

Environmental Sustainability: Metrics and Definitions

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Abstract. Corporate sustainability as a newly defined concept is based on five main pillars of environment, business excellence, innovation, governance and human contributions. Among these pillars, environment is an important one since it has a wide common area with other pillars. In this paper, environmental sustainability as an important challenge to achieve a sustainability program in any corporation is discussed. This paper develops some important metrics to assess the environmental sustainability program of any given corporation. Moreover, as there are some overlaps among environment and other pillars of sustainability, these similarities and overlaps will be discussed. Finally, the application of introduced metrics in top five Fortune companies will be illustrated to accredit the practicality of the introduced metrics.

1. Introduction

Sustainability as a rather newly defined concept refers to the capability of an organization to continue its activity without exposing any risks to its surroundings. This concept first started with an increasing attention about pollution and seems to gain attention more by the developments of industrial activities. Sustainability as a broad concept is based on five important pillars of environment, business excellence, innovation, governance and human contributions (social pillar). In this research, environmental pillar addresses environmental impact which is considered to be the possible [adverse effects](#) caused by an [industrial](#) project or by the [release](#) of a substance in the environment. By increasing the global attention toward some environmental crises during the last two decades such as the ozone hole, global warming and some drastic chemical pollution in air, water sources and soil, a great need was recognized for corporations to consider some specific programs to assess the ecological effects of their activities on the environment. With the help of these assessing programs, corporations can document their environmental goals along with improving their environmental management systems. [1] In other words, environmental sustainability measurements investigate the firms to illustrate how green they are, how the activities of a firm can change the environment and how the environmental risks and opportunities are managed within the firm.

According to [2] environmental sustainability, encompassing a wide range of issues from pollution to natural resource management challenges and institutional capacity refer to the long-term maintenance of valued environmental resources in an evolving human context. According to [Brundtland Commission](#) of the [United Nations](#) environmental sustainability can be defined as the capability to meet the needs of the present without compromising the ability of future generations to meet their needs. [3] Improving the efficiency of processes and cycles with respect to the throughput of energy and materials is the most important operational challenge of clean production corresponding to the concept of reducing or minimizing waste.

2. Experiment, Results, Discussion, and Significance

Emerging new concepts like sustainability have broadened the environmental assessment metrics tremendously in comparison with traditional visions which consider some metrics just as gauges to assess the toxic emissions of a company. Defining efficient metrics for environmental assessment is challenging since the environment is complicated and usually cannot be assessed based on mathematical relations easily. In this paper, some applicable metrics for assessing environmental sustainability programs are introduced as below:

Long term plan of corporations, traditional metrics for measuring toxic emissions, innovation rate, investment rate on new technologies, number of employed researchers in the area of environment, executed process improvement programs, planned preventive costs, design revision rates, number of memberships in voluntary environmental-based programs and commitment to some global regulatory standards.

Among these metrics, long term plan, toxic emission measurement and innovation are assumed to be more important since they are more comprehensive. Long term plan of a corporation reflects the defined strategies related to environmental objectives such as budgeting on environmental issues. It means that as predefined metrics are directly related to the main objectives of corporations, long term planning can be regarded as the most comprehensive metric. Toxic emission assessing methods, measuring the amount of chemicals emitted to the environment are fundamental for environmental problems. Also, innovation which addresses new products rate and innovating production methods in order to achieve more efficiency is of great importance such that it is accounted as one the main pillars of sustainability.

Case studies approve that in top Fortune companies (such as Exxonmobile, Walmart, Royal Dutch Shell plc..) these metrics are extensively used for related environmental sustainability programs. Moreover, more precise studies show that there are some overlapping areas between environment and other pillars of sustainability which sound to be independent at first glance. This relation is illustrated in Figure 1. For instance, some metrics of environmental assessment are exactly related to innovation such as innovation rate, or number of employed researchers in the area of environment. Regulations set by government are key leading factors while enacting environmental programs for a firm. Also, if a corporation holds the requirements of an environmental sustainable program, it can achieve to a competitive advantage resulting in higher profits. This argument verifies the relation between environment and business excellence pillar. By means of environmental sustainable program a company will be able to reduce emissions and provide healthier environment, providing more degree of acceptance for the corporation in the society. This argument can support the relation between environment and social pillar.

3. Conclusions

In this paper some definitions of corporate sustainability and environmental sustainability are introduced. Then 10 important metrics for measuring environmental issues of any corporation are presented. Moreover, the overlaps between environment and other pillars of sustainability are discussed. Also the practicality of the proposed metrics are discussed in top Fortune companies to illustrate how they apply efficiency programs to make their processes and energy consumption under control while reducing their harmful environmental impacts. In this way, they can recreate their required amount of energy by managing their wastes.

References:

- [1] S. Tuler, T.P. Seager, R. Kay, ENVIRONMENTAL PERFORMANCE METRICS FOR OIL SPILL RESPONSE, Technical report submitted to the Coastal Response Research Center, 2006
- [2] Environmental sustainability index, Yale Center for Environmental Law & Policy, 2005
- [3] United Nations General Assembly, [Report of the World Commission on Environment and Development: Our Common Future](#). Transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment. Retrieved on: 2009

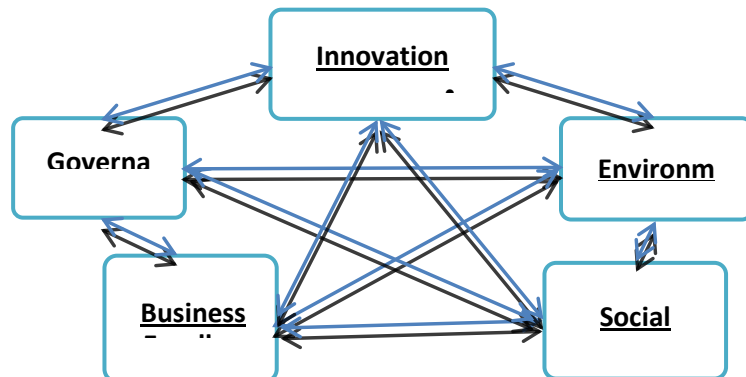


Fig. 1. The relation among pillars of sustainability