corporate environmental performance. Moreover, the eco-efficiency has the ability to measure the environmental performance of the corporation in relative sense (Derwall, Guenster, Bauer, & Koedijk, 2005; Guenster, et al., 2005). This can be another advantage over the other proxies of environmental performance, which base on the absolute pollution levels (Derwall, et al., 2005). In the absolute terms, the environmental performance of different industrial corporations can be varying depending on the type of industry. For instance, the chemical industries will be considered as less environmental performance if compared to food industries, this because of the great environmental impacts of the chemical industries on the environment. In the contrary, in the relative sense, using eco-efficiency concept, corporation that operate in environmentally sensitive industries such as mining, energy, or chemicals can still do well relative to their competitors facing the same environmental challenges (Derwall, et al., 2005). Therefore, the eco-efficiency measures can give the real environmental performance of the corporations under investigation.

### **3.5. Eco-efficiency performance data collection**

With regard to the practical aspects of measurement of the corporate environmental performance, the availability of the data about the observed environmental issues becomes a critical factor. For instance, several studies that have conducted studies on environments have limited the studies to the environmental variables found in databases found mainly in the western countries. These databases are Kinder, Lydenberg, Domini Research & Analytics database (KLD) (Turban & Greening, 1997; Wanger, 2010), Franklin Research and Development Corporation (Russe & Fouts, 1997), Toxic Release Inventory (TRI) ( King & Lenox, 2001; Sarkis & Cordeiro, 2001), the Management Today 'Britain's Most Admired Companies' Survey in terms of Community and Environmental Responsibility (Salama, 2005), and the Nikkei Environmental Management Score Report published by Nihon Keizai Shimbun Inc (Nakao, et al., 2007). Even though sources such as TRI and KLD are the most comprehensive and detailed databases on environmental and social issues, these databases suffer from some limitations. According to Sarkis & Cordeiro (2001), when material calculations are applied to the primary industrial processes, the TRI might underestimate some critical toxins, because reporting rules may allow the corporations to ignore some waste streams and don't include toxic releases from products after their use by customers. In addition to the problems related to TRI database, the KLD database also received criticisms about its validity and reliability. Nevertheless, such databases are still considered as the best sources of environmental and social issues in western countries. In the absence of such databases as in developing countries, the self perceptions of managers based on ordinal or ratio-scales are used to assess the corporate environmental performance (López-Gamero, et al., 2009; Wagner, 2003, 2007).

#### 4. CONCLUSION

It is believed that the environmental issues should receive more attention from the academic studies. The environmental studies should distinguish between the used terms to represent the environmental aspects, since each term includes different interests; corporate environmental responsibility is the duty of the corporation to mitigate its impacts on the natural environment, the implementation of such duties is known as an environmental management, which refers to the technical and organizational activities undertaken by the corporation for the purpose of reducing their environmental impacts on natural environment, while corporate environmental performance refers to the level of harmful environmental impact caused by a firm so that the smaller the harmful environmental impact the better the environmental performance and vice versa. Moreover, the corporate environmental performance can represent different levels of environmental related activities in the corporations. These levels are the operational, managerial, and conditional levels. The paper has clarified each level's interests that should be considered in the environmental studies. With regard to the eco-efficiency concept that represents the main focus of this paper, it has found that such concept can measure corporate environmental performance. The eco-efficiency concept incorporates the main environmental performance indicators such as clean production, pollution prevention, and waste minimization. It is also found that the eco-efficiency concept has advantages over other environmental performance measures; this is because the eco-efficiency measures can give the real environmental performance of the corporations under investigation regardless of the nature differences between the industrial sectors of these corporations.

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