

# We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

186,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index  
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?  
Contact [book.department@intechopen.com](mailto:book.department@intechopen.com)

Numbers displayed above are based on latest data collected.  
For more information visit [www.intechopen.com](http://www.intechopen.com)



# Indicators of Sustainable Business Practices

Hyunkee Bae and Richard S. Smardon  
*Department of Environmental Studies,  
SUNY College of Environmental and Science and Forestry  
USA*

## 1. Introduction

Since the end of the 1990s, businesses have started to systematically consider environmental problems in terms of different positions and levels within a firm, such as design, purchase, sale, and disposal (Welford, 2000). The United Kingdom published BS 7750, a standardized specification for an environmental management system in 1994 and the International Organization for Standardization (ISO) published ISO 14001 - an environmental management standard in 1996. The main goal of these standards is to help all kinds of organizations to establish and implement environmental management systems by systematically setting up environmental policies, practices, objectives, and targets. The number of organizations with ISO 14001 certification around the world rapidly increased to 13,368 in December of 1999 to 129,031 in December of 2006 (Corporate Risk Management Company, 2000:2007).

Welford (2000) insisted that Environmental Management Systems (EMSs), such as ISO 14001, are no longer options. However, there are some problems with EMSs. The ISO 14001 standard does not promote the flexibility needed to handle continuously changing environmental issues (Moxen & Strachan, 1998). The ISO 14001 mostly depends on action control and results based on environmental impacts, rather than social and ethical control. Thompson (2002) pointed out three areas of ISO 14001 that should be described: (i) social aspects and impacts and how to control them; (ii) guidelines for a set of widely recognized and accepted environmental performance principles; and (iii) a method to communicate environmental performance information to external stakeholders and decision makers. To address these areas, businesses should go even further than environmental management systems and completely integrate all the components of sustainable development into a new way of doing business (Welford, 2000). In addition, a variety of interested parties, such as governments, "green" consumers, and "green" investors, are also encouraging firms to incorporate their environmental management systems and sustainable development into their decision-making process for sustainable business practices and/or strategies. Companies could implement sustainable business practice to meet these demands for interested parties on sustainable business. To effectively implement sustainable business practices, firms need to know the kinds of indicators that meet the characteristics or concepts of sustainable business practices.

Based on these needs, we aim to identify whether or not firms have applied sustainable business practices based on the Triple Bottom Line (Environmental, economic, and social

areas). To accomplish this goal, we conducted two surveys. The first survey identified the trends of indicators in terms of the TBL used to describe sustainable business practices. The second survey assessed the degree to which firms have issued performance reports and what kinds of keywords were used in the titles of these reports.

## 2. Literature review

### 2.1 Sustainable business

There is no single definition of sustainable business, as there is for sustainable development (Azapagic, 2003). A lack of a common accepted definition of sustainable business is the most critical problem because the definition is a fundamental tool to carry out new policies and actions. To overcome this, a few institutions have introduced the definition of sustainable business. The Evergreen Group (2008), a business brokerage dedicated to sustainable business, defines that a sustainable business is a business that carries out an environmentally friendly business processes without negative environmental impacts related to their activities, products, and services. Sustainable business.Com<sup>1</sup> (2009) says that sustainable business is "a business that contributes to an equitable and ecologically sustainable economy." Based on these examples of the definitions of sustainable business, sustainable business offers products and services that fulfill society's needs while contributing to the well-being of all earth's inhabitants. Sustainable business is a new, radical paradigm that considers the ecological, social, and economic impacts in a way that will not compromise the needs of future generations (Azapagic & Perdan, 2000; Welford, 2000). Azapagic and Perdan (2000) asserted that firms need a paradigm shift if firms want to integrate sustainable development into their business.

Sustainable business requires effective harmonization of a Triple Bottom Line (TBL), which is the environmental, economic, and social areas. Since the TBL is the key element of sustainable development, firms that carry out sustainable business should not only understand the TBL, but also integrate it into their policies or strategies and decision-making processes (Desimone & Popoff, 1998; WBCSD, 2000).

The environmental area consists of environmental impacts related to an organization's diverse activities, products, and services. These environmental indicators should be identified in all stages of the organization's full life cycle because they are used to track environmental progress, support environmental policy evaluation and inform the public. Examples of environmental indicators are energy and water consumption, air pollution, and solid and hazardous waste produced.

The economic area includes an organization's economic values and performance that are explained by economic indicators. The economy provides solutions and methods to invest in protecting the environment and conservation of natural resources as well as to sustain society. Examples are annual profits and sales, Research & Development investment, fines, capital investment, and share values or annual returns.

The social area is related to wider responsibilities that business has to communities within which it operates and to society in general, including both present and future generations. Since the importance of social and ethical responsibilities of a company is gradually

---

<sup>1</sup> Sustainablebusiness.Com: SustainableBusiness.com is an organization that "provides global news and networking services to help green business grow, covering all sectors: renewable energy, green building, sustainable investing, and organics" <http://www.sustainablebusiness.com/>

increasing, its social responsibility has become a constituted element within what society expects from business. A few international organizations and institutions, such as the European Commission (EC), have developed and launched a variety of standards relevant to corporate social and ethical responsibility around the world. For instance, the Social Accountability 8000 (SA 8000)<sup>2</sup> focused on social and ethical issues, and on Corporate Social Responsibility (CSR). It is not easy to define and quantify social indicators in terms of physical indicators like economic and environmental indicators. Nevertheless, many firms have set up a realistic goal to continuously measure these indicators in a comparable manner across organizations by using qualitative social indicators. These sets of qualitative social indicators are used to evaluate sustainable business embedded in the concept of sustainable development. Examples of social indicators are: (i) human development and welfare (e.g., education and training and health and safety); (ii) equity (e.g., wages, equal opportunity, and non-discrimination); and (iii) ethical considerations (e.g., human rights and child labor abolition) (Azapagic, 2003).

## 2.2 Voluntary communication to the public

A firm that would like to apply sustainable business could voluntarily communicate diverse performance of their practices to the public because interested parties want to know information about the firms' sustainable business practices (Adams, Houldrin & Slomp, 1999). Voluntary reporting information about firms' environmental and social performance is becoming a powerful and popular tool to communicate with the public because interested parties can use such information to evaluate firms' activities and performance (Feldman, Soyka, & Ameer, 1996; Sasseville, Willson, & Lawson, 1997). Internal or external reporting systems can have a significant effect on corporate culture for sustainable business because they are designed to support positive behaviors in terms of sustainable development.

Since the early 1990s, a few companies, such as Monsanto and Kodak, have disclosed outcomes of their environmental performance according to their own indicators. However, the lack of credibility and verifiability of the indicators and outcomes disclosed in these reports has become a significant problem (Lin & Wang, 2004; Thompson, 2002).

To overcome these problems, in 2002, the Global Reporting Initiative (GRI) published the 2002 GRI Sustainability Reporting Guidelines based on the concepts of sustainable development (Lin & Wang, 2004 ; Thompson, 2002). The GRI guidelines propose principles and general indicators to report an organization's performance in terms of the TBL: economic, environmental, and social dimensions. After publishing the GRI guidelines, many companies like 3M have integrated their own indicators into the GRI guidelines. SmiXXX (06) said that it used the Global Reporting Initiative's 2002 Sustainability Reporting Guidelines to increase the credibility of its information and reports. In 2002, the European Commission (EC) published "Corporate Social Responsibility (CSR): A business contribution to Sustainable Development". The EC formally defined corporate social responsibility:

---

<sup>2</sup> Social Accountability 8000: Social Accountability 8000 was developed by the Council on Economic Priorities Accreditation Agency in 1997. "SA8000 is promoted as a voluntary, universal standard for companies interested in auditing and certifying labour practices in their facilities and those of their suppliers and vendors. It is designed for independent third party certification" <http://www.mallenbaker.net/csr/CSRfiles/SA8000.html>

CSR is a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis. (p. 7)

The Corporate Social Responsibility (CSR) standard includes environmental, financial, and social performance information related to sustainable development. To meet the demands of the public for corporate social responsibility, many companies, such as Kodak and Ford, are annually disclosing the performance reports of their sustainable business practices with different titles, such as "Corporate Social report," and "Sustainability Report" to the public.

### 2.3 Indicators for sustainable business practices

An indicator is a measurement that shows the status of an environmental, economic, or social system over time (Redefining Progress, Sustainable Seattle, and Tyler Norris Associates, 1997). The goals of indicators are:

- to monitor and evaluate effectiveness and performance of goals and targets of sustainable business (Bennett & James, 1999; Parris & Kates, 2003);
- to communicate to diverse stakeholders (Thompson, 2002). Indicators can help stakeholders, including the public, decision makers, and managers, to assist in decision-making about sustainable business (Kuhndt & Geibler, 2002); and
- to compare actions and performance of firms that may or may not be implementing sustainable business (Kuhndt & Geibler, 2002).

With these objectives in mind, numerous companies and international organizations, such as the International Organization for Standardization and the Global Reporting Initiatives, have developed a set of indicators to measure progress of environmental performance and sustainable business. Many organizations are using diverse indicators to integrate current environmental management systems into sustainable business.

Indicators for sustainable business practices can be expressed in many different forms (e.g., qualitative or quantitative, general or specific, and absolute or relative), in accordance with objectives and applications of an indicator. Quantitative indicators are measured in terms of mass, volume or number of environmental pollutants or physical materials. Examples of quantitative indicators are total amount of air emissions like CO<sub>2</sub>, or total volume of hazardous waste. Not all indicators will be quantitative, and some will have to be expressed qualitatively because they cannot be defined in physical terms (Azapagic & Perdan, 2000). Qualitative indicators are expressed interpretively. Qualitative indicators include social dimensions of a firm's activities, such as changes in cultural values or equity (Azapagic & Perdan, 2000). Sustainable business could be described by both qualitative and quantitative metrics because both are required to explain whether or not an organization's diverse activities consider or meet human needs and social demands (Daly, 1990; Azapagic & Perdan, 2000). Thus, many firms are setting up qualitative indicators as a substantial goal to measure the progress of the firms' policies even though qualitative indicators are difficult to define in physical terms (Azapagic & Perdan, 2000).

Indicators can also be divided into general and specific indicators (Verfaillie & Bidwell, 2000). General indicators are used by businesses across all industries in the world. These general indicators can be used to measure issues that have already been discussed globally, such as an international agreement or consensus: Agenda 21, Montreal Protocol, and Kyoto Protocol (global warming) (Verfaillie & Bidwell, 2000; Muller & Sturm, 2001). General indicators include energy, water and material consumption, greenhouse gas emissions, carbon dioxide, methane, and air emissions per unit product. These indicators can be used

to compare one organization's performance against another's. Specific indicators are defined differently and measured in accordance to characteristics of each industry or firm (Verfaillie & Bidwell, 2000). For instance, Chemical Industries Association (2002) established the Responsible Care (RC) program for companies in the chemical industry. RC is the chemical industry's global voluntary initiative program.

Indicators for sustainable business practices can be expressed in absolute or relative forms. Absolute indicators are used to measure a firm's quantitative environmental and social impact related to its activities, products, and services. Thompson (2002) said that absolute indicators are expressed in terms of measured quantities: total amount of energy consumed a year, total amount of water consumed, total amount of wastewater, and total amount of hazardous waste generated. These indicators can provide managers or the public with incomplete information relevant to operational levels because these indicators use a single value to represent how much a firm has accomplished towards its goals and targets over time (Bennett & James, 1999). For instance, a firm reduces the total energy consumed this year by 5% compared to last year's total. A manager cannot determine whether or not this reduction is an environmentally positive result since the reduction of energy could be the result of other factors, such as reduction of productivity, rather than actual improvements of environmental activities and technologies. Relative indicators were introduced to address this problem of absolute indicators.

Relative indicators are expressed in terms of a ratio or proportion that compares an absolute indicator with another absolute indicator (Thompson, 2002). Azapagic and Perdan (2000) argue that relative indicators enable firms and interested parties to evaluate improvement from year to year and figure out more sustainable opportunities and practices. Thus, relative indicators could help stakeholders understand whether or not a company truly increases efficiency of emissions by measuring levels of pollutant per unit of production (Bennett & James, 1999). Examples of relative indicators are eco-efficiency indicators, such as carbon dioxide emissions per unit of output, ratio of waste per unit of input material, ratio of total hazardous solid waste per unit of product, etc. These relative indicators can be used to measure the constant economic value of natural capital stocks. However, Bennett and James (1999) mentioned that relative indicators also have a problem because they do not show the total amount of pollutants in terms of absolute values, which could be used as firm to firm benchmarking. To resolve these problems of absolute and relative indicators, many companies choose to use both types of indicators to evaluate and report their performance.

### 3. Data collection

We conducted two surveys. To conduct the first survey, we collected firms' annual performance reports announced to the public through Internet media. There are two reasons why these performance reports were collected. The first reason is because the changes in the types of indicators for sustainable business practices were described in those performance reports. The second one is that the changes in the performance reports announced through Internet mass media can be used to investigate the extent to which firms have communicated their performance reports to the public.

Sample performance reports for the first survey were collected from January 1999 to December 2006. Since the ISO published ISO 14031 Environmental Performance Evaluation -

guidelines in 1999, firms might have gained interest in reporting their environmental performance beginning in 1999. 2006 is the most current year that firms' performance reports could be collected through firms' Internet homepages.

The announcements that were disclosed the performance reports were identified by using newswire databases; ABI/Inform, Global, Business & Industry, Business & Company Resource Center, and LexisNexis. The key words used to find the announcement events were "Environmental Performance," "Reports," "Sustainability," "Corporate Social Responsibility," and "Citizenship." The following criteria were used to collect sample data:

- Only publicly traded firms on the New York Stock Exchange (NYSE) were considered;
- Companies in the information, finance, and insurance industry were excluded because their businesses did not generate direct environmental pollution; and
- Firms that provide their performance reports (PDF file) were included.

Companies have created and continuously updated their Internet homepages to provide environmental and social performance reports. After identifying firms that announced their performance reports, the performance reports of sample firms were collected through each firm's Internet homepage. The Internet Archive Organization<sup>3</sup> was used to find the performance reports of companies that did not provide previous performance reports directly from the current homepage. The internet archive organization provides archive data of a firm's Internet homepage according to the day that the firm updated the homepage. The North American Industry Classification System (NAICS) was used to classify types of industries. A firm's NAICS code categorized by the Wharton Research Data Service (WRDS) was used.

The indicators for sustainable business practices were selected by reviewing diverse environmental and sustainable indicator guidelines, such as ISO 14031, GRI guidelines, the Organisation for Economic Co-operation and Development (OECD), Social responsibility, and other researchers.

The second survey was conducted to identify the current trend in the titles of firms' performance reports. The terms used as key words in titles of firms' performance reports could be used to identify the main themes or strategies of the reports (Bruemmer, 2000). Performance reports have been given diverse titles, such as "Environmental Reports," "Environmental, Health, and Safety Report," "Sustainable Reports," "Corporate Social Reports," "Citizenship Report," etc. If a firm used "Environmental" as a key word in the titles of its performance report, it means that the firm did not set up social and economic indicators, which are the fundamental indicators of sustainable business. However, if a firm used the terms, "Social Responsibility," "Corporate Social Responsibility," "Sustainability," and "Citizenship" as key words, it could indicate that the firm has likely incorporated the concepts of sustainable development into its business strategies, which is sustainable business. This is because these terms are evolved from the concept of sustainable development.

For the second survey, we used S&P 500 firms as of December 2006 that reported their performance reports to the public in 2007. Since 2006 performance reports, disclosed in 2007, were the most current reports that could be collected through the Internet, they were chosen as the sample. Thus, the Internet homepages of S&P 500 sample companies were searched to identify annual sustainability or environmental reports for 2006. Among S&P 500 firms, a

---

<sup>3</sup> Internet Archive Organization is "a 501(c)(3) non-profit that was founded to build an Internet library, with the purpose of offering permanent access for researchers, historians, and scholars to historical collections that exist in digital format" <http://www.archive.org/index.php>

few industries (e.g., Information; Finance and Insurance; Real Estate and Rental and Leasing; Educational Services; and Health Care and Social Assistance) were excluded from the sample because they neither generated environmental pollution nor had heavy environmental burdens.

## 4. Results and discussion

### 4.1 Changes in indicators for sustainable business

We found eighty-nine announcements published by 40 companies through Internet media. Approximately eighty-eight percent (78 announcements) of the total sample was taken from the manufacturing industries (NAICS code 31, 32, and 33). The rest of the total samples (21 announcements) was disclosed by firms in other industries: the mining industry (NAICS code 21), the utilities industry (NAICS code 22), the miscellaneous store retailers (NAICS code 45), and the couriers and messengers industry (NAICS code 49). Table 1 presents the distribution of the sampled companies based on the NAICS. Table 2 lists the types of manufacturing industries. Of the

NAICS		Year								Total	
Title (Two digit)	Three digit	'99	'00	'01	'02	'03	'04	'05	'06	Number	%
Mining (21)	212						1	1	1	3	3.4%
Utilities (22)	221							2	2	4	4.5%
Manufacturing (31,32,33)	311							1	3	4	87.6%
	312						1	1	1	3	
	316			1				2	1	4	
	321					1	1	1		3	
	322				1				2	3	
	324			1		2	1	4	3	11	
	325	1		1	1	3	3	2	3	14	
	331				1	2	1	2	2	8	
	333	1					1		2	4	
	334			1		2	1	3	2	9	
	335							1	1	2	
336		1	1	1			2	5	3	13	
Miscellaneous Store Retailers(45)	453								1	1	1.1%
Couriers and Messengers (49)	492					1		1	1	3	3.4%
Total		2	1	5	4	11	12	26	28	89	

Table 1. Distribution of Sampled Companies Based on the NAICS

NAICS	Type of Manufacturing	Number (%)
311	Food Manufacturing	4 (5%)
312	Beverage and Tobacco Product Manufacturing	3 (4%)
316	Leather and Allied Product Manufacturing	4 (5%)
321	Wood Product Manufacturing	3 (4%)
322	Paper Manufacturing	3 (4%)
324	Petroleum and Coal Products Manufacturing	11 (14%)
325	Chemical Manufacturing	14 (18%)
331	Primary Metal Manufacturing	8 (10%)
333	Machinery Manufacturing	4 (5%)
334	Computer and Electronic Product Manufacturing	9 (12%)
335	Electrical Equipment, Appliance, and Component Manufacturing	2 (3%)
336	Transportation Equipment Manufacturing	13(17%)
Total		78

Table 2. Types of Manufacturing in the Sample Announcements

78 announcements in the manufacturing industries, 55 announcements (71%) are from firms in petroleum and coal products manufacturing, chemical manufacturing, primary metal manufacturing, computer and electronic products manufacturing, and transportation equipment manufacturing. The main reason why firms in these manufacturing industries have disclosed their performance reports more often than in other industries is that firms producing final consumer goods proactively meet needs and avoid potentially adverse stakeholders' reactions (Anton, Deltas & Khanna, 2004). Anton et al. (2004) said that firms that produce consumer goods are pressured by environmental interests more than firms that produce industrial goods. To proactively respond to the increasing environmental pressures and social responsibilities, firms producing consumer goods have actively communicated their environmental and social information to their interested parties.

We could not find many announcements in the mining sector related to the disclosure of environmental or sustainable performance reports during 1999 to 2006. Three announcements were reported by one firm, BXXX Ltd. Other firms in this industry have reported and provided their environmental performance reports on their Internet homepages. For instance, CXXX has reported the performance of a few environmental and social indicators relevant to sustainable development on its Internet homepage. It has monitored the performance of environmental and social indicators since 2005.

Since the utilities industry has to use natural capital to produce their products, such as electric power, natural gas, and fuel, it is one of the critical industries for sustaining society, doing business, and for activities such as the operation of factories and the routine activities of daily life. We found just four announcements in the utilities industry that were reported by. It does not seem that many firms in this industry proactively communicate their performance reports to the public. However, they have started disclosing their performance reports on Internet homepages since 2005 or 2006. For example, SXXX Company began providing its Corporate Responsibility Reports in 2006. To proactively respond to the increasing requirements of firms' performance reports, they might realize that they should disclose their social and environmental performance reports.

OXXX in the miscellaneous store retailers industry announced its performance reports based on the concept of sustainable development and business in 2006. Some firms in this industry have also reported their environmental or sustainability performance reports. For instance, StaXXX Inc. has been reporting its corporate responsibility, which includes a few sustainable business indicators, on its Internet homepage since 2006.

There were three announcements of environmental or sustainable performance reports in the couriers and messengers industry. They were reported by UXXX. UXXX has disclosed its sustainability reports since 2003. Like the utilities industry and the miscellaneous store retailers industry, a few firms like FXXX had provided their environmental or sustainable performance reports on their Internet homepages.

#### 4.1.1 Increasing announcements

Figure 1 shows the trends of the announcements of the disclosure of firms' performance reports during 1999 to 2006. We did not find many firms that announced their performance reports through diverse Internet media even though they began reporting their environmental performance in the early 2000s. This is consistent with previous studies. When Hamilton (1995) studied how media and stock market responded to the disclosure of the Toxic Release Inventory (TRI) data, he used 50 firms that reported TRI data through the media. This indicates that firms did not progressively communicate their environmental information to the public. Firms did not use various communication tools to inform the public about their environmental performance reports. According to Figure 1, the number of announcements of the disclosure of firms' performance reports has been gradually increasing since 2003. Firms that announced performance reports before 2002 were in the manufacturing industry. From 2003, firms in other industries, such as the couriers and messengers, the mining, and the utilities industries, started announcing their performance reports through diverse Internet media. There are two reasons why the number of announcements of firms' performance reports might have increased since 2003.

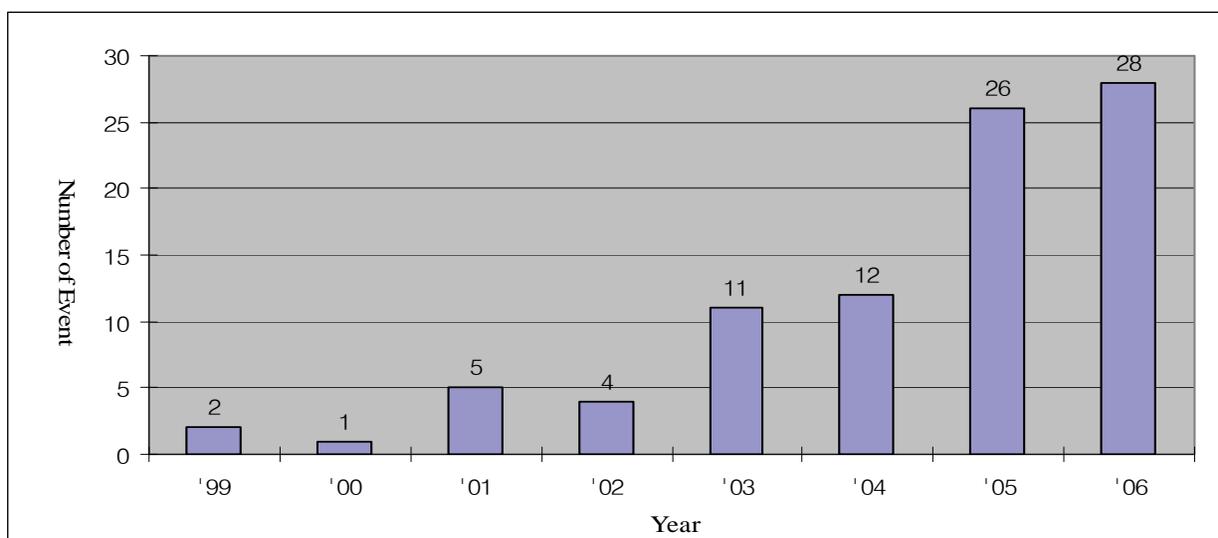


Fig. 1. Trends of the Announcements from 1999 to 2006

The first reason is that after 2003 firms might have recognized that voluntarily announcing their performance reports by using various Internet media is a powerful tool to inform the public of their performance reports (Feldman et al, 1996; Sasseville et al., 1997). Firms can

use their socially and environmentally friendly management activities as key information in their marketing strategies because environmental and social information has been gaining significance as a marketing tool since the early 2000s. Another reason is that a few international guidelines relevant to the disclosure of environmental, social, and economic performance reports have been published since 2002, such as the 2002 GRI Sustainability Reporting Guidelines which is the fundamental guidelines of all GRI documents (GRI, 2004). The 2002 GRI guidelines included more detailed performance indicators of three sustainability dimensions (economic, environmental, and social) than the 2000 GRI guidelines first published by the GRI in 2000. Thus, many firms have actively adopted the 2002 GRI guidelines not only to voluntarily implement sustainable business, but also to voluntarily communicate the performance of sustainable business. After publishing the GRI guidelines, many global firms have integrated their own indicators into the GRI guidelines to meet the needs of their interested parties. For example, UXXX announced its first corporate social responsibility report with the title "Operating in Unison UXXX 2002 Corporate Sustainability Report" on Nov 14, 2003. In this report, they mentioned, "We used the Global Reporting Initiative (GRI) as the foundation for writing our first Corporate Sustainability Report."

#### **4.1.2 Identifying sustainable business indicators (SBIs)**

After reviewing diverse environmental and sustainable indicator guidelines, such as the GRI guidelines, a total of 90 general indicators were selected. Table 3 shows the list of 90 general indicators. These general indicators were separated into seven categories in order to identify absolute and relative indicators types for sustainable business based on the TBL: 22 Environmental indicators; 14 economic indicators; 16 social indicators; 15 economic and environmental (eco-efficient) indicators; 7 social and environmental (socio-environmental) indicators; 6 social and economic (socio-economic) indicators; and 10 environmental, economic and social (integrated) indicators.

Environmental, economic, and social indicators are absolute indicators. Eco-efficient, socio-environmental, socio-economic, and integrated indicators are relative indicators used to implement sustainable business practices. Socio-environmental indicators are focused on environmental impacts that affect social impacts, and vice versa. Azar, Holmberg, and Lindgren (1996) mentioned that the goal of the socio-environmental indicators is to serve as a tool in planning and decision-making processes at various managerial levels within society. Socio-economic indicators are related to the relationship between a firm's economic activities and social effects. Socio-economic requires firms not only to consider one or more social impacts, but also one or more economic impacts (Etzioni, 2003). Unlike socio-environmental and socio-economic indicators, eco-efficient indicators are more easily understood and quantified than those of the socio-environmental and socio-economic indicators. Eco-efficient indicators incorporated with environmental and economic indicators mean business's activities that increase economic values while decreasing ecological impacts and using natural capital stocks (Desimone & Popoff, 1998). Integrated indicators are comprehensively incorporated with economic, environmental, and social issues of the TBL. They are systematic and fundamental indicators that are built from the concepts of sustainable business as well as supporting the other indicators.

To identify the general indicators for sustainable business, a pilot survey was conducted. This pilot survey was implemented by identifying whether or not each indicator of 90 general indicators was popularly reported in each pilot sample, which is a firm's report. Of the 89 sample firms' reports, 38 performance reports disclosed in 2004 and 2005 were selected as pilot samples in order to select a sample of firms in the industries that

significantly affect environmental and social impacts, such as the mining, utilities, and manufacturing industries. Firms in the mining industry started announcing their performance reports in 2004 and firms in the utility industries announced their performance reports in 2005 through Internet media. General indicators that were reported in over 60% of the samples of the pilot survey are defined as sustainable business indicators (SBIs) for this research. Table 3 shows the results of the pilot survey.

Based on Table 3, the distribution of general indicators in each category is as follows: 9 environmental indicators; 5 economic indicators; 10 social indicators; and 5 integrated indicators. We did not find relative indicators, such as socio-environmental and socio-economic indicators that were reported in over 60% of the pilot sample. Based on the results

	Indicators	Reporting (%)	Not Reporting(%)
Environmental	1)Total amount of water used	<b>34(90%)</b>	4(10%)
	2)Total amount of materials used to package product	14(37%)	<b>24(63%)</b>
	3)Total amount of materials used to produce products	8(21%)	<b>30(79%)</b>
	4)Total amount of renewable resources used	7(18%)	<b>31(82%)</b>
	5)Total amount of non-renewable resources used	0(0%)	<b>38(100%)</b>
	6)Total amount of recycled or reused materials used	15(40%)	<b>23(60%)</b>
	7)Total amount of energy used	<b>35(92%)</b>	3( 8%)
	8)Total amount of renewable energy used	20(53%)	<b>18(47%)</b>
	9)Total amount of non-renewable energy used (oil)	12(32%)	<b>26(68%)</b>
	10)Concentration of a specific contaminant in tissue of a specific plant species found in the local or regional area	17(45%)	<b>21 (55%)</b>
	11)Habitats protected or restored	20(53%)	<b>18(47%)</b>
	12)Strategies, current actions, and future plans for managing impacts on biodiversity	16 (42%)	<b>22(58%)</b>
	13)Total amount of greenhouse gases generated (CO2)	<b>38(100%)</b>	0(0%)
	14)Total amount of emissions of ozone-depleting substances	18(47%)	<b>20(53%)</b>
	15)Total amount of Volatile Organic Compound (VOC) generated	<b>24(63%)</b>	<b>14(37%)</b>
	16)Total amount of air emissions generated (SOx, NOx)	<b>28(74%)</b>	<b>10(26%)</b>
	17)Total amount of waste recycled or reused	<b>26(68%)</b>	<b>12(32%)</b>
	18)Total amount of solid waste generated	<b>32(84%)</b>	<b>6(16%)</b>
	19)Total amount of hazardous waste generated	<b>31(82%)</b>	7(18%)
	20)Total number and volume of significant spills and accidents	21(55%)	<b>17 (45%)</b>
	21)Total amount of wastewater	16(42%)	<b>22(58%)</b>
	22)Total number of environmental violations	<b>30(79%)</b>	<b>8(21%)</b>
Economic	1)Annual profits	<b>23(61%)</b>	15(39.5%)
	2)Annual revenues	18(47%)	20(52.6%)
	3)Annual sales	<b>30(79%)</b>	8(21.1%)
	4)Annual operating costs (based on EHS)	14(37%)	24(63.2%)
	5)Costs saving (based on EHS)	8(21%)	30(78.9%)
	6)Capital expenditure (environmental)	11(29%)	27(71%)
	7)Annual productivity	15(40%)	23(60%)
	8)Fines	<b>28(74%)</b>	10(26%)
	9)R & D investment (Based on EHS)	8(21%)	<b>30(79%)</b>
	10)R & D investment (total)	<b>24(63%)</b>	14(37%)
	11)Donations	<b>37(97%)</b>	1(3%)
	12)Annual turnover	3(8%)	35(92%)
	13)Value added	0(0%)	<b>38(100%)</b>
	14)Stock price/dividends	19(50%)	19(50%)

Indicators		Reporting (%)	Not Reporting (%)
Social	1)Female, disabled person's rights	<b>26(68%)</b>	12(32%)
	2)Abolition of all child labor	21(55%)	17 (45%)
	3)The recruitment of people from ethnic minorities, older workers, women	<b>26(68%)</b>	12(32%)
	4)Empowerment of employees	<b>23(61%)</b>	15(40%)
	5)Average hours of training per employee	<b>26(68%)</b>	12(32%)
	6)Number of employees	<b>33(87%)</b>	5 (13%)
	7)Employment creation	20(53%)	18 (47%)
	8)Employment turn over	12(32%)	26(68%)
	9)Recordable Illness rate (RIR)	<b>27(71%)</b>	11 (29%)
	10)Lost time Rate (LTR)	<b>25(66%)</b>	13(34%)
	11)Total number of work-related fatalities	20(53%)	18(47%)
	12)Whether or not firms implement a broad range of voluntary activities	<b>35(92%)</b>	3 ( 8%)
	13)Whether or not firms provide opportunities to communicate internally and externally to interested parties	<b>31(82%)</b>	7(18%)
	14)Breakdown of employees in terms of gender, age, and minority group	<b>27(71%)</b>	11 (29%)
	15)Ratio of basic salary of men to women by employee category	10(26%)	28(74%)
	16) Whether or not equity was mentioned	7(18%)	31(82%)
Social- Environmental	1)Training time/total amount of solid waste generated	3(8%)	<b>35(92%)</b>
	2)Employee's training time / total amount of energy used	2(5%)	<b>36(95%)</b>
	3)Total solid waste/employee	5(13%)	<b>33(87%)</b>
	4)Total amount of energy used /employee	3(8%)	<b>35(92%)</b>
	5)Voluntary activities/total amount of energy used	0(0%)	<b>38(100%)</b>
	6)Recordable illness rate/total amount of energy used	0(0%)	<b>38 100%</b>
	7)Lost time rate/total amount of energy used	0(0%)	<b>38(100%)</b>
Social - economic	1)Training time of employee per profit	2(5%)	<b>36(95%)</b>
	2)Sales per employee	0(0%)	<b>38 (100%)</b>
	3)Lost time rate per profits	0(0%)	<b>38(100%)</b>
	4)Donations per sales	0(0%)	<b>38(100%)</b>
	5)Donations per profit	0(0%)	<b>38(100%)</b>
	6)Donations per revenue	0(0%)	<b>38(100%)</b>
Eco-efficiency	1)Total amount of material used / sales	1(3%)	<b>37(97%)</b>
	2)Total amount of material used /profits	1(3%)	<b>37(97%)</b>
	3)Total amount of solid waste /revenue	1(3%)	<b>37 (97%)</b>
	4)Total amount of non-renewable energy used / sales	0(0%)	<b>38 (100%)</b>
	5)Total amount of non-renewable energy used / sales	0(0%)	<b>38 (100%)</b>
	6)Total amount of non-renewable energy used / revenues	0(0%)	<b>38(100%)</b>
	7)Total amount of energy used / sales	21(55%)	<b>17(45%)</b>
	8)Total amount of energy used /revenues	1(3%)	<b>37(97%)</b>
	9)Total amount of toxic materials generated/sales	2(5%)	<b>36 (95%)</b>
	10)Total amount of toxic materials generated /profits	0(0%)	<b>38 (100%)</b>
	11)Total amount of material recycled and reused/ales	0(0%)	<b>38(100%)</b>
	12)Total amount of material recycled and reused /revenue	0(0%)	<b>38(100%)</b>
	13)Total amount of global warming materials generated/sales	0(0%)	<b>38(100%)</b>
	14)Total amount of global warming materials generated/profits	0(0%)	<b>38(100%)</b>
	15)Total amount of global warming materials generated/ revenue	0(0%)	<b>38(100%)</b>

Indicators		Reporting (%)	Not Reporting (%)
Integrated	1)Whether or not firms implement voluntary environmental management systems (ISO 14001, LCA, etc)	28(74%)	10(26%)
	2)Whether or not firms implement environmental accounting	2(5%)	36(95%)
	3)Whether or not firms make decisions based on the concept of sustainable business and long-term objective	29(76%)	9(24%)
	4)Whether or not firms enlighten consumers and suppliers for the concept of sustainable business	27(71%)	11(29%)
	5)Whether or not firms deal with the impact on the Third World	16(42%)	22 (58%)
	6)Whether or not being verified their performance reports by third parties	14(37%)	24(63%)
	7)Whether or not firms compare GRI		
	8)Whether or not firms mention culture	25(66%)	13(34%)
	9)Whether or not firms survey in the reports (feedback)	28(74%)	10(26%)
	10)Whether or not firms compare performance based on standard year (total values/relative values)	16(42%) 21(55%)	22(58%) 17 (45%)

Table 3. The List of 90 General Indicators and the Results of Pilot Survey (Sustainable Business Indicators over 60% of the sample) (N=38)

of the pilot survey, firms were not familiar with relative indicators. Since many firms had already measured and reported absolute indicators, absolute indicators made up a larger proportion of the SBIs than relative indicators such as socio-economic and socio-environmental indicators. With 29 SBIs identified from the pilot survey, a full survey was conducted to identify SBIs in the total sample of 89 firm's reports. Table 4 shows the results of the full survey.

#### 4.1.3 Changes in sustainable business indicators disclosed in performance

Eighty-nine sample companies were separated into two categories, category I (1999 ~ 2002) and category II (2003~2006), to compare the trends of sustainable business indicators over a time period. These two categories were divided based on the year 2003 because the number of firms that announced their performance reports increased beginning in 2003. To compare the trends of sustainable business indicators, we chose firms in the manufacturing industries because all firms in category I were in the manufacturing industries. Among the 89 sample companies, the 78 announcements disclosed by the manufacturing industries were divided into category I (12 firms) and category II (66 firms).

To identify the changes in SBIs used in manufacturing firms, we added four indicators to the previously defined 29 sustainable business indicators; total amount of renewable energy used (solar energy, clean energy); whether or not firms describe environmentally friendly product or process; abolition of all child labor; and whether or not firms use relative indicators (eco-efficiency). Although some of these four indicators were not reported at over 60% in the pilot survey, they are considered necessary by the authors as indicators to evaluate the characteristics of sustainable business. Total amount of renewable energy used and whether or not firms develop or describe environmentally friendly product or process are used to evaluate whether or not firms apply diverse technologies to implement sustainable business; whether or not firms use relative indicators, such as eco-efficiency, is used to identify the consistency of natural capital stocks; and abolition of all child labor is used to evaluate the social performance of sustainable business. Thus, we used a total of 33 SBIs to identify the trends of sustainable business indicators of firms in the manufacturing industries. The trends of sustainable business indicators used in category I and category II is shown in Table 5.

Indicators		No. of Firms Reporting (%)			No. of Firms Not Reporting (%)
		Quant. indicator	Qual. indicator	Sub-total	
Environmental Indicators	1)Total amount of water used	66	13	79(89%)	10(11%)
	2)Total amount of energy used	69	16	85(96%)	4(4%)
	3)Total amount of greenhouse gases generated (CO <sub>2</sub> )	70	17	87(98%)	2(2%)
	4)Total amount of Volatile Organic Compound (VOC) generated	38	16	54(61%)	35(39%)
	5)Total amount of air emissions generate (SO <sub>x</sub> , NO <sub>x</sub> )	65	14	79(89%)	10 (11%)
	6)Total amount of waste recycled or reused	51	26	77(87%)	12(13%)
	7)Total amount of solid waste generated	54	28	82(92%)	7(8%)
	8)Total amount of hazardous waste generated	56	19	75(84%)	14 (16%)
	9)Total number of environmental violations	44	24	68(76%)	21(24%)
Economic Indicators	1)Annual profits	44	13	57(64%)	32(36%)
	2)Annual sales	68	12	80(90%)	9(10%)
	3)Fines	49	12	61(69%)	28(31%)
	4)R & D investment (total)	30	22	52(58%)	37(42%)
	5)Donations	52	3	85(96%)	4(4%)
Social Indicators	1)Female, disabled person's rights	0	59	59(66%)	30(34%)
	2)The recruitment of people from ethnic minorities, older workers, women	0	56	56(63%)	33(37%)
	3)Empowerment of employees	0	58	58(65%)	31(35%)
	4)Average hours of training/ employee	4	71	75(84%)	14(16%)
	5)Number of employees	61	20	81(91%)	8(9%)
	6)Recordable illness rate (RIR)	68	2	70(79%)	19(21%)
	7)Lost time rate (LTR)	64	1	65(73%)	24(27%)
	8)Whether or not firms implement a broad range of voluntary activities	0	82	82(92%)	7(8%)
	9)Whether or not firms provide opportunities to communicate internally and externally to interested parties	0	78	78(88%)	11(12%)
	10)Breakdown of employees in terms of gender, age, and minority group	0	55	55(62%)	34 (38%)
Integrated Indicators (reference)	1)Whether or not firms implement voluntary environmental management systems (ISO 14001, LCA, etc)	0	6	68(76%)	21(24%)
	2)Whether or not firms make decisions based on the concept of sustainable business and long-term objective	0	74	74(83%)	15(17%)
	3)Whether or not firms enlighten consumers and suppliers for the concept of sustainable business	0	71	71(80%)	18(20%)
	4)Whether or not firms compare GRI	0	60	60(67%)	29(33%)
	5)Whether or not firms mention Culture	0	71	71(80%)	18 (20%)

Table 4. List of the Sustainable Business Indicators (SBIs) (1999 ~ 2006) (N=89)

No	Indicators	Category I (1999 ~ 2002)						Category II (2003 ~ 2006)					
		Reporting			Not Reporting (%)	Total	Reporting			Not Reporting (%)	Total		
		Quant. (%)	Qual. (%)	Sub-total (%)			Quant. (%)	Qual. (%)	Sub-total (%)				
EN1	Total amount of water used	10 (83%)	2 (17%)	12 (100%)	0 (0%)	12	50 (77%)	15 (23%)	65 (99%)	1 (1%)	66		
EN2	Total amount of energy used	8 (67%)	4 (33%)	12 (100%)	0 (0%)	12	53 (80%)	13 (20%)	66 (100%)	0 (0%)	66		
EN3	Total amount of greenhouse gases generated (CO <sub>2</sub> )	7 (64%)	4 (36%)	11 (92%)	1 (8%)	12	53 (82%)	12 (18%)	65 (99%)	1 (1%)	66		
EN4	Total amount of Volatile Organic Compound (VOC) generated	6 (86%)	1 (14%)	7 (58%)	5 (42%)	12	31 (72%)	12 (28%)	43 (65%)	23 (35%)	66		
EN5	Total amount of air emissions generated (SO <sub>x</sub> , NO <sub>x</sub> )	12 (100%)	0 (0%)	12 (100%)	0 (0%)	12	45 (70%)	19 (30%)	64 (97%)	2 (3%)	66		
EN6	Total amount of waste recycled or reused	8 (67%)	4 (33%)	12 (100%)	0 (0%)	12	38 (58%)	28 (42%)	66 (100%)	0 (0%)	66		
EN7	Total amount of solid waste generated	6 (50%)	6 (50%)	12 (100%)	0 (0%)	12	41 (66%)	21 (34%)	62 (94%)	4 (6%)	66		
EN8	Total amount of hazardous waste generated	8 (73%)	3 (27%)	11 (92%)	1 (8%)	12	39 (68%)	18 (32%)	57 (86%)	9 (14%)	66		
EN9	Total number of environmental violations	5 (45%)	6 (55%)	11 (92%)	1 (8%)	12	32 (50%)	32 (50%)	64 (97%)	2 (3%)	66		
EN10	Total amount of renewable energy used (clean fuel, solar energy, clean energy)	0 (0%)	3 (100%)	3 (25%)	9 (75%)	12	35 (75%)	12 (25%)	47 (71%)	19 (29%)	66		
EN11	Whether or not firms describe environmentally friendly product or process	0 (0%)	9 (100.0%)	9 (75%)	3 (25%)	12	0 (0%)	60 (100%)	60 (91%)	6 (9%)	66		
EC1	Annual profits	3 (50%)	3 (50%)	6 (50%)	6 (50%)	12	32 (80%)	8 (20%)	40 (61%)	26 (39%)	66		
EC2	Annual sales	7 (64%)	4 (36%)	11 (92%)	1 (8%)	12	54 (89%)	7 (11%)	61 (92%)	5 (8%)	66		
EC3	Fines	4 (57%)	3 (43%)	7 (58%)	5 (42%)	12	38 (83%)	8 (17%)	46 (70%)	20 (30%)	66		
EC4	R & D investment (total)	4 (80%)	1 (20%)	5 (42%)	7 (58%)	12	23 (55%)	19 (45%)	42 (64%)	24 (36%)	66		
EC5	Donations	4 (40%)	6 (60%)	10 (83%)	2 (17%)	12	40 (63%)	24 (37%)	64 (97%)	2 (3%)	66		

Table 5. Changes in Sustainable Business Indicators Used in Category I and II

No	Indicators	Category I (1999 ~ 2002)						Category II (2003 ~ 2006)					
		Reporting			Total	Not Reporting (%)	Total	Reporting			Total	Not Reporting (%)	
		Quant. (%)	Qual. (%)	Sub-total (%)				Quant. (%)	Qual. (%)	Sub-total (%)			
SO1		0 (0%)	5 (100%)	5 (42%)	12	7 (58%)	12	0 (0%)	49 (100%)	49 (74%)	66	17 (26%)	
SO2	Abolition of all child labor	0 (0%)	2 (100%)	2 (17%)	12	10 (83%)	12	0 (0%)	41 (100%)	41 (62%)	66	25 (38%)	
SO3	The recruitment of people from ethnic minorities, older workers, women	0 (0%)	3 (100%)	3 (25%)	12	9 (75%)	12	0 (0%)	44 (100%)	44 (67%)	66	22 (33%)	
SO4	Empowerment of employees	0 (0%)	1 (100%)	1 (8%)	12	11 (92%)	12	0 (0%)	41 (100%)	41 (62%)	66	25 (38%)	
SO5	Average hours of training/employee	0 (0%)	12 (100%)	12 (100%)	12	0 (0%)	12	5 (8%)	61 (92%)	66 (100%)	66	0 (0%)	
SO6	Number of employees	7 (58%)	5 (42%)	12 (100%)	12	0 (0%)	12	48 (76%)	15 (24%)	63 (96%)	66	3 (4%)	
SO7	Recordable illness rate (RIR)	8 (100%)	0 (0%)	8 (67%)	12	4 (33%)	12	52 (95%)	3 (5%)	55 (83%)	66	11 (17%)	
SO8	Lost time rate (LTR)	7 (100%)	0 (0%)	7 (58%)	12	5 (42%)	12	51 (98%)	1 (2%)	52 (79%)	66	14 (21%)	
SO9	Whether or not firms implement a broad range of voluntary activities	0 (0%)	10 (100%)	10 (83%)	12	2 (17%)	12	0 (0%)	64 (100%)	64 (97%)	66	2 (3%)	
SO10	Whether or not firms provide opportunities to communicate internally and externally to interested parties	0 (0%)	9 (100%)	9 (75%)	12	3 (25%)	12	0 (0%)	60 (100%)	60 (91%)	66	6 (9%)	
SO11	Breakdown of employees in terms of gender, age, and minority group	0 (0%)	6 (100%)	6 (50%)	12	6 (50%)	12	0 (0%)	53 (100%)	53 (80%)	66	13 (20%)	
I1	Whether or not firms implement voluntary environmental management systems (ISO 14001, LCA, etc)	0 (0%)	6 (100%)	6 (50%)	12	6 (50%)	12	0 (0%)	53 (100%)	53 (80%)	66	13 (20%)	
I2	Whether or not firms make decisions based on the concept of sustainable business and long-term objective	0 (0%)	3 (100%)	3 (25%)	12	9 (75%)	12	0 (0%)	56 (100%)	56 (85%)	66	10 (15%)	

Table 5. Changes in Sustainable Business Indicators Used in Category I and II

No	Indicators	Category I (1999 ~ 2002)					Category II (2003 ~ 2006)				
		Quant. (%)	Qual. (%)	Sub- total(%)	Not Reporting (%)	Total	Quant. (%)	Qual. (%)	Sub- total(%)	Not Reporting (%)	Total
I3	Whether or not firms enlighten consumers and suppliers for the concept of sustainable business	0 (0%)	4 (100%)	4 (33%)	8.0 (67%)	12	0 (0%)	55 (100%)	55 (83%)	11 (17%)	66
I4	Whether or not firms compare GRI	0 (0%)	6 (100%)	6 (50%)	6 (50%)	12	0 (0%)	45 (100%)	45 (68%)	21 (31.8%)	66
I5	Whether or not firms mention culture	0 (0%)	8 (100%)	8 (67%)	4 (33%)	12	0 (0%)	58.00 (100%)	58 (88%)	8 (12.1%)	66
I6	Whether or not firms use relative indicators (eco-efficiency)	3 (100%)	0 (0%)	3 (25%)	9 (75%)	12	56 (100%)	0 (0%)	56 (5%)	10 (15.2%)	66

Table 5. Changes in Sustainable Business Indicators Used in Category I and II

Key Words in the Titles in Category I (1999 ~ 2002)			Key Words in the Titles in Category II (2003 ~ 2006)		
Environmental / Environmental, Health, and Safety	Sustainability	Total	Environmental / Environmental, Health, and Safety	Sustainability	Total
5 (42%)	7 (58%)	12	11 (17%)	55 (83%)	66

Table 6. Changes in Key Words Used in the Title of Performance Reports in Category I and II

Daly (1990) and Azapagic and Perdan (2005) said that sustainable development should be described by qualitative as well as quantitative measurement because it is required to explain whether or not an organization's diverse activities consider or meet human needs and social demands. We also found that firms in category I and II used both qualitative and quantitative indicators in their sustainable business performance reports.

In category II, most social and integrated indicators except for four social indicators and one integrated indicator were qualitative indicators. Two quantitative social indicators, the Recordable Illness Rate (RIR) and the Lost Time Rate (LTR), are used to evaluate firms' occupational safety and health. The recordable illness rate is the number of full-time employees suffering a recordable injury or illness during a given calendar year. The LTR is measured as the number of lost time claims per million hours worked and allows analysis of the number of lost time claims without the distorting effects of the size of the workforce.

#### 4.1.3.1 Consistency of natural capital

The consistency of natural capital stocks can be measured by identifying the changes in the constant physical capital stocks, such as renewable energy and resources. This is because constant physical capital stock is one of the two concepts of the consistency of natural capital stock (Pearce, Barbier, & Markandya, 1990). Accordingly, the amount of renewable energy used in firms is a sustainable business indicator. Examples of renewable energy used in firms' performance reports are wind, solar energy, hydrogen energy, and biogas. Based on Table 5, firms in category I reported the performance of this indicator by 25%, but firms in category II reported it by about 71%. Since 2003, many firms in category II had increased the use of renewable energy while they reduced the use of non-renewable energy. In the Corporate Responsibility Report 2005, STXXX electronics (2006) reported that they increased the use of wind and solar energy from 18.6GWh in 2003 and 30.5GWh in 2004. In the '2004 Sustainability Report' published in 2005, POTXXX Corporate reported that it has started using renewable energy in 2004.

The consistency of the natural capital stock can also be measured by identifying a constant economic value, which is another concept of the consistency of natural capital stock (Pearce et al., 1990). We found firms that disclosed different eco-efficient indicators in their performance reports, such as energy efficiency, the amount of pollution per dollar, etc. Based on Table 5, only 25% of the sample firms in category I disclosed eco-efficient indicators in their performance reports, while about 85% of the sample firms disclosed them in category II. Many firms in category II reported eco-efficient indicators, such as energy efficiency, in their performance reports. This is consistent with what WBCSD (2005) and Desimone and Popoff (1998) stated. They said that firms can integrate sustainable

development into their business by applying constant economic values of the natural capital stocks, such as eco-efficient indicators.

By providing the performance of various eco-efficient indicators, firms can help interested parties understand how effectively physical natural capital stocks, such as energy, have been used to retain an appropriate level of natural capital stock. For instance, AnhXXX Company (2006) measured and reported a few eco-efficient indicators, such as energy efficiency in 1,000 gig Joules (gJs) per million dollars Adjusted Net Sales (ANS), and Hazardous waste generated in kg per million dollars ANS. BaXXX Inc. (2005) defined energy efficiency as cumulative % improvement in energy use per unit of production value and reported that energy efficiency increased from 12% in 2002 to 22% in 2004.

Most firms in category I used absolute indicators, such as the total amount of energy consumed, rather than relative indicators, while firms in category II used absolute indicators as well as relative indicators, such as eco-efficient indicators based on their own firms' characteristics. This is because firms in category I did not have diverse and sufficient guidelines for relative indicators. After a few international guidelines, such as the GRI guidelines, were published in 2002, firms had opportunities to use or consider relative indicators, such as various eco-efficient indicators. Those guidelines have introduced and proposed diverse relative indicators, such as eco-efficient indicators. By comparing firms that used eco-efficient indicators in category I and II, we found that firms in category II may have proactively monitored and improved the level of consistency of natural capital stocks by setting up and evaluating eco-efficiency more so than firms in category I.

#### 4.1.3.2 Culture for sustainable business

We found firms that had described their culture for sustainable business practices. This is consistent with what the International Institute for Sustainable Development (IISD) et al. (1992) and what Welford (1995) emphasized. They asserted that a firm should change its corporate culture to implement sustainable business practices. They also proposed some examples of corporate culture: employee participation in decision-making processes, the equitable treatment of women and minority groups, communication with the public, and the impact on the Third World and indigenous populations. We found these examples as SBIs. Table 5 shows the trends of these indicators in category I and II.

We searched the terms, "Empower," "Participation," and "Decision," to identify whether or not firms allow employee participation in the decision making process. Firms in category I and II reported that they involved their employees in their decision making process by empowering employees. While 62% of samples firms in category II reported that they involved their employees in their decision making process by empowering employees, only about 8% of sample firms in category I described the empowerment of employees. For instance, SXXXX Inc. in category II addressed, "Within this culture, employees are empowered and strongly encouraged to use their skills and experience to find better ways of doing business" (Corporate Social Responsibility Report 2005, p. 4). The CoXXX Company in category II also stated that its employees are empowered to keep the highest standards of quality in products, processes and relationships in 2006 Corporate Responsibility Review. STXXX electronics Company in category I did not mention employee empowerment in Corporate Environmental Report and Social Review 2001. However, STXXX electronics Company (2006) in category II stated that employee empowerment is one of the key principles for its sustainable business in their corporate responsibility report.

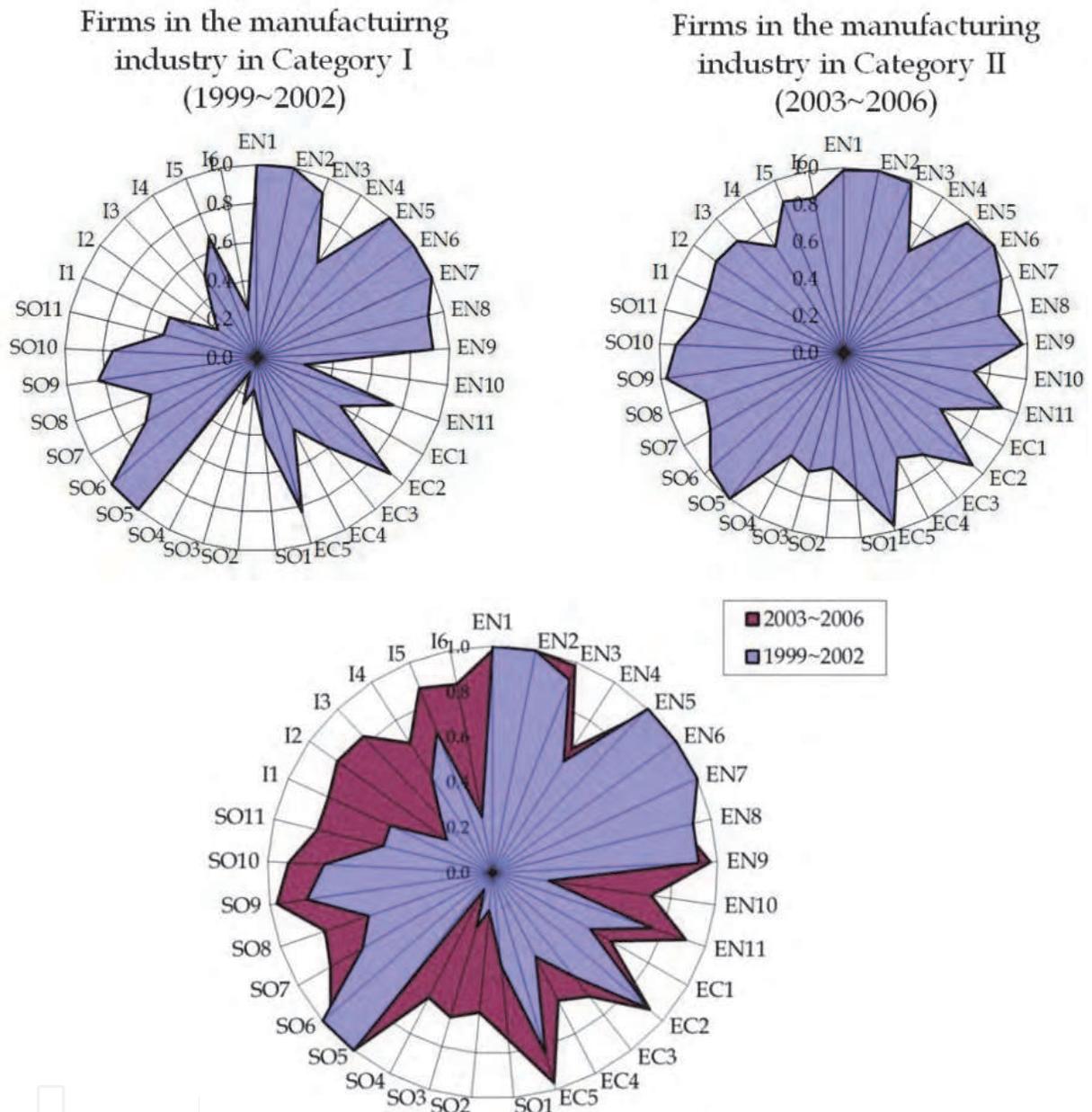
We found one indicator; breakdown of employees in terms of gender, age group, and minority group membership, as one of the SBIs. This indicator can be used to identify the equitable treatment of women and minority groups which is one aspect of corporate culture that the IISD et al. (1992) proposed. Firms in category II reported this indicator by 80% of the firms, and firms in category I described it 50% of the firms. STXXX electronics Company in category I did not mention diversity and equitable opportunity of women and minority in Corporate Environmental report and Social Review 2001. However, in category II, it reported that it not only ensured diversity and equal opportunity, but also disclosed the changes in percentage of average employee age and seniority, number of nationalities by regions, and gender breakdown by regions in Corporate Responsibility Report 2005 and 2006.

#### 4.1.3.3 Harmonization of the triple bottom line

Table 5 presents the trends of the Triple Bottom Line (TBL) used in firms' performance reports in category I and category II. Sustainable business indicators that were reported in over 60% of sample firms in category I are: 9 environmental indicators (82% of total environmental indicators); 2 economic indicators (40% of total economic indicators); 5 social indicators (45% of total social indicators); and one integrated indicator (20% of total integrated indicators). Firms in category I focused more on the environmental indicators, rather than social and economic indicators. On the other hand, many firms in category II described environmental indicators as well as economic and social indicators in their performance reports. Based on Table 5, all sustainable business indicators were reported in over 60% of all sample firms in category II. For example, 17% of firms in category I and 62% of firms in category II reported abolition of child labor. Only about 8% of firms in category I mentioned empowerment of employees in their performance reports, but firms in category II reported it by approximately 65%. Figure 2 shows the harmonization of the TBL used in firms in category I and II. It seems that most firms in category I focused more on environmental indicators and firms in category II tried to harmonize the TBL. Based on Table 6, about 42% of firms in category I used the term, "Environmental," "Environmental, health, and safety" as key words in the titles of their performance reports. While approximately 58% of sample firms in category I used the term "Sustainability" or "Corporate social responsibility" as a key word in the title of their performance reports, about 83% of sample firms in category II used the term. These changes indicate that many firms have shifted the key words in the title of their performance reports from the concept of environmental performance to the concept of sustainable business practices, which is based on the concept of the TBL. For instance, STXXX electronics Company used "Environmental Report" as the title of its performance reports in 2001 and "Social and Environmental Report" in 2003. In 2004, STXXX electronics Company first used the term, "Corporate Responsibility Report 2004" as the title of its performance reports on sustainable business practices.

#### 4.1.3.4 Sustainability enlightenment

Young (2000) insisted that sustainable business enlightens its interested parties, such as investors, customers, and employees, on the concept of sustainable business practices. This is because interested parties have significant roles in changing traditional consumption, purchasing, and investing behaviors toward sustainable business practices. We found firms behaviors that are consistent with Young's (2000) findings. Based on Table 5, 83% of firms in category II and 33% of firms in category I reported that they enlightened their interested parties, such as customers, suppliers, investors, and employees about the concepts of sustainable business. It seems that firms in category II progressively enlightened their



EN1:Total amount of water used;EN2:Total amount of energy used;EN3:Total amount of greenhouse gases generated (CO<sub>2</sub>);EN4:Total amount of Volatile Organic Compound (VOC) generated;EN5:Total amount of air emissions generated (SO<sub>x</sub>, NO<sub>x</sub>);EN6:Total amount of waste recycled or reused;EN7:Total amount of solid waste generated;EN8:Total amount of hazardous waste generated;EN9:Total number of environmental violations;EN10: Total amount of renewable energy used (clean fuel, solar energy, clean energy);EN11:whether or not firms describe environmentally friendly product or process;EC1:Annual profits;EC2:Annual sales;EC3:Fines;EC4:R&D investment (total);EC5:Donations;SO1:Female, disabled person's rights;SO2: Abolition of all child labor; SO3:The recruitment of people from ethnic minorities, older workers, women;SO4:Empowerment of employees;SO5:Average hours of training per employee;SO6:Number of employees; SO7:Recordable illness rate (RIR);SO8:Lost time rate (LTR);SO9:Whether or not firms implement a broad range of voluntary activities;SO10:Whether or not firms provide opportunities to communicate internally and externally to interested parties;SO11:Breakdown of employees in terms of gender, age, and minority group; I1:Whether or not firms implement voluntary environmental management systems (ISO 14001, LCA, etc);I2:Whether or not firms make decisions based on the concept of sustainable business and long-term objective;I3:Whether or not firms enlighten consumers and suppliers for the concept of sustainable business;I4:Whether or not firms compare GRI;I5:Whether or not firms mention culture;I6:Whether or not firms used relative indicators (eco-efficiency)

Fig. 2. Trend of Sustainable Business Indicators Reported in Category I and II

interested parties on sustainable business practices more so than firms in category I did. For instance, in their 2006 Citizenship Report, GeXXX Electronic Co. reported that it had required their suppliers to consider the concepts of sustainable business since 2002 by complying with laws and regulations governing minimum wage, hours of service, and overtime wages for employees. GeXXX Electronic Co. (2007) introduced “*The Spirit & The Letter*” polices so that GeXXX Electronic Co. could help its interested parties, such as employees, suppliers, and customers, understand the common standards of behaviors required to implement sustainable business practices of GeXXX Electronic Co. In KimXXX’s 2005 Sustainability Report, KimXXX Corporation reported that they enlightened and shared tools and technologies with suppliers to meet its social and environmental requirements that are sustainable business practices.

#### 4.1.3.5 Voluntary programs and communication to the public

We identified whether or not a firm implemented diverse voluntary programs as an indicator to evaluate a firm’s sustainable business, and found that most of the firms in category I and II have implemented and reported a variety of voluntary programs. This is consistent with Thompson (2002) and Scott (2001). They found that sustainable business should implement diverse voluntary programs to build strong relationships with stakeholders, increase a firm’s image and reputation, and consider ethical investment for individual investors and fund managers. In Table 5, about 83% of firms in category I and 97% of firms in category II reported their diverse voluntary programs. In their 2005 Sustainability Report, KimXXX Corporation disclosed that it voluntarily joined the U.S. Environmental Protection Agency’s Climate Leaders program in December 2005. GeXXX Company reported that it had implemented various voluntary greenhouse gas management initiatives to mitigate global climate change in their Corporate Responsibility Report of 2004/5. Many firms in category II implemented their voluntary programs especially for people employed in developing countries. AIXX X Inc. and KimXXX Corporation disclosed that they voluntarily implemented HIV/AIDS programs and management systems at places where they operate their facilities in South Africa. The goal of these programs is to help employees and their families undergo voluntary counseling and confidential testing for HIV/AIDS. The increasing number of voluntary HIV/AIDS programs implemented in developing countries is consistent with changes in corporate culture that the IISD et al. (1992) and Welford (1995) suggested in order to implement sustainable business.

Many firms in category II have voluntarily applied to the GRI guidelines to report the performance of their sustainable business practices. AlcXXX Inc. reported that it voluntarily used the GRI guidelines to help its interested parties to understand its sustainable business practices in 2004 Sustainability Report.

#### 4.2 Changes in the key words of the performance titles

Data from a total of 287 firms were collected as sample data among all S&P 500 companies, as of December 2006. The following words were used to codify the results: *Environmental Report*; *Environmental, Health, and Safety Report*; *Sustainability*; *Corporate Social Responsibility*; *Corporate Report*; and *Citizenship Report*. The results of these codes are separated into 3 categories; E (environmental report); EHS (environmental, health, and safety reports); Sustainability (sustainability, corporate social responsibility, and sustainable report). Sustainability, corporate social responsibility, corporate report, and sustainable report mean that the firm considered the concept of sustainable business because these words evolved from the concept of sustainable development. Table 7 presents the trends in key word usage

NAICS		Reporting				Not Reporting	Total
Title(2 digit)	Title(3 digit)	E	E, H, S	Sustainability	Sub-total		
Agriculture, Forestry, Fishing and Hunting (11)	Crop Production (111)	0(0%)	0(0%)	1(100%)	1(100%)	0(0%)	1
	Forestry and Logging (113)	1(100%)	0(0%)	0(0%)	1(100%)	0(0%)	1
	Sub-total	1(50%)	0(0%)	1(50%)	2(100%)	0(0%)	2
Mining (21)	Oil and Gas Extraction (211)	0(0%)	2(40%)	3(60%)	5(62%)	3(38%)	8
	Mining (except Oil and gas)(212)	1(33%)	0(0%)	2(67%)	3(75%)	1(25%)	4
	Support Activities for Mining (213)	0(0%)	2(50%)	2(50%)	4(57%)	3(43%)	7
	Sub-total	1(8%)	4(33%)	7(58%)	12(63%)	7(37%)	19
Utilities(22)	Utilities (221)	7(28%)	6(24%)	12(48%)	25(78%)	7(22%)	32
Construction (23)	Construction of Buildings (236)	0(0%)	0(0%)	1(100%)	1(20%)	4(80%)	5
	Heavy and Civil Engineering Construction (237)	0(0%)	0(0%)	0(0%)	0(0%)	2(100%)	2
	Sub-total	0(0%)	0(0%)	1(100%)	1(14%)	6(86%)	7
Manufacturing (31,32,33)	Food (311)	1(14%)	2(29%)	4(57%)	7(50%)	7(50%)	14
	Beverage and Tobacco Product (312)	3(60%)	0(0%)	2(40%)	5(50%)	5(50%)	10
	Apparel (315)	0(0%)	0(0%)	0(0%)	0(0%)	4(100%)	4
	Leather and Allied Product (316)	0(0%)	0(0%)	1(100%)	1(50%)	1(50%)	2
	Wood Product (321)	0(0%)	0(0%)	1(100%)	1(100%)	0(0%)	1
	Paper (322)	0(0%)	1(25%)	3(75%)	4(57%)	3(43%)	7
	Printing and Related Support Activities (323)	0(0%)	0(0%)	0(0%)	0(0%)	1(100%)	1
	Petroleum and Coal Product (324)	0(0%)	3(43%)	4(57%)	7(88%)	1(12%)	8
	Chemical (325)	0(0%)	5(19%)	22(81%)	27(64%)	15(36%)	42
	Plastics and Rubber Product (326)	0(0%)	1(33%)	2(67%)	3(75%)	1(25%)	4
Primary Metal (331)	1(50%)	0(0%)	1(50%)	2(40%)	3(60%)	5	

NAICS		Reporting				Not Reporting	Total
Title(2 digit)	Title(3 digit)	E	E, H, S	Sustainability	Sub-total		
	Fabricated Metal Product (332)	0 (0%)	1 (33%)	2 (67%)	3 (60%)	2 (40%)	5
	Machinery (333)	0 (0%)	1 (17%)	5 (83%)	6 (38%)	10 (62%)	16
Manufacturing (31,32,33)	Computer and Electronic Product (334)	2 (9%)	3 (14%)	17 (77%)	22 (37%)	37 (63%)	59
	Electrical Equipment, Appliance and Component (335)	0 (0%)	0 (0%)	2 (100%)	2 (40%)	3 (60%)	5
	Transportation Equipment (336)	1 (11%)	3 (33%)	5 (56%)	9 (60%)	6 (40%)	15
	Furniture and Related Product (337)	0 (0%)	0 (0%)	1 (100%)	1 (50%)	1 (50%)	2
	Miscellaneous (339)	0 (0%)	0 (0%)	3 (100%)	3 (33%)	6 (67%)	9
	Sub-total	8 (8%)	20 (19%)	75 (73%)	103 (49%)	106 (51%)	209
Transportation and Warehousing (48,49)	Air transportation (481)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	1
	Rail Transportation (482)	1 (100%)	0 (0%)	0 (0%)	1 (25%)	3 (75%)	4
	Water Transportation (483)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	1
	Pipeline Transportation (486)	1 (33%)	2 (67%)	0 (0%)	3 (100%)	0 (0%)	3
	Couriers and Messengers(492)	0 (0%)	0 (0%)	2 (100%)	2 (100%)	0 (0%)	2
	Sub-total	3 (43%)	2 (29%)	2 (28%)	7 (64%)	4 (36%)	11
Accommodation and Food Service (72)	Accommodation (721)	1 (100%)	0 (0%)	0 (0%)	1 (33%)	2 (67%)	3
	Food Services and Drinking Places (722)	0 (0%)	0 (0%)	2 (100%)	2 (50%)	2 (50%)	4
	Sub-total	1 (33%)	0 (0%)	2 (67%)	3 (43%)	4 (57%)	7
Total		21 (14%)	32 (21%)	100 (65%)	153 (53%)	134 (47%)	287

\* E: Environment, H: Health, S: Safety

Table 7. Trends of the Key Words Used in the Titles of S&P 500 Firms' Performance Reports in 2006

within the titles of performance reports based on the industry of all 287 sample firms. Of the 287 firms, approximately 53% of the firms (153 firms) reported their performance reports. Performance reports could not be found on the respective Internet homepages for the remaining firms. Of the 153 firms, 65.4% (100 firms) used "sustainability," "sustainable," or

“corporate social” as (a) word(s) used in the titles of their performance reports; 20.9% (32 firms) used “environmental, health, and safety” as (a) word(s) for their performance reports; and 13.7% (21 firms) used “environmental” as (a) word(s) for their performance titles. This means that 65.4% of the 153 S&P 500 firms surveyed have reported the performance of sustainable business indicators; 20.9% have disclosed the performance of environmental, health, and safety indicators; and 13.7% have reported only environmental performance. Fifty-three firms, 18.5% of the total 287 S&P 500 firms surveyed reported that their environmental performance reports used the terms *Environmental reports* or *environmental, health and safety reports* in the title of their performance reports. This result is quite different from that of a previous study. In 1998, the Investor Responsibility Research Center (IRRC) conducted a survey to identify how many S&P 500 firms reported their performance reports to the public. They found that 61% of the 191 S&P 500 companies in 1998 used the term *Environmental* as a keyword in the title of their performance reports (Gozali et al., 2002). This indicates that 61% of the S&P 500 companies surveyed in 1998 focused on the performance of environmental indicators. The use of the term *Environmental* in the title of the performance reports swiftly dropped from 61% in 1998 to 18.5% of the total 287 S&P 500 firms (53 firms) in 2006. On the other hand, the IRRC did not find firms that used the term *Sustainability* in the titles of their samples. However, we found 34.8% (100 firms) of 287 S&P 500 companies surveyed in 2006 used the term *Sustainability* as a keyword in the title of their performance reports. Changing the keywords used in the title of a firm’s performance reports means that the main strategies of the performance reports have likely changed and that the firm has informed the readers of what they have implemented and evaluated.

#### 4.2.1 Distribution of industries

As of 2006, of the 287 S&P 500 companies surveyed, 19 firms were in the mining industry. 63.2% of these 19 firms (12 firms) provided their performance reports. Of the 12 firms, seven firms (58.3% of 12 firms) used the term, *Sustainability* and five firms (41.7% of 12 firms) used the term *Environmental* and *EHS*. In other words, 58.3% of firms described their performance in accordance with the concept of sustainable development. It could be said that firms in the mining industry have begun to progressively apply sustainable business strategies.

Thirty-two firms in the utilities industry provided their performance reports. Among them, 48.0% of the firms used the term *Sustainability*, and 52% of the firms used the term *Environmental* and *EHS* in the title. Based on these numbers, it appears that many firms had still focused more on environmental management systems than on sustainable business even though international organizations had proposed guidelines, such as the Electric Utilities project proposed by the WBCSD in 2000, to help firms in the utilities industry implement sustainable business practices.

Seventy-five firms (72.8% of 103 firms) in the manufacturing industry used the term *Sustainability*; 8 firms (7.8% of them) used the term *Environmental*; and 20 firms (19.4% of them) used the term *EHS*. It appears that firms in the manufacturing industry have proactively applied sustainable business practices or labels for such practices. Firms in the manufacturing industry have changed from environmental management strategies to sustainable business strategies. This shift was made possible in part because manufacturing firms could easily apply and implement sustainable business aided by the fact that most had already established and implemented several environmental management systems, such as ISO 14001.

The construction industry is a sector where sustainable business practices should be implemented as a business practice for two reasons: it is faced with indispensable challenges posed by "Sustainability"; and the construction industry is generally one of the largest industries in both developed and developing countries in terms of economic, social, and environmental impacts (Zhang, Shen, Love, & Treloar, 2000; Cole, 1998; Spence & Mulligan, 1995). However, we could not find many construction firms among S&P 500 companies in 2006 that reported their environmental or sustainable business performance. Of the seven S&P 500 companies in the construction industry, only one firm published its performance reports with a title that used the term *Sustainability*.

Several international organizations, such as the WBCSD and the Institute of Sustainable Forestry (ISF), have encouraged firms in the agriculture, forestry, fishing, and hunting industry to apply sustainable development by proposing special programs, such as the Sustainable Forest Products Industry project and the Sustainable Forestry Initiatives. This is influenced by the fact that they deal with natural capital stocks. We found only two firms in the S&P 500, as of 2006, in Agriculture, Forestry, Fishing and Hunting. These two firms reported their performance reports and used the terms *Sustainability* and *Environmental* in the title of their performance reports. It is difficult to say whether firms in this industry have applied sustainable business practices because of the small sample.

There are seven firms in the transportation and warehousing industry that published their performance reports. Of the seven firms, two firms (28.6%) used the term *Sustainability* and five firms (71.4%) used the term *Environmental* or *EHS* in their performance titles. It does not seem that firms in the transportation and warehousing industry have implemented sustainable business practices based on the key words used in the title of their performance reports. Of the seven firms, the main products of four firms are the transfer of water and gases through pipelines to their customers. Since transferring water and gases through pipelines has the potential for causing environmental accidents, such as spills and explosion incidents, the focus for these firms may be on the concept of environmental management strategies.

Three firms in the accommodation and food service industry disclosed environmental or sustainability performance reports even though this industry does not produce environmental impact directly. Of the three firms, two firms (66.7% of the 3 firms) used the term *Sustainability* and one report used *Environmental*. This implies that some firms in the accommodation and food service industry have begun to consider the concept of sustainable business.

## 5. Conclusions

The objective of this research is to identify whether or not firms are applying sustainable business practice based on the Triple Bottom Line (Environmental, economic, and social areas). We found that more companies in the manufacturing industries have measured and disclosed diverse sustainable business indicators based on the Triple Bottom Line so that they have implemented sustainable business practices since 2003. In other words, firms in the manufacturing industries have integrated the concepts of sustainable business practices into their decision-making process and that some firms in other industries have begun incorporating the concepts of sustainable business practices into their business strategies since 2003. We conclude that since 2003 many companies have changed their strategies from environmental management to sustainable business. Although many firms have

increasingly disclosed their performance reports to the public as one of their sustainable business practices, in many cases, they have not proactively announced the disclosure of their performance reports to the public through Internet mass media or newspapers.

The results of this research, the distribution and types of sustainable business indicators, could contribute to the existing literature of firms' sustainable business practices and activities. By providing empirical indicators that will be presented to the public, this research can help stakeholders, including "green" investors, "green" consumers, corporate firms, and others, recognize how the surveyed firms have implemented sustainable business practices. This research can also encourage scholars to actively study not only the theoretical methods for evaluating sustainable business practices, but also the theories or methods for the development of sustainable business strategies.

The samples used in this research were not randomly collected, but purposefully sampled. Since the sample for this study is announcements that firms voluntarily disclosed their performance reports, it is not easy to randomly collect samples. Future researchers could conduct case studies to identify the changes in corporate culture and evaluate the benefits of those changes in corporate culture.

## 6. References

- Adams, R., Houldin, M. and Slomp, S. (1999). Toward a Generally Accepted Framework for Environmental Reporting, In: *Sustainable Measures*, Bennett, M. and James, P. (Ed.), 314-321, Greenleaf Publishing Limited, Sheffield, UK
- Anton, W. R. Q., Deltas, G. and Khanna, M. (2004). Incentives for environmental self-regulation and implications for environmental performance. *Journal of Environmental Economics and Management*, Vol. 48, pp. 632-654
- Azapagic, A. and Perdan, S. (2000). Indicators of sustainable development for industry: A general framework. *Trans IChemE*, Vol. 78, No.B, pp. 243-261
- Azapagic, A. (2003). Systems approach to corporate sustainability: A general management framework. *Trans IChemE*, Vol. 81, No.B, pp. 303-316
- Azapagic, A. and Perdan, S. (2005). An integrated sustainability decision-support framework part I: Problem structuring. *International Journal of Sustainable Development and World Ecology*, Vol. 12, No. 2, pp. 98-111
- Azar, C., Holmberg, J. and Lindgren, K. (1996). Socio-ecological indicators for sustainability. *Ecological Economics*, Vol. 18, No. 2, pp. 89-112
- Bennett, M. and James, P. (1999), *Sustainable Measures*, Greenleaf Publishing, Sheffield, UK.
- British Standard 7750 (BS7750). (n.d.), 20.09.2008, Available from <http://www.quality.co.uk/bs7750.htm>
- Bruemmer, P. J. (2000). Choose Your Words With Care. 10.01.2008, Available from <http://www.clickz.com/831571>
- Chemical Industries Association. (2002). Responsible Care (RC) program. 01.03.2008, Available from <http://www.responsiblecare.org/page.asp?p=6341&l=1>
- Cole, R. (1998). Emerging trends in building environmental assessment methods. *Building Research and Information*, Vol. 26, No.1, pp.3-16
- Corporate Risk Management Company. (2000). The number of ISO 14001/EMAS registration of the world. 01.07.2009, Available from

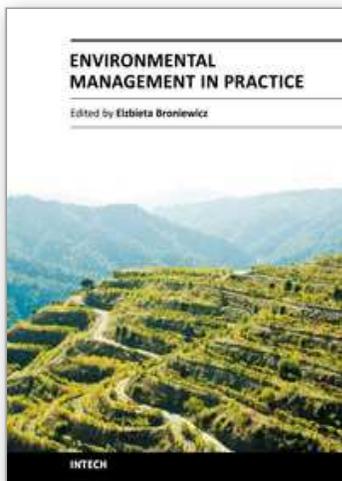
- <http://web.archive.org/web/20000305163812/http://www.ecology.or.jp/isoworld/english/analy14k.htm>
- Corporate Risk Management Company. (2007). The number of ISO 14001/EMAS registration of the world. 01.07.2009, Available from <http://www.ecology.or.jp/isoworld/english/analy14k.html>
- Council on Economic Priorities Accreditation Agency. (1998). Social accountability 8000. 20.05.2007, Available from <http://www.mallenbaker.net/csr/CSRfiles/SA8000.html>
- Daly, H. E. (1990). Sustainable development: From concept and theory to operational principles. *Population and Development Review*, Vol. 16, pp. 25-43
- Desimone, L. D. and Popoff, F. (1998). *Eco-efficiency: The business link to sustainable development*, MIT Press, Cambridge, MA, USA
- Evergreen Group. (2008). What is a sustainable business. 10.10.2008, Available from <http://www.theevergreengroup.com/sustainable-business.htm>
- European Commission. (2002). Corporate social responsibility: A business contribution to sustainable development. 20.06.2008, Available from [http://ec.europa.eu/employment\\_social/publications/2002/ke4402488\\_en.pdf](http://ec.europa.eu/employment_social/publications/2002/ke4402488_en.pdf)
- Etzioni, A. (2003). Toward a new socio-economic paradigm. *Socio-Economic Review*, Vol. 1, pp. 105-134
- Feldman, S. J., Soyka, P. A., and Ameer, P. (1996). *Does improving a firm's environmental management system and environmental performance result in a higher stock price*. ICF Kaiser Consulting Group. Fairfax, VA, USA
- Global Reporting Initiative (GRI). (2002). Sustainability reporting guidelines 2002. 10.06.2007, Available from <http://www.rsuniversitaria.org/page6/gri02.pdf>
- Global Reporting Initiative (GRI). (2004). An abridged version of the 2002 Sustainability Reporting Guidelines. Integrated with the draft Mining and Metals Sector Supplement. 20.01.2008, Available from <http://www.wbcsd.org/web/projects/mining/Mining.pdf>
- Gozali, N. O., How, J. C. Y. and Verhoevern, P. (2002). The economic consequences of voluntary environmental information disclosure. *The International Environmental Modelling and Software Society, Lugano, Switzerland, 2002*, Vol. 2, pp. 484-489
- Hamilton, J. T. (1995). Pollution as news: Media and stock market reactions to the Toxic Release Inventory data. *Journal of Environmental Economics and Management*, Vol. 28, pp. 98-113.
- International Institute for Sustainable Development (IISD), Deloitte and Touche, and the World Business Council for Sustainable Development. (1992). *Business Strategy for Sustainable Development: Leadership and Accountability for the 90s*, International Institute for Sustainable Development, Winnipeg, Canada
- International Organization for Standardization (ISO). (1999), ISO 14031:1999 (E). Environmental Management - Environmental evaluation - Guidelines. ISO, Geneva, Switzerland
- Internet Archive Organization (n.d.). 10.06.2008, Available from <http://www.archive.org>
- Kuhndt, M. and Geibler, J. V. (2002). Developing a sectoral sustainability Indicators system using the COMPASS methodology. *Futura*, Vol. 2 No. 2, pp. 29-44

- Lin, L. and Wang, L. (2004). Making sustainability accountable: A valuation model for corporate performance, *Proceedings of the 12th IEEE international Symposium on Electronics and the Environment (ISEE) and the 5th Electronics Recycling Summit, 2004*, pp. 7-12, Scottsdale, AZ, USA, May 10-13,2004
- Moxen, J. and Strachan, P. A. (1998). *Managing Green teams*, Greenleaf Publishing, Sheffield, UK.
- Muller, K. and Sturm, A. (2001). *Standardized eco-efficiency indicators*, Ellipson AG., Basel, Switzerland
- Parris, T. M. and Kates, R. W. (2003). Characterizing and measuring sustainable development. *Annual Review of Environmental and Resources*, Vol. 28, pp. 559-586
- Pearce, D. W., Barbier, E. and Markandya, A. (1990). *Sustainable development: Economics and environment in the Third World*, Edward Elgar Publishing, London, UK
- Redefining Progress, Sustainable Seattle, and Tyler Norris Associates. (1997). *The Community indicators Handbook: Measuring progress toward healthy and sustainable communities*, Redefining Progress, CA, USA
- Sasseville, D. R., Willson, G. W. and Lawson, R. W. (1997). *ISO 14001 Answer book: Environmental management for the world market*, John Wiley & Sons, Inc, New York, USA
- Scott, R.W. (2001). *Institutions and Organizations*, Sage, Thousand Oaks, CA, USA
- Spence, R., & Mulligan, H. (1995). Sustainable development and construction industry. *Habitat International*, Vol.19, No.3, pp. 279-292
- SustainableBusiness.com. (n.d.). Progressive investor. 10.06.2008, Available from <http://www.sustainablebusiness.com/index.cfm/go/progressiveinvestor.main/?CFID=19300401&CFTOKEN=27983115>
- Thompson, D. (2002). *Tools for Environmental Management: A practical Introduction and Guide* New Society, BC VOR, Canada
- Verfaillie, H. A. and Bidwell, R.(2000). Measuring eco-efficiency: A guide to reporting company performance. World Business Council for Sustainable Development, Washington, D.C,USA
- Welford, R. (1995). *Environmental strategy and sustainable development: The corporate challenge for the 21<sup>st</sup> century*, Routledge, New York, USA
- Welford, R. (2000). *Corporate environmental management 3: Toward sustainable development*, Earthscan Publications Lt, London, UK
- Wharton Research Data Service. (n.d), 13.06.2008, Available from <http://wrds.wharton.upenn.edu>
- World Business Council for Sustainable Development (WBCSD). (2000). Sustainability report. 10.08.2008, Available from <http://www.sustreport.org/background/definitions.html>
- World Business Council for Sustainable Development (WBCSD). (2005).Eco-efficiency: Creating more value with less impact. 01.05.2007, Available from <http://www.wbcscd.org>
- Young, C .W. (2000). Towards sustainable production and consumption: From products to services, In: *Corporate Environmental Management 3 Toward Sustainable Development*, Welford, R, 79-108, Earthscan Publications Lt, London, UK

Zhang, Z. H., Shen, L.Y., Love, P. E. D., & Treloar, G. (2000). A framework for implementing ISO 14001 in construction. *Environmental Management and Health*, Vol.11, No.2, pp.139-149

IntechOpen

IntechOpen



## **Environmental Management in Practice**

Edited by Dr. Elzbieta Broniewicz

ISBN 978-953-307-358-3

Hard cover, 448 pages

**Publisher** InTech

**Published online** 21, June, 2011

**Published in print edition** June, 2011

In recent years the topic of environmental management has become very common. In sustainable development conditions, central and local governments much more often notice the need of acting in ways that diminish negative impact on environment. Environmental management may take place on many different levels - starting from global level, e.g. climate changes, through national and regional level (environmental policy) and ending on micro level. This publication shows many examples of environmental management. The diversity of presented aspects within environmental management and approaching the subject from the perspective of various countries contributes greatly to the development of environmental management field of research.

### **How to reference**

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Hyunkee Bae and Richard S. Smardon (2011). Indicators of Sustainable Business Practices, Environmental Management in Practice, Dr. Elzbieta Broniewicz (Ed.), ISBN: 978-953-307-358-3, InTech, Available from: <http://www.intechopen.com/books/environmental-management-in-practice/indicators-of-sustainable-business-practices>

**INTECH**  
open science | open minds

### **InTech Europe**

University Campus STeP Ri  
Slavka Krautzeka 83/A  
51000 Rijeka, Croatia  
Phone: +385 (51) 770 447  
Fax: +385 (51) 686 166  
[www.intechopen.com](http://www.intechopen.com)

### **InTech China**

Unit 405, Office Block, Hotel Equatorial Shanghai  
No.65, Yan An Road (West), Shanghai, 200040, China  
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元  
Phone: +86-21-62489820  
Fax: +86-21-62489821

© 2011 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike-3.0 License](#), which permits use, distribution and reproduction for non-commercial purposes, provided the original is properly cited and derivative works building on this content are distributed under the same license.

IntechOpen

IntechOpen