Eco-Balance in Business Activities

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ABSTRACT

It has long been said that in order for any business enterprise to survive through the 21st century, it is an essential prerequisite to improve its environmental performance. At manufacturing companies, in particular, they are continually stepping up activities to control the environmental pollution caused by their products and production plants. By the way, aren't there any companies that implement pollution control simply because there is growing social concern about the environment or because other companies are doing the same? Aren't there any companies that consider only the life cycle of each individual product? Actually, many (if not all) manufacturing companies make a wide variety of products. Therefore, without evaluating the life cycle of products as a group, it would be impossible for any manufacturing company to determine the priority of environmental measures to take in its business activity.

Recently, we, at Ricoh, made an attempt to clarify which of all the company's activities give the larger impacts on the environment by employing a new technique to make a comprehensive analysis. Namely, we first divided the company's activities largely into seven stages—procurement, production, distribution, selling, use, recycling, and scrapping. Next, we collected data about the load on the environment produced in each of the stages (air and water pollution, energy consumption, waste, etc.). Then, we assessed the overall load our business imposes on the environment employing one of the proven techniques that are used around the world and a new technique that is being developed in Japan.

As a result, we could find that in addition to the environmental measures we have taken so far, there are new problems to tackle in earnest in the future. We could also find that the new analytical technique is an effective decision-making tool for setting goals of environmental conservation.

1. Integration method

The methods used for evaluation of business activities in this study are listed below. For this study, outlines and characteristics of existing integration methods are summarized and special features and problems of the results of evaluation, in which the methods were actually applied to Ricoh's business activities, are considered. The integration methods applied in this study include ones considered as representative among existing methods studied worldwide and another being developed in Japan.

- Eco-indicator'99
- EPS (Environment Priority Strategies for Product Design)
- Nagata method (by Professor Nagata of Waseda University)

1.1 Eco-Indicator'99

Eco-Indicator'99 is a method developed by specialists including Dutch Goedkoop as a leader, which takes a top-down approach and whose safeguard subjects are the followings:

i) Human health, ii) Ecosystem and iii) Resource drain

<Characteristics of the method>

In this Eco-Indicator'99, 9 items, which correspond to impact categories used in the past methods, are evaluated primarily as an intermediate subjects between safeguard subjects and environmental impact substances.

Eco-Indicator'99 evaluates activities in 3 steps. Its conceptual figure is in Figure 1.1.

Step 1 is ordinary inventory analysis, but the method features that damage is calculated for 3 damage categories, which are safeguard subjects, at step 2 and weighting is implemented at step 3.

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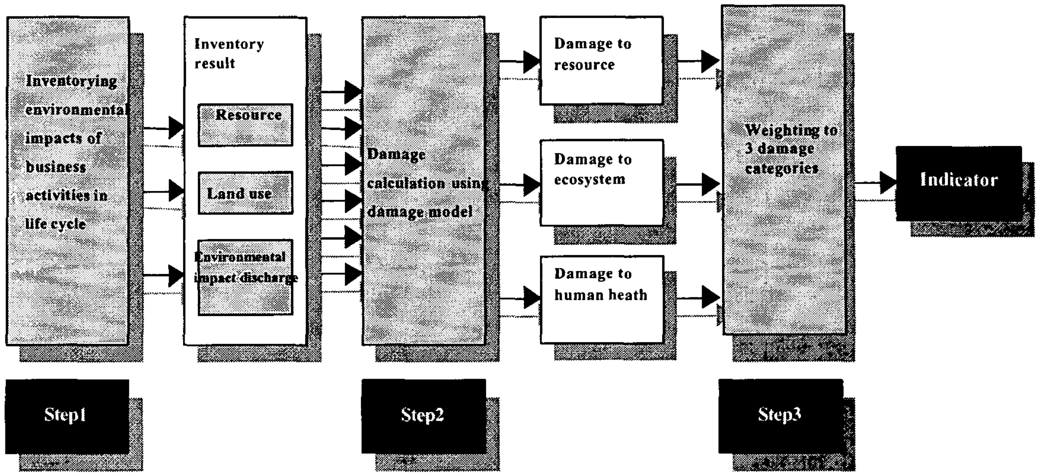

Figure 1.1 Outline of Eco-Indicator'99

1.2. EPS

EPS (Environment Priority Strategies for Product Design) was developed by IVL in Sweden and has been applied to evaluation for development of car products by Swedish VOLVO. It is a method also using a top-down approach.

<Characteristics of the method>

Safeguard subjects taken up in this method are 5 items: biodiversity, production capacity, human health, abiotic resources and cultural value. The method is mainly characterized by 94 impact categories chosen for such safeguard subjects. One of factors of this feature may be that there are 5 kinds of safeguard subjects, which are superordinate concepts of impact categories, increased in number compared to Eco-Indicator'99.

This method does not use a panel like the Eco-Indicator, but is a representative method utilizing monetary evaluation with WTP (willingness-to-pay), whose final result is presented in ELU (Environmental Load Unit) based on money. As 1 ELU can be regarded as 1 EUR (Euro), ELU is a numerical value indicating how much money will be paid to avoid environmental impact caused during a life cycle of a product.

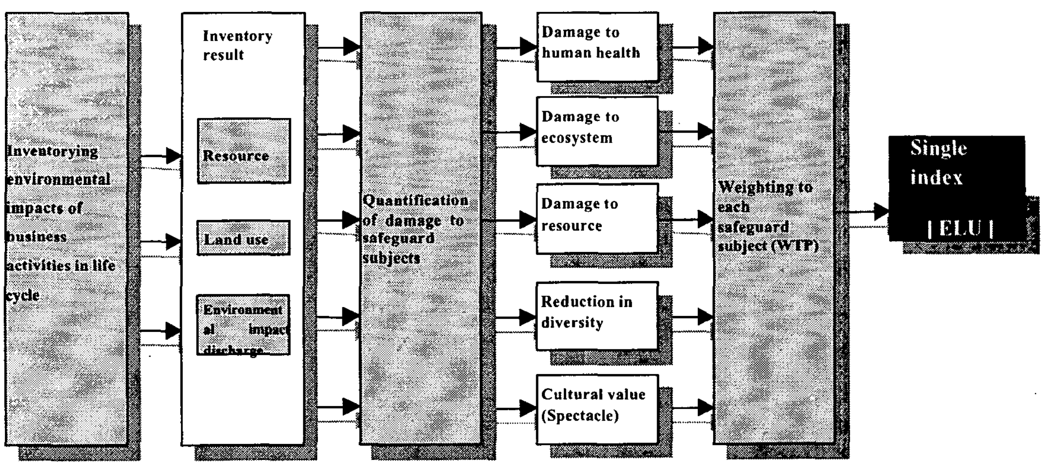

Figure 1.2 Process to derive factors in EPS (ELU can be regarded as EUR.)

1.3. Nagata Method

In this method, relative importance among impact areas is quantified by a panel (group of specialists or people chosen by other qualifications for this purpose) and environmental impact is evaluated using a unique index called ELP (Environmental Load Point). So far as integrating evaluation for each category using a panel is concerned, Nagata method is the same as Eco-Indicator, but, for such categories, it uses midpoint subjects including global warming, acidification and ozone layer depletion, while Eco-Indicator end point evaluation.

2. Evaluation

2.1. Scope for evaluation

Whole fields of business activities of the Ricoh Group were chosen to be the scope for integrated evaluation. Figure 1.1.1 illustrates the scope for the evaluation. Resources, energy, water consumption and discharge of matters causing environmental impacts including CO_2, CH_4, NOx, SOx, BOD, COD and chemicals are organized before evaluation is conducted.

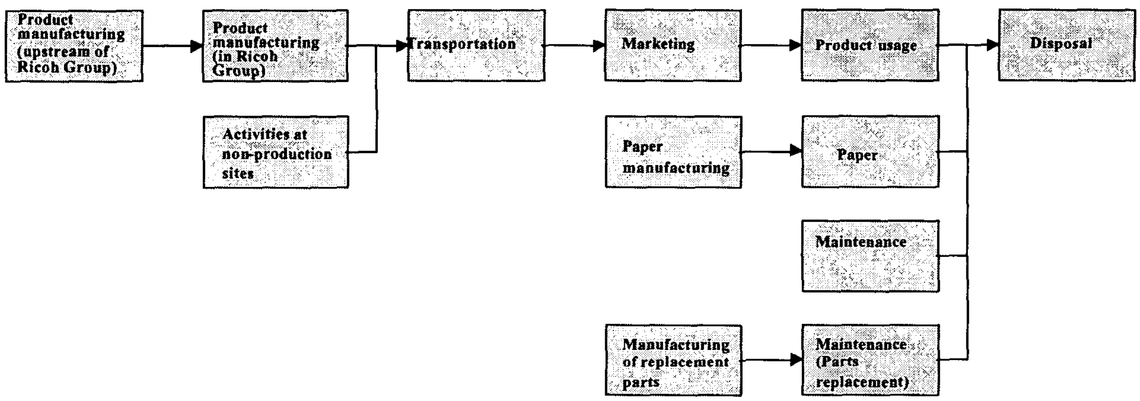

Figure2.1 Scope for evaluation

(1) Product manufacturing process (upstream of the Ricoh Group): Product manufacturing process are divided into one within the Ricoh Group and another upstream of the Group, for the latter of which manufacturing process for parts of each product is considered.

(2) Product manufacturing process (in the Group sites): For this process, environmental impact caused at each business site in both Japan and foreign countries is evaluated.

(3) Activities at non-production sites: Environmental impact incurred by activities at non-production business sites including headquarters and design, development, marketing and indirect sections, which do not directly participate in manufacturing process is also addressed.

(4) Transportation process: Environmental impact related to transportation of products is covered, which includes one by not only Group-owned cars, but also contracted transportation.

(5) Marketing process: Environmental impact by marketing companies of Ricoh Group is dealt with.

(6) Product usage process: Covered is environmental impact caused during use of products by users, which includes electricity consumption and use of paper, photographic sensitive drums, developing solution and toner for copiers.

(7) Maintenance process: Environmental impact generated by maintenance companies of Ricoh Group is addressed.

(8) Discard and recycling process: Environmental impact concerning discard and recycling of products and other substances in the business activities is covered.

2.2. Evaluation result

Categories considered to be especially important factors of environmental impact as a result of the evaluation are presented below.

2.2.1. Impact of chemical substances contained in products

Factors affecting numerical values obtained by each method for such chemical substances are discussed.

Impact of chemical substances contained in products accounts for larger percentage for Eco-Indicator'99. If discharged to the environment, nickel in products is highly rated in the evaluation for its effect to human health as a carcinogen. On the other hand, cancer-causing effect of discharged nickel is regarded null in EPS, which greatly differs from Eco-Indicator'99.

Further, EPS mainly attaches importance to lead among chemical substances contained in products for the impact, but does not much to hexavalent chromium and copper. Meanwhile, copper's effect is considered as equal to or greater than lead in Eco-Indicator'99

Impact of these substances is not considered in Nagata method.

2.2.2. Impact of resource consumption

In EPS, the impact of manufacturing process upstream of Ricoh Group is second largest after the effect of paper related processes and accounts for percentage larger than in other methods. It indicates that impact of resource consumption accounts for larger percentage of all the impacts compared to other 2 methods.

Although These 3 methods use different ways to evaluate the impact of resource consumption, Eco-Indicator'99 and Nagata method employ the same approaches in which the impact of resource consumption, normalized, is multiplied by importance determined using a questionnaire.

Validity of resource prices, or WTP obtained using market prices, compared to WTP to pay to avoid damage incurred by other environmental impact, comes into question for a method evaluating with price of the resource consumed such as EPS.

2.2.3. Impact of paper

Process related to a life cycle of paper affects the environment most in these methods. Comparing energy consumption and discharges of major substances causing environmental impact among these methods finds that the environment is affected most by Sox and next by COD and NOx in Eco-indicator'99 and Nagata method.

The impact of CO2 is not so large in Nagata method than in other two methods. This indicates that Nagata method is much affected by air pollution, water pollution and acidification.

On the other hand, as for Eco-indicator'99, the impact of acidification and eutrophication on ecosystem is not a large factor, but the impact of NOx on the health of respiratory disease patients is reflected larger than that of global warming.

Further, impact of CO2 is dominant in EPS, which indicates that global warming affects much more than others. When the effect of global warming is compared between EPS and Eco-Indicator'99, as pathways for it in Eco-Indicator'99 are fewer than ones for EPS, Eco-Indicator'99 estimates impact of global warming smaller than EPS.

2.3. Comparison among the methods

In end point type evaluation methods such as Eco-Indicator'99 and EPS, items ranging from environmental impacts to damage to the environment being related scientifically, evaluation is conducted using unit of "extent of damage," for example, DALY or YOLL (/person/year) for human health, for every category or safeguard subject. Accordingly, they are methods very understandable to both the part of doing evaluation and the part of looking the result through and evaluate serious state of the environmental problems in more concrete form.

On the other hand, midpoint type evaluation methods present evaluation results within categories not with extent of damage, but with relative impact such as GWP (global warming potential) or ODP (ozone layer depletion potential); therefore, they are difficult to be understood by the public. However, midpoint types may have the advantage of dealing with the impact which can not be covered by end point types, which are purely scientific.

These methods are the same in terms of evaluating using a sole index after integrating results of every category. However, there is no scientific method for the integration. The ways of integration differ among the methods. Some integration methods require normalization procedures applied to results of evaluation for each category.

3. Summary

This time, tackling the evaluation of eco-balance of our business activities using representative integration methods resulted in finding the characteristics of each method discussed above. Review of the result in light of our environmental management policy, the form of our business, the trend of our society and our past activities found that EPS met these conditions best.

However, many incomplete parts still existing in the integration methods prevent such result from being reflected in our business activities. By furthering collection of data on chemical substances and study on integration methods taking local conditions into account, we intend to utilize such analysis of the eco-balance as a tool for decision making for environmental management.