

# ASSESSMENT MODEL OF ENVIRONMENTAL MANAGEMENT: A CASE STUDY OF CONSTRUCTION ENTERPRISES IN LATVIA

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## Abstract

In recent years, an increasing number of private and public-sector organizations have been engaged in the implementation and use of environmental management systems (EMSs). Usually, organizations worldwide certified EMS according to ISO 14001, the global EMS standard. But thousands organizations in Europe had registered an EMS according to Eco-Management and Audit Scheme (EMAS)

The aim of the paper is to build up the model for environmental management assessment on enterprise's activities based on ISO 14001 standard requirements. The model foresees elaboration of ecological radar consisting of 16 indicators that can serve as efficiency indicators of the environmental management system. The author suggests displaying on radar axis the respective titles of ISO 14001 requirement clauses and sub-clauses and the opinion assessment average value indicators of the respondents. Environmental management assessment model was approbated in five construction companies and the approbation results are outlined in the paper. The model is applicable to the needs of enterprise management as well as external audit.

*Keywords:* Environmental management, Environmental management system (EMS), ISO 14001, self-assessment.

## Introduction

The need for application of environmental management is determined by the ecological situation, which changes in the result of commercial activities of companies. As for today Latvia already has all level organisational system for environmental management: state, regional, municipal as well as company, public organisation and on interpersonal level. However, this system has not yet developed fully: there is no strict and precisely structured basis, systematized organisationally – economic environmental management mechanism, precise distribution of subject - object mutual relations. It is necessary to increase efficiency of management efforts in the field of company ecological activity.

Currently the organisational mechanism of environmental management in Latvia is based on ecological norms and standards, including environmental quality norms, natural resource utilisation quotas, norms regulating maximum possible hazardous impact on the environment, ecological standards, sanitary and protected area norms, ecological limitations, licensing, standardisation, certification and nature usage contracts.

Traditionally, governments in many countries exercise environmental regulations bu imposing quality/quantity limits on emissions or requiring facilities to adopt specific abatement technologies. This “command-end-control” approach has been criticized, however, for cost-ineffectiveness and inflexibility. As the government regulations and the introduction of economic incentives face limitation, policy makers have turned more attention to a “voluntary approach” with which they attempt to promote organizations’ voluntary actions. One of the organizations’ voluntary actions is to implement environmental management systems (EMSs).

The British Standards Institute have defined an EMS as “part of the overall management system that includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy” (BS8555, 2003). It can be seen as a risk management tool also – since the standards to which organisations are assessed are not prescriptive, they provide the framework within which an organisation must identify it's own potential impacts upon the environment, and seek to control these as well as to identify opportunities to reduce the associated risks. An EMS can be considered to follow the Deming cycle of “Plan – Do – Check – Act”.

In recent years, an increasing number of private and public-sector organizations have been engaged in implementation and use of EMSs. EMSs typically consist of policy making, planning, implementing and reviewing the environmental policies, presumably helping firms reduce environmental impacts. Usually, organizations worldwide certified EMS according to ISO 14001, the global EMS standard. But thousands organizations in Europe had registered an EMS according to Eco-Management and Audit Scheme (EMAS).

In response to the rapid growth of EMS certified organizations, researches recently examine determinants of organizations' adoption of certified EMSs and the effectiveness of EMSs on environmental performance. Another major voluntary environmental practice is publishing environmental reports. Reports are designed to inform stakeholders (e.g. the government, financial institutions, the consumers, investors, local public and employees) of the organization's products and environmental performance, which gives the organization incentives to decrease its environmental impacts and to be innovative in the reduction of emissions.

ISO 14001 is a certified EMS that specifies a system for facilities to promote their effort for reducing environmental burdens generated by their products, services and activities. To be ISO 14001 registered or ready, a facility has to demonstrate that its EMS meets five basic requirements: definition of the facility's environmental policy, project planning, implementation and operation, checking and corrective action and management review.

Self-assessment is aimed at providing organisations with a systematic and regular measurement system leading to the implementation of planned improvement actions, involving the application of workshops, discussions and questionnaire surveys. The self-assessment process allows the organization to discern clearly its strengths and areas in which improvement can be made. Following this process of evaluation, improvement plans are launched, which are monitored for progress. Organizations carry out this cycle of evaluating and taking action repeatedly so that they can achieve genuine and sustained improvement.

The aim of the paper is to build up the model for environmental management assessment on enterprise's activities based on ISO 14001 standard requirements. A model for environmental management assessment was developed, which can be used to compare different companies as well as to analyse activity of a single enterprise and for enterprise's self-assessment.

To achieve the aim of the paper, the following research methods were used: monographic research method, expert assessments, study of normative documents, as well as summarization of statistical materials and grouping of data. Survey was used for the research. To visualize the conducted research, the author has also used tables and diagrams.

### **Self-assessment tool - the EFQM Excellence Model**

With the Latvia introduction into EU the question about enterprises activity and the problems connected with their competitiveness became actual. The very often Latvian businessmen assert that it is almost impossible to compete to the enterprises of other EU countries (Krūmiņa, 2009).

Partially the answer to these questions can be received, comparing principles of work and practice to the successful and recognised enterprises in Europe. One of such possibilities is the self-assessment of the enterprise which is based on principles of European Foundation for Quality Management (EFQM) Excellence Model.

The EFQM Excellence Model was created in 1991 by the European Foundation for Quality Management (EFQM) as a framework against which applicants for the European Quality Award are judged, and to recognize organizational excellence in European companies. The EFQM Excellence Model is a non-prescriptive framework based on 9 criteria. Five of these are "Enablers" and four are "Results". The "Enabler" criteria cover what an organisation does and how it does it. The "Results" criteria cover what an organisation achieves. "Results" are caused by "Enablers" and "Enablers" are improved using feedback from "Results".

The Model, which recognises there are many approaches to achieving sustainability, is based on the premise that: Excellent Key Results, Customer Results, People Results and Society Results are achieved through Leadership driving the Strategy that is delivered through People, Partnerships and Resources, and Processes, Products and Services (The EFQM Excellence Model, 2009).

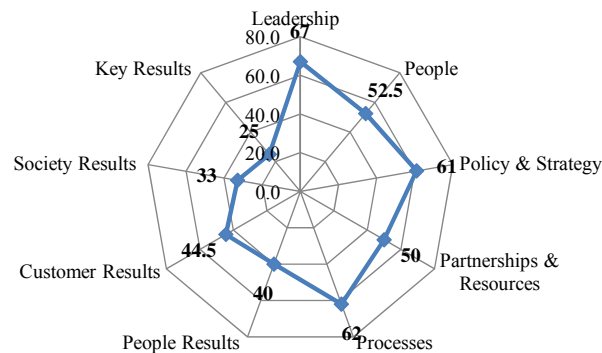
Some empirical work supports the existence of interrelationships between the enabler side of the EFQM Excellence Model (Dijkstra, 1997; Eskildsen and Dahlgaard, 2000; Reiner, 2002; Bou-Llusar et al., 2005), based on the assumption that these criteria are components of the unique TQM philosophy. Eskildsen and Dahlgaard (2000), Westlund (2001), Reiner (2002) or Calvo-Mora *et al.* (2005) conclude that some organizational results depend on the management of some enabler criteria.

Based on these findings, organisations can decide what improving actions must be taken to strengthen one or several Enablers, in order to achieve better results next time. For example: if an organisation wants to

improve People (employee) satisfaction, it has to strengthen People Management and also perhaps Leadership, and Policy and Strategy. This can be realised by improvement actions in these particular areas.

After such improvement actions have been implemented, the organisation again carries out a self-assessment in order to see if the improvement actions have resulted in a better overall performance. Based on this second assessment, new Result areas can be selected for improvement, and so the cycle begins again.

The model serves as a useful framework to structure quality improvement efforts because of its integrated cycle for continuous improvement. The cycle begins by carrying out a self-assessment to see what Results are achieved at a given moment. Based on these findings organizations can decide what actions must be taken to strengthen one or several Enablers, in order to achieve better results next time. To better understand this model results it is possible to build a spider chart. The representation of innovation quality can be performed by using radar diagrams, like those depicted in Figure 1.



**Figure 1.** Example of self-assessment using EFQM Excellent Model

From an enterprise user perspective, these diagrams allow getting a fast overview of the general situation as well as offer the possibility to specifically scrutinize the meaning of individual parameters.

### Measuring eco-efficiency using Eco-Compass

Within the previous researches the author has studied and analysed different interpretations and definitions of the term “environment management”. As the result of the research the author offers her own definition of the term: “Environmental management is the planning, implementation and control of strategic, tactical and operational measures for prevention, reduction and elimination of damage caused to the environment as well as purposeful usage of market advantages gained thereof”.

To find solutions to the existing ecological situations and risks, every enterprise should create a well considered system of mechanisms corresponding to the strategic goals, which includes the content and the principal function of the strategic ecologically oriented management.

Strategic environmental management was created to identify the ecological potential (mostly environmental protection, resource economy, ensuring of ecological safety in the industry, competition with other companies) for successful operation of a enterprise as well as the ecological risks Through application of strategic environmental management, the long term goals of a enterprise can be identified and their implementation ensured by means of application of well considered measures and tools.

Companies measure their eco-efficiency performance to track and document progresses, identify and prioritize opportunities for improvement, and identify cost savings and other benefits related to eco-efficiency. Indicators provide measurable entities, which can then help managers to make decisions on a product or business portfolio. They can provide managers with the information on how to make a business portfolio more eco-efficient or more sustainable overall – and usually more profitable as well.

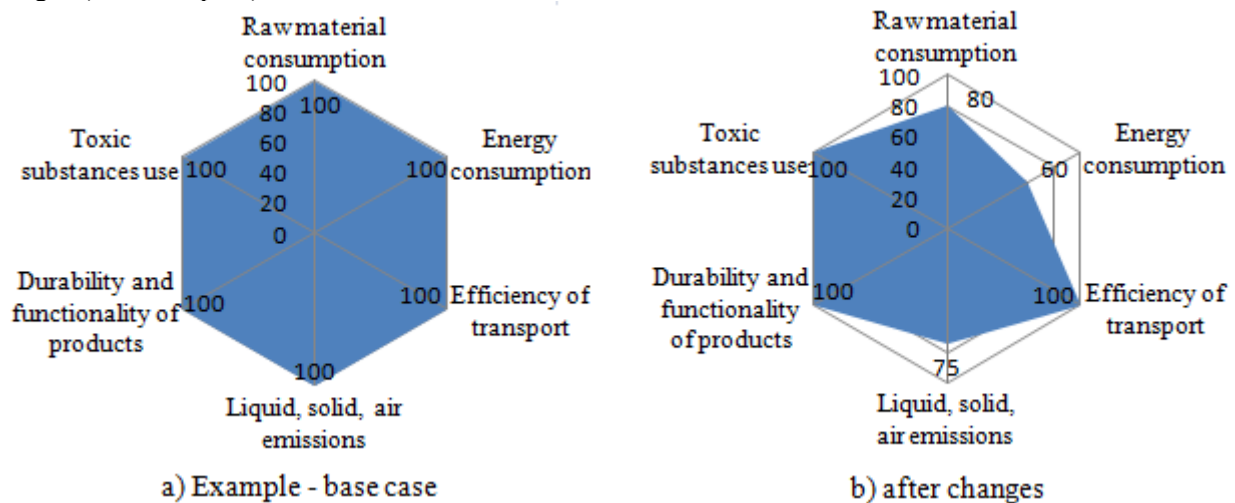
Monitoring and reporting eco-efficiency publicly is a way to communicate a key element of the corporation’s progress on sustainable development to external audiences, including investors, insurers, consumers, and other interest groups. Defined indicators provide systematic and verifiable ways to report.

The Eco-Compass tool, developed by Fundación Entorno of Spain, is one tool that can be used by companies to graphically represent improvements made in process and product design (WBCSD, 2005). They define six key indicators:

1. Intensity of raw material use (including water)
2. Intensity of energy consumption
3. Generation of liquid, solid and air emissions
4. Efficiency in transportation of the product
5. Content of toxic substances in the product
6. Durability and functionality of the product or service.

The first three indicators refer to the environmental impacts of the fabrication of the product or service, while the latter three refer to the product or service distribution and use. An existing product or service, a base case, is set to have a score of 2 on each of the six scales, while an ideal product will score 5 in each category, covering the entire surface area of the hexagon. If the quality of one of the components, for instance service extension, decrease the score for that dimension will be 1 or 0.

In Figure 2 the two diagrams show the “base case” – the situation prior to implementing eco-efficiency practices, with each of the six indicators at a base level of 100 – and the effect of implementing changes (Eco Compass).



**Figure 2.** Example of Example of self-assessment using Eco Compass tool

By implementing changes, the company achieved (see Figure 2):

- 20% reduction in raw material consumption;
- 40% reduction in energy consumption, and
- 25% reduction in solid, liquid or air emissions.
- they had no change in transportation efficiency, product durability or toxicity of products.

There are many ways to measure and report on eco-efficient successes. This activity demonstrates one approach. The cases are based on real studies from Fundación Entorno’s experience with the Eco-Compass tool. The activity introduces some basic indicators that can be used within a company and shows how improvements can graphically be represented over time, or how impacts of different design scenarios can be compared prior to implementation. The activity has also been designed to help the learner think through why measurement is important and what issues need to be considered. Since eco-efficiency includes economical issues as well, an economical evaluation must also be done in order to see if the changes from the eco-compass method is economical valuable.

### The model for environmental management assessment

There are a number of techniques of sustainability assessment that evaluate the performance of companies. During the previous research, the author has analysed the current situation of environmental management in Latvian companies as well as readiness of the companies for certification or compliance with ISO 14000 standards.

Environmental management system on company level is part of the entire management structure of the company, including organisational structure, setting of responsibilities and implementation of environmental policy. The functioning of the environmental management system, according to the author, has to be based on function hierarchy by considering the level of urgency of the solutions. Urgent and

immediate management measures are defined by preventive and operational environmental management, whereas measures that can be postponed – by tactical and strategic management. Thus, environmental management is an art of making efficient management decisions to increase efficient usage of natural resources and environmental protection within the conditions of the relevant market. According to the author, the experience of managers and middle level managers can most precisely describe the studied questions. For the purpose of this analysis, the author proposes to use assessment method which is based on the use of an “eco-radar” diagram.

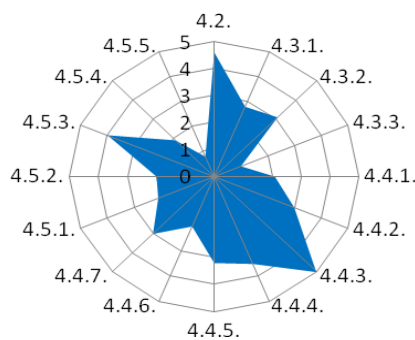
Enterprise can create it own radar diagram adapted to it product depending on the available environmental information. In this case, enterprise may select relevant environmental aspects related to it product's life cycle, such as the use of non-renewable materials, energy consumption during manufacturing or use, the greenhouse emissions produced during distribution etc. Environmental aspects identified during implementation of an Environmental Management Systems (EMS) may be used as the axes, and then the radar diagram may be used for communication of the EMS as well.

Author suggests to build a model for environmental management assessment which will be able to evaluate level of implementation of ISO 14001 standard requirements in organization. The model foresees elaboration of ecological radar consisting of 16 indicators that can serve as efficiency indicators of the environmental system. The author suggests displaying on radar axis the respective titles of ISO 14001 requirement clauses and sub-clauses and the opinion assessment average value indicators of the surveyed personnel (respondents). Questionnaire prepares in accordance with section 4 of ISO 14001:2004 standard. As far as ISO 14001 includes a complete list of general requirements for implementation of the environmental management system in an organization, the author proposes to take into account clauses starting with 4.2. “Environmental policy” and ending with 4.5.5. “Internal audit”. The questionnaire consisted of 16 blocks accordance with section 4 of ISO 14001:2004 standard. Each block consisted of 5 questions, so there are 80 questions.

Environmental management assessment model is built in several steps:

1. In one enterprise are chosen at least five experts. Experts assess environmental management system and fill in a questionnaire. Experts could reply to a question “Yes” or “No”. Each question gets “1” if answer is positive and “0” if answer is negative. So minimal grade is zero that shows deviation from EMS requirements. Maximum grade is five, that shows EMS procedures existence. All answers are summarized into table and average values of each position are calculated.
2. All respondents from all enterprises (if it is not one enterprise) are surveyed and summary tables are filled.
3. The model eco-radar is build from the data of tables. To build eco-radar MS Excel programm is used.

Example of eco-radar is shown in Figure 3.



**Figure 3.** Eco radar for compliance assessment of the existing activities and procedures with ISO 14001 standard requirements in the field of environmental management

The obtained survey data gives the possibility to mutually compare all the companies as well as to highlight the weaknesses of a particular enterprise. The eco-radar model is applicable also to the needs of enterprise management as well as external audit.



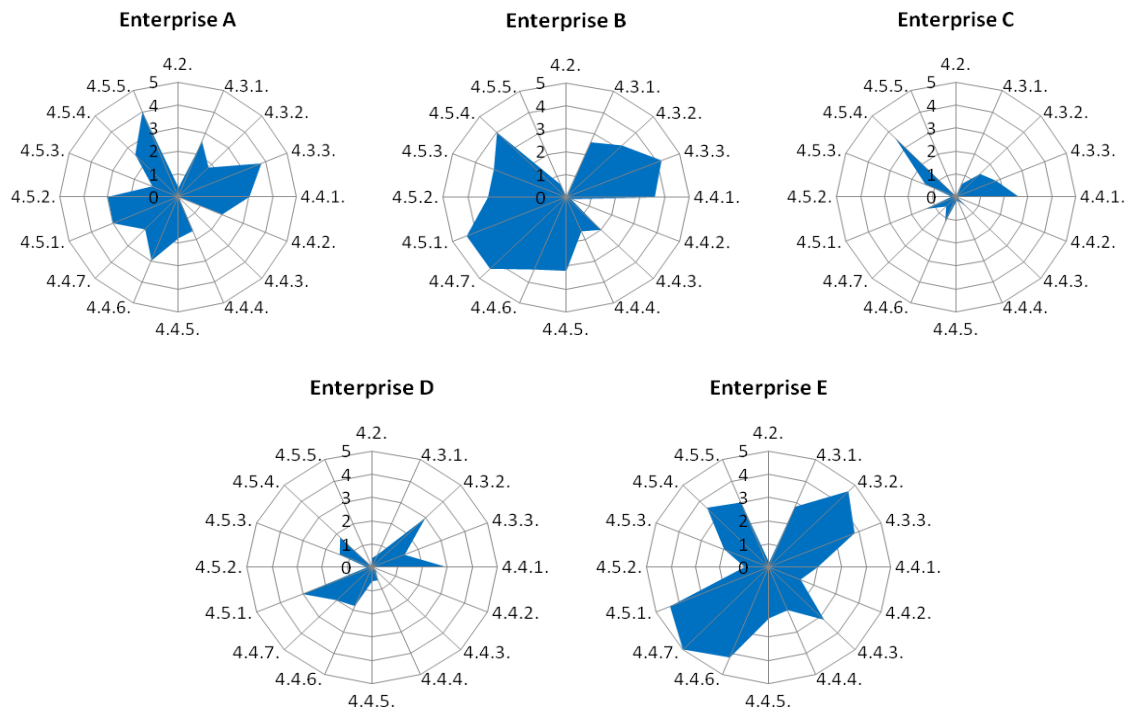
### Case study

The views and opinions of companies' managers are obtained and assessed by using a questionnaire. The questionnaire period was from 2008 April to 2008 May. Environmental management assessment model was approbated in five construction companies and the approbation results are outlined in the paper below. The questionnaire was sent by e-mail to the managers and middle level managers. It has to be mentioned that the fact that the managers were those who filled in the questionnaire may have influenced the results. The findings would probably be different if we had asked other employees with different responsibilities in the organizations. On the other hand, managers were chosen as the respondents, since they are the people with an overview of environmental issues.

Respondents' average values of answers are given in Table 1. Using Table 1 data were built eco-radars for five construction enterprises (see Figure 4).

**Table 1.** EMS assessment average values

Item №	ISO 14001 standard	Enterprises and average values				
		A	B	C	D	E
4.2.	Environmental policy	0.4	0	0	0.4	0.2
4.3.1.	Environmental aspects	2.6	2.6	0.6	0.6	2.8
4.3.2.	Legal and other requirements	1.8	3.2	1.4	3	4.6
4.3.3.	Objectives, targets and programme(s)	3.8	4.2	1.8	1.4	3.8
4.4.1.	Resources, roles, responsibility and authority	3	3.6	2.6	3	2
4.4.2.	Competence, training and awareness	2	0.2	0	0	1.4
4.4.3.	Communication	0	2	0.6	0.2	3.2
4.4.4.	Documentation	1.6	1.6	0.2	0.6	2
4.4.5.	Control of documents	1.8	3.2	0.2	0.6	2.2
4.4.6.	Operational control	3	3.4	1.22	1.8	4.2
4.4.7.	Emergency preparedness and response	2	4.4	0.6	2	5
4.5.1.	Monitorings and measurement	3	4.4	1.4	3	4.4
4.5.2.	Evaluation of compliance	3	3.2	0.2	0.2	1
4.5.3.	Nonconformity, corrective action and preventive action	1.2	3.2	1.4	1.4	2
4.5.4.	Control of records	2.6	4	3.6	1.8	3.6
4.5.5.	Internal audit	4	0.6	0	0	3



**Figure 4.** Eco- radars in five construction enterprises

The performed survey of management personnel in some of the companies has confirmed the assumption that the implemented environmental management system is not functioning. The results of the survey prove that. The analysis of the results of the survey permits the author to offer usage of the developed survey for assessment of one particular industry or similar companies. Within a single industry, the authenticity of the collected answers is based upon a number of various differences between companies to be analysed, i.e. enterprise's history, length of operation, production amount, number of employees, management style, supply with raw materials and materials, fixed asset and average age personnel modernization level and other aspects. Of course, further study of the development of environmental management system and in-depth analyses thereof has to be performed.

The survey gave the opportunity to qualitatively assess the level of general ecological awareness and competency among the respondents. Even though the questionnaire did not include direct questions related to the given aspects, it is possible to draw certain conclusions on the basis of commentaries given by the respondents during the survey. The main questions of the survey were related to such concepts as environmental policy, environmental management and environmental activity aspects. The majority of the respondents demonstrated lack of understanding or knowledge about such issues and tried to give them other conceptual meaning. For example, in one of the companies, clearly seeing non-existence of an environmental management system, a positive answer was given on existence of an environmental management program, by understanding with such a program technological instructions, technological safety and labour protection measures that included requirements for compliance with environmental aspects in the production process and operation of technological equipment. Several questions, which directly concern organisation of ecological control, monitoring, pollution or emergency prevention, were not fully answered by the respondents, because they were considered as ones outside the professional duties or insignificant. By emphasizing the importance of separate questions, for example, personnel communication, training and education in the field of environmental protection, the author has concluded that enterprise's personnel on management level are in quite opposite opinion. Often these questions were not paid enough attention to and they were considered insignificant for raising the importance of the given aspects in the future. Unfortunately it has to be noted that the level of ecological awareness of enterprise's management personnel is relatively low. Careless attitude towards ecological training of the personnel, ecological awareness and competency increase is obvious and can be one of the most important obstacles for development and implementation of EMS in companies.

## Conclusions

EMS has long been applied and promoted in construction industry. The construction industry has been slow in implementing EMS. In Latvia, the main difficulties for general contractors in applying EMS are the complexities of their working processes and habits. According to the results of the performed survey in construction companies in Latvia, the author can assert that all in all environmental management systems are used in Latvian companies, but to reach the expected results and in order the usage thereof would create both economic and ecological effects, the systems have to be improved.

In order to improve the environmental management system of a company, new ecological thinking of the management and personnel has to be developed. Its goal is to generate understanding that integration of environmental protection tasks within the complex of goals and tasks of the traditional commercial activity plays a significant role for subjection of all production functions and factors to the requirements of the ecological situation.

It seems that methods for evaluate company- eco-efficiency are similar to each other. However, what kinds of data and what boundaries should be used are critical issues. There are still many unresolved challenges concerning eco-efficiency, but it is important to know they have just begun. These challenges will not be overcome quickly. There are various conditions including products that are expected to rise in value rather than to reduce environmental impact, and others whose environmental impact should be reduced while maintaining a constant value. Many items and calculation methods concerning eco-efficiency existing and being tried out, and the direction has been becoming clearer and closer. Author hopes that environmental management assessment model will be able to evaluate level of implementation of ISO 14001 standard requirements in organization or at least help to do it. Author also hopes that this paper will be a valuable reference for organizations developing products that benefit the environment by introducing indicator in order to achieve sustainable society.

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