

# Literature Review of Corporate Environmental Performance Evaluation

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## Abstract

*Based on the analysis of international standards of corporate environmental performance evaluation, this article makes a conclusion of the domestic researches about how to build an environmental performance evaluation system. Besides, the existent issues of the application and innovation of our environmental performance evaluation methods will be discussed. It is expected that this article will do some benefits to the use of environmental performance evaluation standards and the construction of environmental performance evaluation system.*

**Keyword:** Environmental performance; performance evaluation; evaluation system

## 1. Standards of Corporate Environmental Performance Evaluation

The corporate environmental performance evaluation standards are mainly issued by some international organizations which have international influences (Table 1). Since the Norwegian company NORSK HYDRO announced the world's first environmental report in 1989, many countries, international organizations, United Nations related departments had released their environmental reporting guidelines making provision on corporate environmental performance evaluation standards. In China, the earliest published independent environmental report "Health, Safety and Environment Report" was released by Petro China in 2000.

**Table 1: International Influenced Environmental Reporting Guidelines**

Issue institution	Issue time
WBCSD (World Business Council for Sustainable Development)	2000
ISO (International Organization for Standardization)	1999, 2013
UNCTAD (United Nations Conference on Trade and Development)	2000
GRI (Global Reporting Initiative)	2000,2002,2006,2014

### 1.1 World Business Council for Sustainable Development (WBCSD)

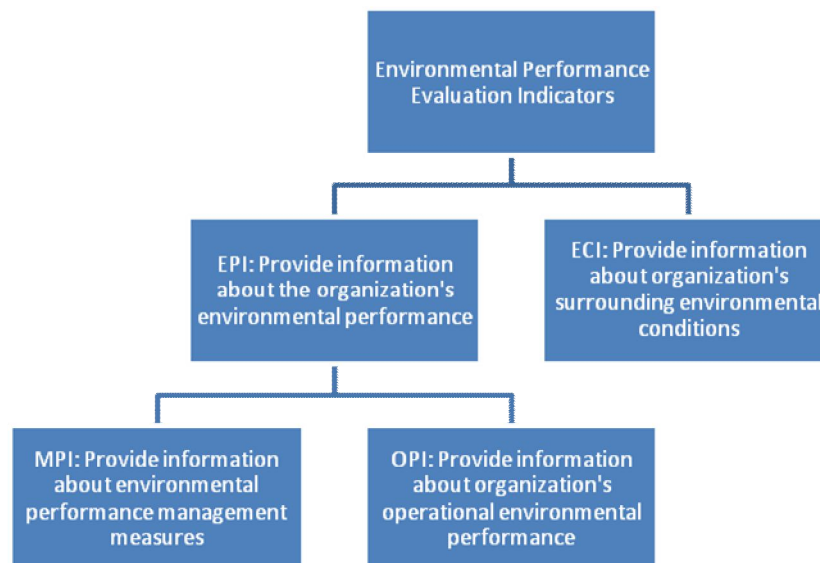
World Business Council for Sustainable Development (WBCSD) made the world's first set of quantitative structure of eco-efficiency indicators in August 2000, advocating the use of eco-efficiency indicators, namely eco-efficiency assessment standard, to measure the environmental performance of enterprises. The eco-efficiency indicators include environmental indicators and value indicators. According to this standard, the companies, on one hand, have created the maximization of economic value, on the other hand, have progressively realized the minimization of ecological impacts and energy use during the product life cycle, which achieve a win-win situation to improve economic performance and environmental performance. The formula of ecological performance indicators can be expressed as following:  $\text{eco-efficiency} = \text{value of products or services} / \text{impacts on the environment}$ .

Among them, the ecological can be expressed by the available resources productivity of the enterprise, such as the production of per unit of water (per unit of energy, per unit of carbon dioxide emissions, per unit of raw materials, etc). The value of products and services is the net added value of products or services. The impacts on the environment include energy consumption, raw material consumption, water consumption, greenhouse gas emissions, etc.

WBCSD divide the indicators into “core indicators” and “secondary indicators “. The “core indicators” are known as generic indicators, suitable for almost all industries, and the “secondary indicators” are also named as specific indicators for enterprises with particularity. The divisions of generic indicators and specific indicators enable the environmental performances between the different industries comparable, and make the corporate environmental performance evaluation standards more perfect.

## 1.2 International Organization for Standardization (ISO)

International Organization for Standardization (ISO) had worked out the international standards ISO14000 series on environmental performance evaluation since 1994, and released the official announcement of ISO14031 “Environmental Performance Evaluation Standards” in November 1999, which provided a guide to the design and implement of environmental performance audition inside the organization. ISO14031 standard is a management model based on “PDCA cycle (Plan-Do-Check-Act cycle)”. According to ISO14031 standards, environmental performance evaluation indicators can be divided into two sets, the first one is environmental condition indicators (ECI), providing information for organization’s external management, the other one is environmental performance indicators (EPI), which is providing information for the organization's internal operations. The environmental performance indicators are consisting of management performance indicators (MPI) and operational performance indicators (OPI). The logical relationship between them is shown in figure 1.



**Figure 1: Logical Relationship of Environmental Performance Evaluation Indicators** <sup>[2]</sup>

ISO14031 indicator systems provide a framework for the organization, facing different environmental conditions, to make environmental performance evaluation, and give a guide for the acquisition and calculation of the indicators. International Organization for Standardization (ISO) enacted the ISO14031-2013 in 2013, which was the revision of the ISO14031-1999. Under the ISO14031-2013, companies can use their own approaches to make environmental performance evaluation. China's current used environmental performance evaluation standard is GB/T24031-2001. The effectiveness of this standard in our country is equivalent in the international standard ISO14031-1999.

## 1.3 United Nations Conference on Trade and Development (UNCTAD)

The United Nations Conference on Trade and Development gave a set of environmental performance evaluation indicators in a report in 1997, which contained eight areas, including: the ultimate indicator of environmental impact, emissions and waste indicators, input indicators, resource consumption indicators, efficiency indicators, risk indicator of potential environmental impacts, customer indicators and financial indicators.

“The binding of corporate environmental performance indicators and financial performance indicators” released in 2000 had proposed an environmental performance evaluation system, including both the financial performance indicators, reflecting the financial impacts, and the environmental performance indicators, the reflection of the emissions. These indicators contain non-renewable energy depletion, freshwater resources depletion, solid and liquid wastes, ozone depletion, global warming etc.

#### **1.4 Global Reporting Initiative GRI**

In order to improve the comparability and credibility of sustainability reporting worldwide, the Global Reporting Initiative is responsible for the design of standardized sustainability reporting, providing guidelines for the global trial. It respectively released four editions of “Sustainability Reporting Guidelines” in 2000, 2002, 2006, and 2014. The once every two years “KPMG 2013 Corporate Responsibility Report International Investigation”, published in December 9, 2013, displayed that nowadays there are 80 percent enterprises using the GRI sustainability reporting guidelines among the world's top 100 enterprises in 41 countries, releasing a corporate responsibility report. In the surveyed 4100 companies worldwide, there are 75 percent companies released the corporate responsibility report, among which there are 78 percent based on the GRI guidelines. In the world's top 250 companies, 93 percent companies released corporate responsibility report, and 82 percent of the references are GRI guidelines. These statistics indicate that GRI guidelines have become the sustainable development or global social responsibility information disclosure standards.

## ***2. Literature Review of Domestic Corporate Environmental Performance Evaluation System***

### **2.1 The Corporate Environmental Performance Evaluation System Based on the Economic Benefits**

The comprehensive and scientific evaluation of corporate environmental accounting not only can induce the investors to make the right investment decisions, but also can enable enterprises to fully acknowledge the economic and social benefits of all aspects (from input, production to output) during the product life cycle as to make the sustainable management of the enterprise can be maintained. Chinese scholars mainly from the production chain, value chain, supply chain and environmental capital structure perspectives construct the corporate environmental performance evaluation system.

Liu Yan, Liu Huanan et al (2003) proposed the concept of corporate green degree, analyzed the purposes, principles and methods of setting green indicator system, and set indicator system at all aspects of the production chain—green degree of raw materials, green degree of process engineering, marketing green degree and consumption green degree. Chen Xuan, Chun Weide (2009) proposed an integrated environmental performance evaluation system including upstream and downstream business environment factors on the basis of value chain theory— environmental resource consumption, pollution control and governance, investment in environmental protection. Zhao Lijuan, Luo Bing (2003) designed an environmental management performance—supply chain green degree evaluation system in accordance with the connotation of green supply chain and environmental management standards (ISO14000 series), namely the environmental impact of supply chain process, the resource consumption of supply chain, recycling of resource, environmental reputation, etc. From the perspective of green production chain, Chen Zhaojiang (2011) combined the characteristics of the balanced scorecard ideas and green supply chain, and designed a set of environmental performance evaluation system of re-use of recycled resources, energy consumption of supply chain process, environmental impact of supply chain process, and environmental reputation. Li Lei (2013) build a corporate environmental accounting performance evaluation system at the point of environment capital structure, and the main indicators are general overview of environmental activities, environmental asset structure, environmental liability structure, environmental expenditure structure, and environmental benefit structure, other environmental quantitative indicators, and appraisal indicators.

### **2.2 The Corporate Environmental Performance Evaluation System Based on the Ecological Benefits**

When the concept of eco-efficiency was first formed, eco-efficiency is defined as a corporate social responsibility reflecting the pursuit of sustainable development. At the request of the sustainable development of modern society, enterprises make their most effort to reduce the resources and energy consumption of production or services, reduce or eliminate the damage to the environment while meeting people's needs and improving the quality of life, and their final goal is to maximize the economic benefits while minimizing the impacts on the ecological environment.

Therefore, the concept of eco-efficiency has become an important theoretical basis for enterprises to evaluate their environmental performance. Our scholars' researches about corporate environmental performance evaluation system based on the perspective of the ecological benefits have got a certain outcome.

Lin Fengchun, Chen Jing et al (2007) draw on the ecological indicator system proposed by WBCSD and issued an eco-efficiency based corporate environmental performance evaluation system—output value of per unit of energy consumed, output value of per unit of water consumed, output value of per unit of raw materials consumed, output value of the unit of water pollutant emissions, output value of the unit of air pollutant emissions, output value of the unit of solid packaging waste. Gong Tianlei, Zhang Yong et al (2008) made the ecological chain environmental performance evaluation model with combining the principles of industrial ecology and value chain theory—raw material flow, energy flow, pollution emissions, ecological impacts of the product. Li Xiaomei (2014) saw the two principals of eco-efficiency and eco-friendly as the basic and treated the four standardized norms of ecological theory as the evaluation dimension—cleaner production, green management, resource conservation, environmental protection, to set up a corporate environmental performance evaluation system at the opinion of ecological ethics .

### **2.3The Corporate Environmental Performance Evaluation System Based on the Management Accounting Tools**

The uses of management accounting tools in corporate environmental performance evaluation system are mainly in the build of corporate environment performance evaluation system based on four basic dimensions of the Balanced Scorecard. The construction of Balanced Scorecard framework of corporate environmental performance based on the appropriate fusion of the environmental indicators and Balanced Scorecard original four dimensions make the combination between the qualitative indicators and quantitative indicators, the financial indicators and non-financial indicators come true. Chinese scholars' methods of building environmental performance evaluation system by the BSC are putting the environmental indicator into part of dimensions and adding new environmental dimension.

Shi Hong, Zhao Qian (2012) combined the social responsibility and balanced scorecard to structure a four dimensions (financial, stakeholders, internal environmental management, learning and growth) corporate environmental performance evaluation system under the social responsibility perspective. Zheng Liqun, Liu Yang (2013) established a corporate environmental performance evaluation system at goal of maximizing value for investors in four dimensions (financial, customer , internal processes, learning and growth) of balanced scorecard framework: they proposed the concept of environmental strategic value, and analyzed the feasibility of linking the GEVA and environmental strategic value in the financial dimensions; at the learning and growth dimension, they proposed the use of Kaplan and Norton's strategic readiness to assess the support level of intangible assets for corporate environmental strategy, and discussed how to evaluate company's environmental strategy readiness at four dimensions of human capital readiness, green technology readiness, green resources readiness, stakeholders' readiness. Liu Jiansheng (2010) put forward the concept of adding environmental factors into the balanced scorecard, he believed that integrating environmental factors into different levels' business decisions can make company's development strategies fully reflect the concept of sustainable development and enable company's economic and social benefits achieve the optimal condition. Lu Jing (2012) set the sustainable development of low-carbon economy as goal, and put the government and other stakeholders dimension to the balanced scorecard to found a low-carbon economy environmental performance evaluation system based on the balanced scorecard—financial, customer, internal business processes, learning and growth, the government and stakeholders.

### **2.4The Corporate Environmental Performance Evaluation System Based on Specific Industry**

In addition to the theory researches about how to build enterprise environmental performance evaluation system, Chinese also have made experience check about the possibility of how to build environmental performance evaluation system among the pillar industries, such as China's oil drilling, steel, coal and electricity etc. Tian Jinyu (2011) constructed the environmental performance evaluation system of power companies—compliance indicators, environmental management performance indicators, advanced indicators. Li Ying, Lu Li (2013) were from the consumption of resources, environmental pollution, resources recycling, environmental administering and environmental management to built the environmental performance evaluation system of steel companies.

Zhao Junping (2011) determined the according to the characteristics of China's oil drilling companies' environmental management to determine an environmental performance evaluation system—drilling derelicts, drilling wastewater treatment, drilling environmental monitoring and pollution compensation .

### **3. Literature Review about the Methods of Corporate Environmental Performance Evaluation**

#### **3.1 Research on the Direct Application of Existing Methods**

When Chinese scholars evaluate company's environmental performance, they mainly focused on the direct application of existing methods, such as the BP artificial neural network, AHP, cluster analysis and data envelopment analysis method and so on. Tang Jianrong, Zhang Chengxuan (2006) achieved a comprehensive evaluation of corporate environmental performance by using the BP artificial neural network method. Sun Wei (2008) used the fuzzy clustering analysis method to make an overall analysis of the enterprise environmental performance. Zhao Shenghao, Qian Yu et al (2009) put the CCR performance evaluation model of data envelopment analysis (DEA) as the kernel, performance evaluation function and environmental regulation function as tools to appraise the environmental performance of industrial park. Tian Jinyu (2010) studied the principals and methods of the application of FAHP on the basis of the characteristics of corporate environmental performance. Studies have shown that: the use of fuzzy comprehensive evaluation can optimize the qualitative evaluation indicators, including the non-financial information, as the qualitative evaluation indicators, which will help solve the multi-objective decision-making problems of environmental performance evaluation; using AHP to determine the indicators' weight and testing the consistency of the weight judgment matrix will avoid the impacts of human factors in the process of determining the relevant weight, which can better reflect the impartiality and objectivity of performance evaluation; using fuzzy comprehensive evaluation method helps improve environmental performance evaluation, can objectively reflect the actual situation, and ensure the fair and equitable of evaluation.

#### **3.2 Research on Innovation of Evaluation Model**

There also have a small number of academics innovated the evaluation models with combining with companies' own characteristics and the original model and evaluation methods. Liu Yan, Liu Huanan et al (2003) created a green degree evaluation model to assess the environmental performance of the enterprise. Lin Fengchun, Chen Jing (2006) established an environmental performance system of environmental law indicators, environmental management indicators, advanced indicators, and life-cycle environmental impact indicators, which presented a new assessment model—fuzzy comprehensive evaluation model. Xie Shuangyu, Hu Jing et al (2008) build a two second-ordered structure corporate environmental performance evaluation model, which consist of four process factor and two result factors, at the foundation of the “principle—process—results” theory. Hu Jian, Li Xiangyang, Sun Jinhua (2009) put forward the secondary relative effectiveness dynamic evaluation model at the basic ideal of data envelopment analysis method and genetic neural network method to make an empirical analysis of environmental performance of 10 companies.

### **4. Summary**

China's current used environmental performance evaluation criteria is GB/T24031-2001, its effectiveness is equivalent to ISO14031-1999. While the latest international standards are ISO14031-2013 and the fourth edition of "sustainable development report" which is published by GRI at 2014. When Chinese study the environmental performance evaluation criteria, they should refer to the international latest international standards as soon as possible. When building environmental performance evaluation system, our scholars has made some achievements from the industry point based different perspectives. In addition, they should also focus on the study of area environmental performance evaluation. When evaluate the environmental performance, our scholars should also pay more attention to the evaluation model innovation exclude directly use the existing evaluation methods.

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