

# **Environmental Accounting Guidebook II**

**March 2001**

**Ministry of the Environment**

**Japan**



# TOTAL CONTENTS

## Chapter 1

Report from the Electronic and Electric WG:

Arrangement of the system relating to the effects in environmental accounting .... 1

## Chapter 2

Report from the Distribution WG:

Approach to environmental accounting targeting environmental conservation activities

..... 39

## Chapter 3

Report from the Food WG:

Task of segment environmental accounting focusing on the material flow ..... 65



# **Chapter 1**

## **Report from the Electronic and Electric Working Group**

- Arrangement of the System Relating to the Effects in  
Environmental Accounting -

## Contents

1. Purposes of This Chapter.....	4
(1) Background of this chapter.....	4
(2) Issues in this Chapter.....	5
(3) "Mapping" and "Road Map".....	8
2. Entire Image of "Effects Expressed in Monetary Units".....	9
(1) Content of "effects expressed in monetary units".....	9
(2) Evaluation targets of "economic evaluation of environmental conservation effects" and "economical effects associated with environmental conservation measures".....	10
(3) Evaluation purposes of "economic evaluation of environmental conservation effects" and "economical effects associated with environmental conservation measures".....	11
3. Economic Evaluation of Environmental Conservation Effects.....	13
(1) Significance of "economic evaluation of environmental conservation effects".....	13
(2) Notes on announcing "economic evaluation of environmental conservation effects".....	15
(3) Future issues.....	16
4. Economical Effects Associated with Environmental Conservation Measures.....	17
4.1 Clarification of Organization of "Economical Effects Associated with Environmental Conservation Measures".....	17
(1) "Economical effects associated with environmental conservation measures" in the "Environmental Accounting Guideline (2000 Version)".....	17
(2) Organization and classification in this Chapter.....	18
4.2 Revenue.....	24
4.3 Cost Saving.....	26
4.4 Cost Saving by Avoiding Risks.....	29
(1) Organization of "cost saving by avoiding risks".....	29
(2) Examples of assessment in environmental accounting.....	34
(3) Future objectives.....	37
5. Objectives Relating to Measuring of "Effects Expressed in Monetary Units" (Road Map).....	37

# Chapter 1 Report from the Electronic and Electric Working Group

## - Arrangement of the System Relating to the Effects in Environmental Accounting -

### **Introduction**

In electronic and electrical and electronic industries, more effects corresponding to environmental conservation cost that was input are announced in environmental accounting. The Electronic and Electrical Working Group had discussions regarding the effects corresponding to environmental conservation cost with a special emphasis on the effects that are expressed in monetary units.

The "Guideline for Introduction of an Environmental Accounting System (2000 version)" prepared by the Ministry of the Environment (referred to as the "Environmental Accounting Guideline (2000 version)" henceforth also refers to the effects that are expressed in monetary units. In this Report, the details of the concept were organized as a part of the examination for revising the "Environmental Accounting Guideline (2000 version)". This Report may be useful as a reference for the companies that have measured environmental conservation cost by introducing environmental accounting to pursue further measuring of effects.

The details are discussed in the main text, however, the following two types of effects can be presented as the effects that are expressed in monetary units.

- Economic evaluation of environmental conservation effects:  
Result of conversion of environmental conservation effects (social effects) to a monetary amount
- Economical effects associated with environmental conservation measures:  
Internal effects such as revenue acquired by input of environmental conservation cost and cost saving

This chapter describes the summary of roles of these two types of effects in environmental accounting and also describes the detailed examination carried out based on the latter effect, "economical effects associated with environmental conservation measures."

These issues were discussed in the following sequence.

**Section 1.** Purposes of This Chapter

**Sections 2. to 4.** Effects Expressed in Monetary Units

**Chapter 2.** Entire Image of the "Effects Expressed in Monetary Units"

**Chapter 3.** Economic Evaluation of Environmental Conservation Effects

**Chapter 4.** Economical Effects Associated with Environmental Conservation Measures

**Chapter 5.** Objectives Relating to Grasping of "Effects Expressed in Monetary Units" (Road Map)

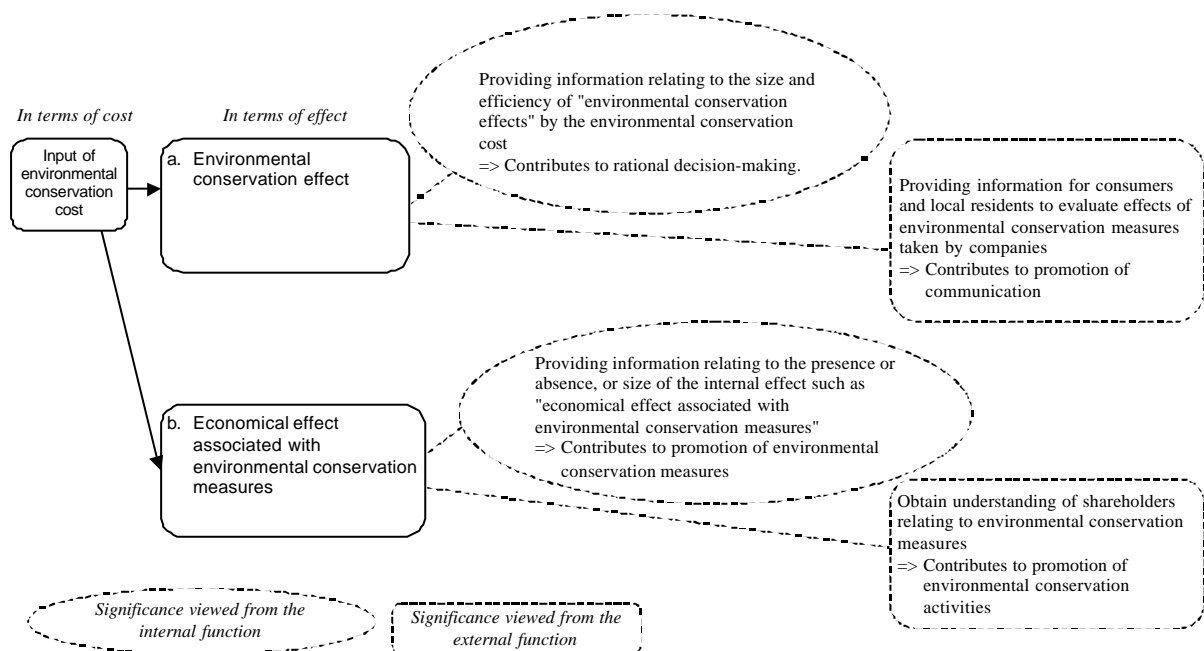
# 1. Purposes of This Chapter

## (1) Background of this chapter

The "Environmental Accounting Guideline (2000 version)" describes the measuring of "environmental conservation cost" and its "effects." The following two "effects" are presented.

- a. Environmental conservation effects  
Indicate the degree of achievement of environmental conservation (prevention and suppression of environment impact associated with business activities and elimination of the influence). The effects indicate social effects.
- b. Economical effects associated with environmental conservation measures:  
Indicates the degree of realization of operating revenue and cost saving achieved as a result of input of environmental conservation cost. These effects indicate internal effects.

The illustration below summarizes the significance of measuring "a. environmental conservation effects" and "b. economical effects associated with environmental conservation." These two types of "effects" are important in effective and efficient input of the environmental conservation cost that is increasing, in terms of internal functions. In terms of external functions, announcement of environmental accounting information by companies in an appropriate form will be useful for consumers, shareholders and so on to evaluate the effects of the environmental conservation measures.



Based on these significances, this Chapter examines further "effects" discussed in the "Environmental Accounting Guideline (2000 version)" and arranges the effects, focusing on the "effects" that are expressed in monetary units.



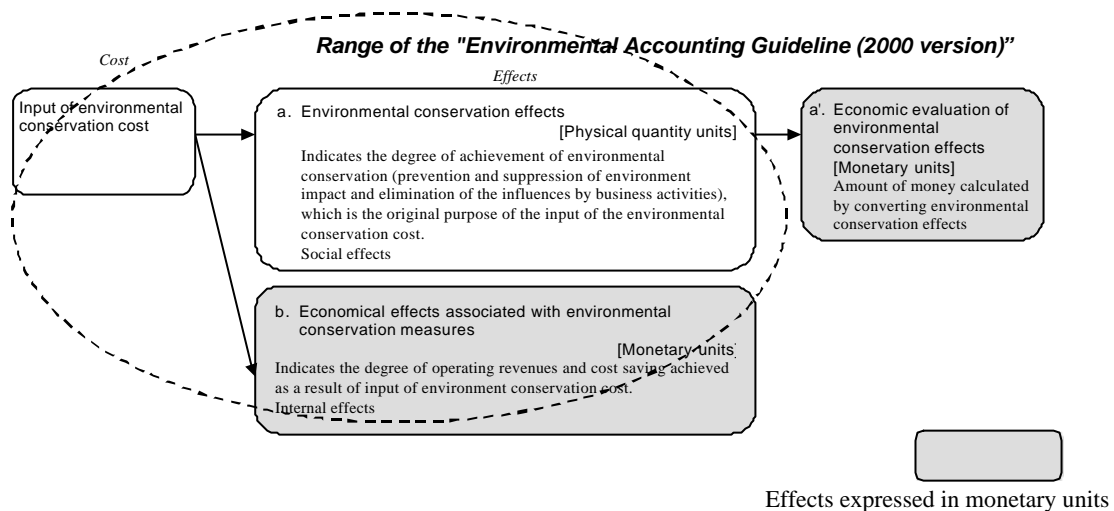
## (2) Issues in this Chapter

This section discusses in what units the two types of effects, "a. environmental conservation effects" and "b. economical effects associated with environmental conservation measures" are expressed.

The effects discussed in "a. Environmental conservation effects" are basically expressed in the unit of physical volume such as amount of reduction of environmental pollution wastes and amount of resources and energy that are conserved. However, recently, there are some attempts to express such environmental conservation effects that are expressed in the unit of physical volumes in the monetary units by converting the effects to the amounts of money (referred to as "economic evaluation of environmental conservation effects").

Since "b. Economical effects associated with environmental conservation measures" refer to revenues or cost saving, they can be expressed in monetary units.

This relationship is illustrated below.



Both of the effects shown above, "a'. Economic evaluation of environmental conservation effects" and "b. Economical effects associated with environmental conservation measures", can be expressed in monetary units, however, they have different meanings: one stands for social effects and the other stands for internal effects. (Therefore, it is meaningless to simply add these two types of effects.) In detail, both effects contain various contents. There are still many issues to be resolved since there is no established actual evaluation method.

For the companies that tackle environmental accounting, this is still in a trial and error stage as to how the effects that are expressed in monetary units can be measured and analyzed to be useful for business management. It is also important for users of environmental accounting information to understand the meaning of the effects that are expressed in monetary units.

This Chapter clarifies the characteristics of the two types of "effects expressed in monetary units", which are indicated below, by systemizing them and indicates future objectives.

- Economic evaluation of environmental conservation effects
- Economical effects associated with environmental conservation measures

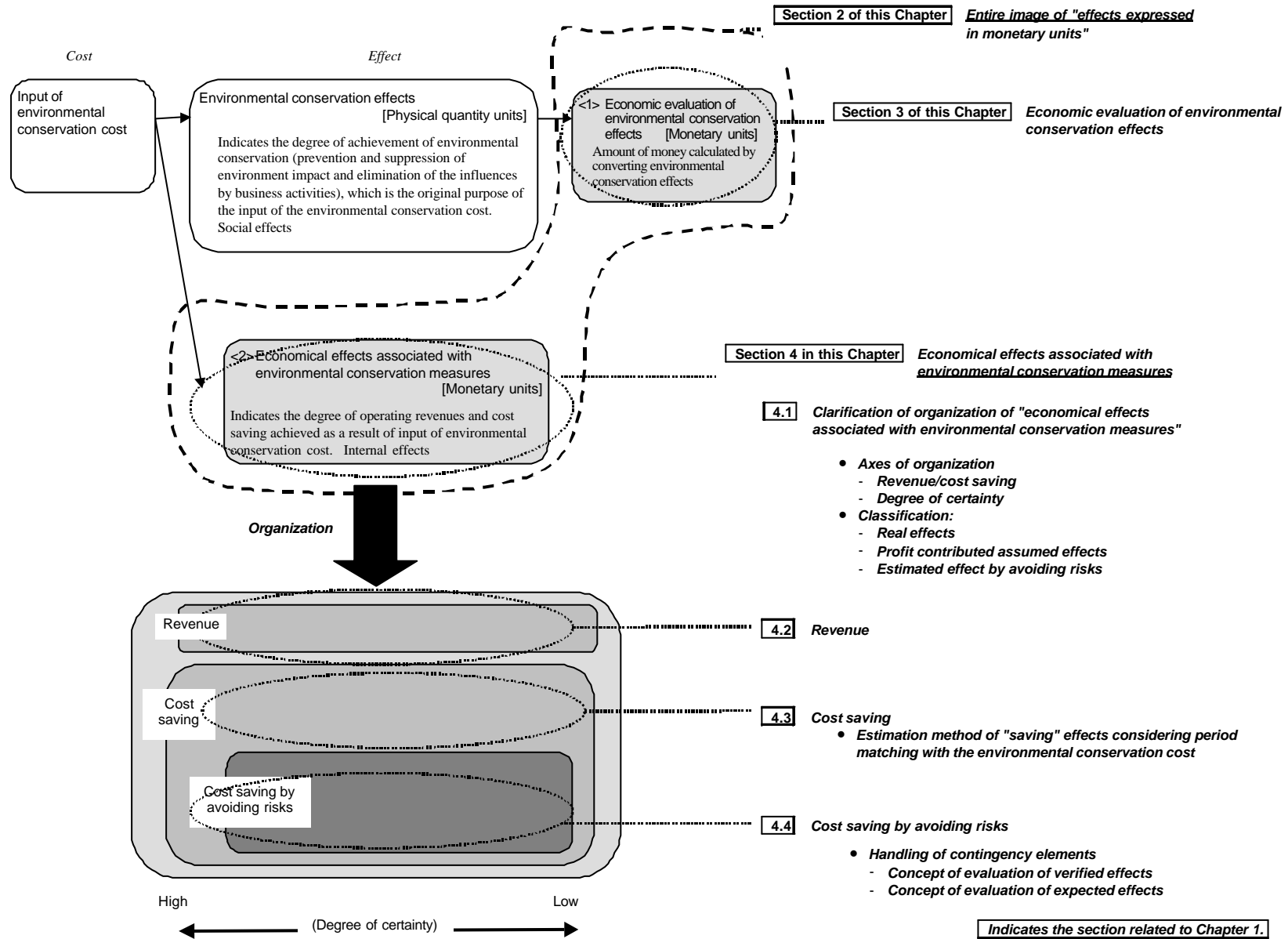
In particular, an emphasis is placed on the latter effects, "economical effects associated with environmental conservation measures", and the contents are examined classifying them into the following categories.

- Revenue
- Cost saving (excluding cost saving by avoiding risks)
- Cost saving by risk avoidance

The practical examination contents are shown in the following table and illustration.

Examination item	Contents
<p><b>Section 2 in this Chapter</b> Entire image of "effects expressed in monetary units"</p>	<ul style="list-style-type: none"> <li>● Indicates that there are two types of effects that are expressed in monetary units in environmental accounting, each of which is measured based on a different evaluation purpose. <ul style="list-style-type: none"> <li>- "Economic evaluation of environmental conservation effects" (Social effects)</li> <li>- "Economical effects associated with environmental conservation measures" (Internal effects)</li> </ul> </li> </ul>
<p><b>Section 3 in this Chapter</b> Economic evaluation of environmental conservation effects</p>	<ul style="list-style-type: none"> <li>● Describes the significance of "economic evaluation of environmental conservation effects", notes on using the evaluation, and future objectives.</li> </ul>
<p><b>Section 4 in this Chapter</b> Economical effects associated with environmental conservation measures</p>	
<p><b>4.1</b> Clarification of organization of "economical effects associated with environmental conservation measures"</p>	<ul style="list-style-type: none"> <li>● Clarifies organization of the "economical effects associated with environmental conservation measures" that was indicated in the "Environmental Accounting Guideline (2000 version)" by examining the contents further.</li> <li>● Specifically, organizes the "economical effects associated with environmental conservation measures" with the following two axes. <ul style="list-style-type: none"> <li>- Revenue/cost saving</li> <li>- Degree of certainty</li> </ul> </li> </ul> <p>Classifies "economical effects associated with environmental conservation measures" into the following three categories focusing on the axes and the contents described above.</p> <ul style="list-style-type: none"> <li>- Real effects</li> <li>- Profit contributed assumed effects</li> <li>- Estimated effects by avoiding risks</li> </ul>
<p><b>4.2</b> Revenue</p>	<ul style="list-style-type: none"> <li>● Sections following Section 4.2 summarize the contents based on the "revenue/cost saving", which is one of the axes of organization in Section 4.1.</li> <li>● Section 4.2 organizes the contents based on "revenue."</li> </ul>
<p><b>4.3</b> Cost saving</p>	<ul style="list-style-type: none"> <li>● Organizes the contents based on "cost saving." (Excluding "cost saving by avoiding risks")</li> <li>● Since "cost saving" is the expense amount that was avoided, unlike "revenue", and is not expressed as a value in terms of accounting, the value needs to be assessed by some comparison (example: difference from the previous year). It is necessary to keep in mind the period matching between the amount avoided and the environmental conservation cost.</li> </ul> <p>This Section describes various assessment methods for cost saving amounts and the features (period matching between amount avoided and environmental conservation cost).</p>
<p><b>4.4</b> Cost saving by avoiding risks</p>	<ul style="list-style-type: none"> <li>● Organizes "cost saving by avoiding risks."</li> <li>● In particular, this Section summarizes the following two concepts as the methods for handling contingency elements (probability of the situation that causes an economical burden for the company due to environmental pollution caused by the company) based on the examples that have been announced. <ul style="list-style-type: none"> <li>- Concept of evaluating the effects that could be verified</li> <li>- Concept of evaluating expected effects</li> </ul> </li> </ul>

\* Cost saving by avoiding the possible cause of the economical burden for the company due to environmental pollution caused by the company



### **(3) "Mapping" and "Road Map"**

This chapter indicates the result of organization of "effects expressed in monetary units" as "mapping" progressively. "Mapping" is used for the following purposes.

- Useful for companies to understand various sides that are meant by the "effects expressed in monetary units" and select targets of checking and analysis according to their purposes
- Useful for users of environmental accounting information to understand the meaning of "effects expressed in monetary units", rather than simply checking the values, among the elements of environmental accounting.

At the end of this Chapter, a summary of the issues in measuring the "effects expressed in monetary units" is provided as a "road map." The "road map" is used for the following purposes.

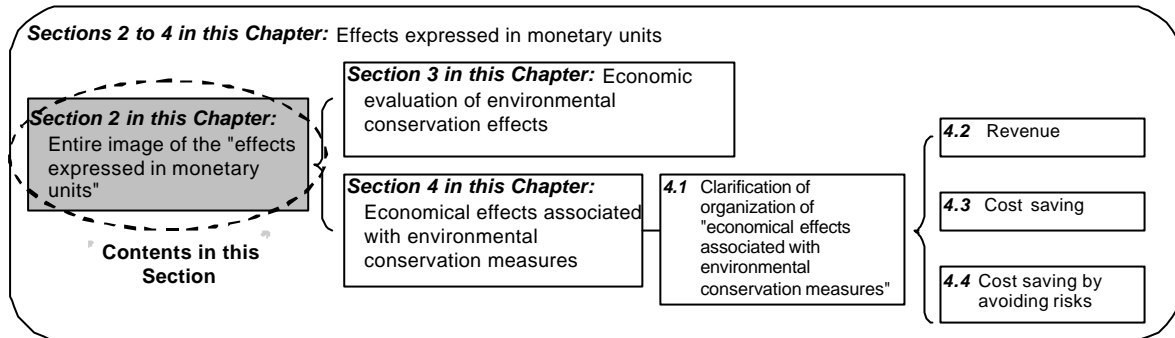
- Clarify the direction of future discussions and assist promotion of research and practice.
- Enable providers and users of environmental accounting information to have common understanding and problem awareness regarding the expression of "effect", enhancing further communication.

## 2. Entire Image of "Effects Expressed in Monetary Units"

### Introduction

This section describes the entire image of the "effects expressed in monetary units" that was described in the previous section. This section provides the general view of the "economic evaluation of environmental conservation effects" and "economical effects associated with environmental conservation measures", which are the two contents included in the "effects expressed in monetary units." This section also summarizes the evaluation targets and differences of the evaluation purposes of both contents.

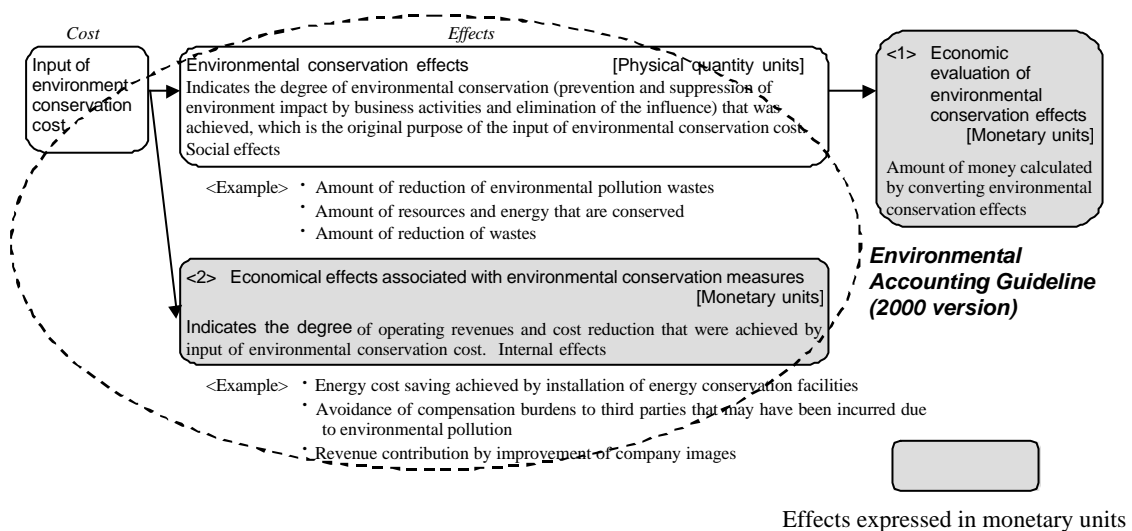
Sections 3 and 4 discuss the details of both contents.



### (1) Content of "effects expressed in monetary units"

This section summarizes again the "effects derived as a result of input of environmental conservation cost" in the relationship of "environmental conservation cost." (See [Mapping 1](#) below.)

### [Mapping 1](#) Organization of "effects expressed in monetary units"



The "effects expressed in monetary units" that were described in the previous section are applicable to the shaded sections in [Mapping 1](#), which are the following items, <1> and <2>.

- <1> Economic evaluation of environmental conservation effects
- <2> Economical effects associated with environmental conservation measures

The evaluation targets and the evaluation purposes of the "effects expressed in monetary units" in <1> and <2> are different. The evaluation targets and evaluation purposes are discussed below.

## **(2) Evaluation targets of "economic evaluation of environmental conservation effects" and "economical effects associated with environmental conservation measures"**

### **a. Economic evaluation of environmental conservation effects**

As shown in [Mapping 1](#), a company initially inputs "environmental conservation cost" for conserving the environment.

As a result of the input of "environmental conservation cost", "environmental conservation effects" are generated. The "environmental conservation effects" may be prevention or suppression of environment impact associated with business activities or elimination of the influence. The effects mean social effects. Practically, the effects include the following.

- Amount of reduction of environmental pollution wastes
- Amount of resources and energies that are conserved
- Amount of reduction of wastes, etc.

As shown in the above examples, "environmental conservation effects" are basically expressed in the unit of physical volume.

At the same time, a technique for converting the values held by "environmental conservation effects" and environments themselves to monetary values and expressing them in monetary units is being studied in the field of environmental economics. In Europe and the United States (in particular, USA), application of the technique is attempted in various fields such as project evaluation and policy decision.

In environmental accounting also, attempts are being made to express in monetary units "environmental conservation effects" as a result of input of "environmental conservation cost" through economic evaluation. Such evaluation is the "economic evaluation of environmental conservation effects" that was described in the previous section. In [Mapping 1](#), it corresponds to the section <1> of the shaded sections.

### **b. Economical effects associated with environmental conservation measures**

As shown in [Mapping 1](#), some internal effects such as realizations of revenue and cost saving may often be generated in business also as a result of input of "environmental conservation cost." In practice, the following effects may be achieved.

- Energy cost saving achieved by installation of energy conservation facilities
- Avoidance of compensation burdens to third parties that may have been incurred due to environmental pollution
- Revenue contribution by improvement of company images

Such internal effects refer to "economical effects associated with environmental conservation measures" that were described in the previous section. The effects correspond to the shaded section <2> in [Mapping 1](#).

The "economical effects associated with environmental conservation measures" are expressed in monetary units since the effects are revenues and cost saving.

**(3) Evaluation purposes of "economic evaluation of environmental conservation effects" and "economical effects associated with environmental conservation measures"**

**a. Economic evaluation of environmental conservation effects**

Purposes of evaluating "environmental conservation effects" are examined as follows as the preconditions of "economic evaluation of environmental conservation effects."

- Internal function: By measuring the size and efficiency of the "environmental conservation effect" by environmental conservation cost, use the effects for rational decision-making.
- External function: Useful information for consumers and local residents to evaluate the effects of environmental conservation measures taken by a company, etc. and to promote communication.

What are the purposes of expressing the "environmental conservation effects" in monetary units through economic evaluation? Section 3, "Economic Evaluation of Environmental Conservation Effects" describes the purposes.

**b. Economical effects associated with environmental conservation measures**

"Economical effects associated with environmental conservation measures" are evaluated for the following purposes.

- Internal function: Measure and analyze the economical merits incurred by environmental conservation measures and use the results for decision-making.
- External function: Indicate economical merits generated by environmental conservation measures to shareholders for gaining understanding.

Either the internal function or external function indicates the possibility for contribution by environmental conservation measures to company revenues and the effects can be expected as the motive force for promoting environmental conservation measures.

For companies, the necessity for measuring the "economical effects associated with environmental conservation measures" is increasing in order to achieve the goals of management considering the environment and improvement of profitability.

**<Column> Capturing the effects of input of environmental conservation cost as a product life cycle**

As described above, "environmental conservation effects" or "economical effects associated with environmental conservation measures" are generated as a result of input of environmental conservation cost. These effects are generated not only within the business area but also the upstream/downstream of the business area. One concept is to focus on the product life cycle in measuring of effects generated in the upstream/downstream area. That is, within the product life cycle (raw material collection -> research and development, and manufacturing -> use -> disposal), the effects generated at the raw material collection stage and the effects generated at the use/disposal stage are captured as the upstream effects and the downstream effects, respectively.

The illustration below shows the concept when effects by input of environmental conservation cost are captured by the product life cycle.

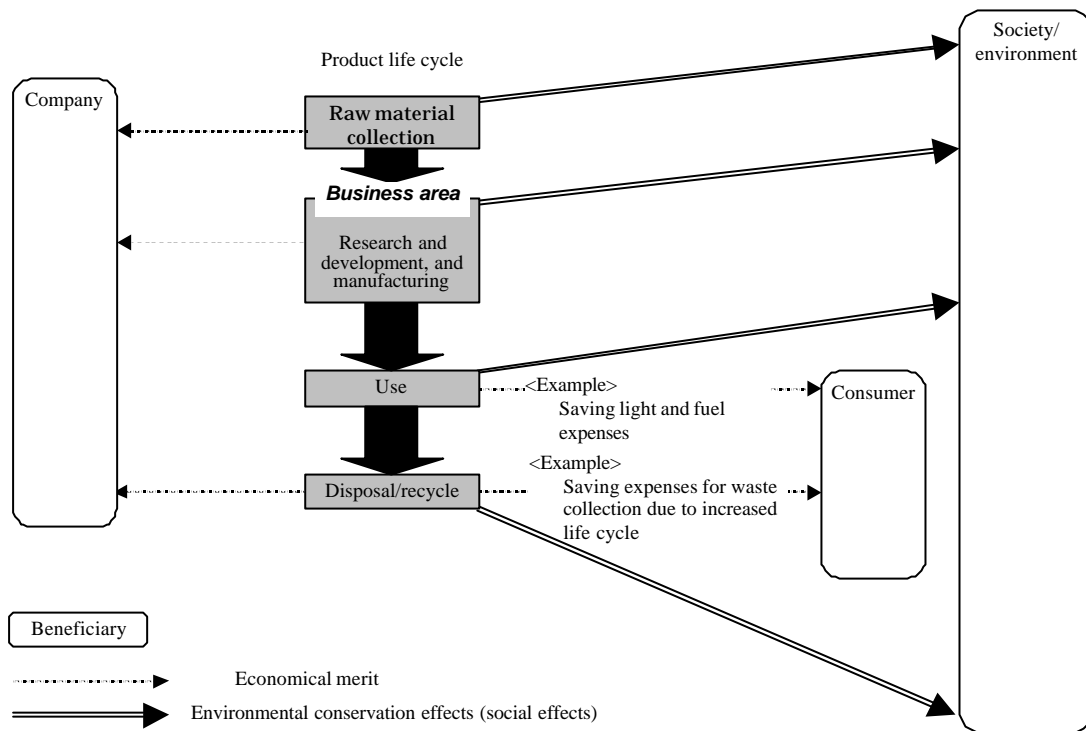
Initially, among the effects of environmental conservation cost input, "environmental conservation effects" (social effects) can be generated at each stage of the life cycle. The beneficiary is the society or the environment.

"Economical effects associated with environmental conservation measures", which is another type of effects (internal effects), are economical merits that are mainly generated at the product raw material collection stage or the research and development, and manufacturing stage. The beneficiary is the company.

At the product use stage, some economical merits are generated for consumers as a result of environmental conservation cost input by a company. For instance, consumers can save light and fuel expenses as a result of research and development carried out by a company at the product use stage.

In the course of development of the recycling-oriented society, the bearing of the expenses incurred at the

product disposal/recycling stage is the responsibility of the companies. Therefore, economical merits may be generated for both the company and consumers as a result of research and development carried out by the company to increase the product life cycle.



Recently, a concept of capturing environment impact by products through the entire life cycle, not just a part of the life cycle, has been advocated. One of the methods is life cycle assessment and more and more companies are practicing this method.

Against such a background, in environmental accounting also, a concept of capturing environmental conservation effects based on the product life cycle may be developed. In the future, it will be necessary to examine the possibility of integration of life cycle assessment of products and environmental accounting.

As the opening for measuring the effects in environmental accounting, one capturing method is to aggregate "economical merits generated to consumers" as well as "environmental conservation effects" (social effects) and "economical effects associated with environmental conservation" (internal effects).

While, currently some companies announce "economical merits generated to consumers", others may not announce yet, assuming that there are some issues to be examined in the method of measuring and expression.

However, separate from the announcement issue, it is meaningful to add "economical merits generated to consumers" in terms of the internal function. For instance, companies can utilize the information as the basic information for product development.

In this sense also, methods of measuring and expressing "economical merits generated to consumers" are to be examined in the future.



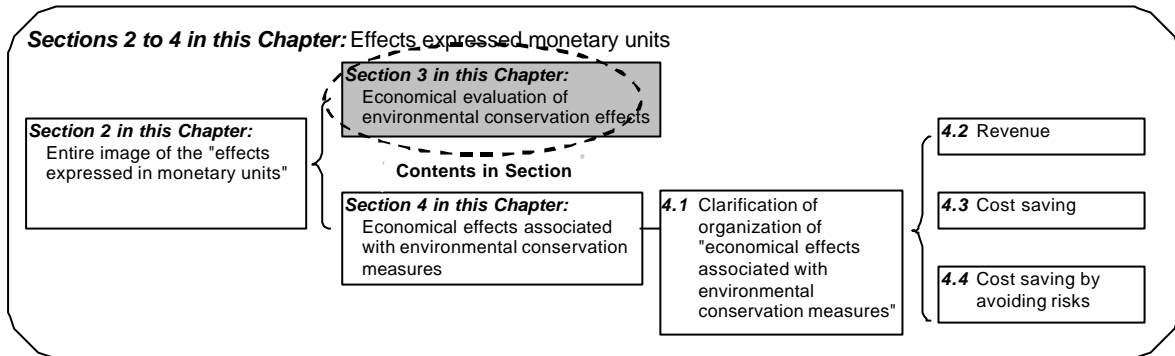
### 3. Economic Evaluation of Environmental Conservation Effects

#### Introduction

This section focuses on "economic evaluation of environmental conservation effects" of the two types of effects that are expressed in monetary units, "economic evaluation of environmental conservation effects" and "economical effects associated with environmental conservation measures."

As described in the previous section, "economic evaluation of environmental conservation effects" converts "environmental conservation effects" that are expressed in the physical quantity units into the monetary amount and expresses in monetary units.

This section initially summarizes the significance of "economic evaluation of environmental conservation effects" and indicates the notes and future objectives of using the evaluation.



#### (1) Significance of "economic evaluation of environmental conservation effects"

In this section, initially assume the situation where environmental conservation effects are expressed in the physical quantity units (example: CO<sub>2</sub> emission reduction volume OOk<sub>g</sub>, NO<sub>x</sub> emission reduction volume XX kg).

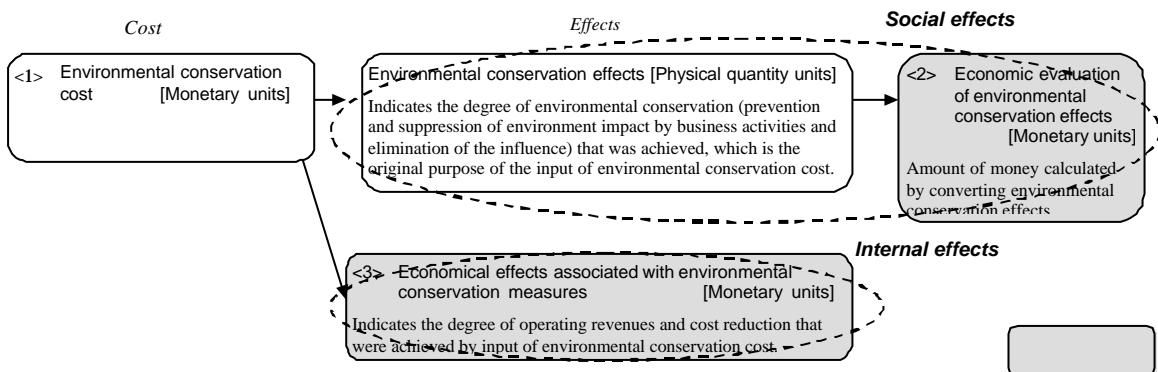
In the physical quantity units, comparison or comprehensive evaluation of different types of environmental conservation effects is not possible. For instance, simple size comparison or addition of amount of reduction of CO<sub>2</sub> emission and amount of reduction of NO<sub>x</sub> emission is not possible. Reduction of one ton of CO<sub>2</sub> emitted and reduction of one ton of NO<sub>x</sub> emitted have different influences on the environment.

If the values corresponding to the effects of reducing CO<sub>2</sub> and NO<sub>x</sub> are expressed in monetary units through economic evaluation, the effects of reducing CO<sub>2</sub> and NO<sub>x</sub> can be compared or the reduction effects can be evaluated comprehensively.

The result of the "economic evaluation of environmental conservation effects" may indicate the cost that may have been borne by the society if the company has not input the "environmental conservation cost", that is the social cost (see <Column> provided later).

Next, examine what can be detected from the relationship between the result of "economic evaluation of environmental conservation effects" and other items expressed in monetary units (environmental conservation cost and economical effects associated with environmental conservation measures).

Examine again the illustration that summarizes environmental conservation cost and the effects.



Effects expressed in monetary units

In the illustration indicated above, items that are expressed in monetary units include "<1> Environmental conservation cost", "<2> Economic evaluation of environmental conservation effects", and "<3> Economical effects associated with environmental conservation measures." The bearers of the cost and beneficiaries of these items are summarized as follows.

- <1> "Environmental conservation cost": Cost paid by the company
- <2> "Economic evaluation of environmental conservation effects": Social effects benefited by the society
- <3> "Economical effects associated with environmental conservation measures": Internal effects benefited by the company

Based on the summary indicated above, the following items are examined.

- Relationship between "<2> Economic evaluation of environmental conservation effects" and "<3> Economical effects associated with environmental conservation measures"
- Relationship between "<2> Economic evaluation of environmental conservation effects" and "<1> Environmental conservation cost"

### **"<2> Economic evaluation of environmental conservation effects" and "<3> Economical effects associated with environmental conservation measures"**

"<2> Economic evaluation of environmental conservation effects" indicates social effects and "<3> Economical effects associated with environmental conservation measures" indicate internal effects, and the beneficiaries are different. Therefore, in environmental accounting, it is appropriate to display them separately.

### **"<2> Economic evaluation of environmental conservation effects" and "<1> Environmental conservation cost"**

There is a direction that judges the validity of environmental conservation measures taken by such as a company, comparing "<2> Economic evaluation of environmental conservation effects" and "<1> Environmental conservation cost".

However, at this point, there is no common standardized technique for "<2> Economic evaluation of environmental conservation effects." There are considerable differences in evaluation results according to the technique. Therefore, caution is necessary in interpretation of the value produced by subtracting "<1> Environmental conservation cost" from the result of "<2> Economic evaluation of environmental conservation effects."

When a company inputs environmental conservation cost in response to the strong social request for environmental conservation, the adequacy of environmental conservation measures cannot be judged simply by the size of the value produced by result of "<2> Economic evaluation of environmental conservation effects - <1> Environmental conservation cost." The background and reason should be taken into account in judgment of environmental conservation measures taken by a company.

Incidentally, comparison between "<1> Environmental conservation cost" and "<3> Economical effects associated with environmental conservation measures" is examined here.

Since environmental conservation activities are not commercially beneficial independently by themselves, it is meaningless to insist that the size of the value is produced by subtracting "<1> Environmental conservation cost" from "<3> Economical effect associated with environmental conservation measures." Environmental conservation cost is intended for achievement of environmental conservation effects and the adequacy should ultimately be judged in terms of environmental conservation.

However, some companies try to promote environmental conservation measures by indicating to the external and internal parties of the company that the value produced by "<3> Economical effects associated with environmental conservation - <1> Environmental conservation cost" is large.

As described above, while economic evaluation of environmental conservation effects has many possibilities of the application, there are many points to be noted and issues to be resolved. Items (2) and (3) describe these notes and issues.

## <Column> Social cost

Unlike the cost that is normally paid by a company, social cost is paid by the society as the third party. For instance, social cost includes health damage and damage to agricultural products or fisheries that are caused by environmental pollutants that are emitted by business.

### (2) Notes on announcing "economic evaluation of environmental conservation effects"

"Economic evaluation of environmental conservation effects" may be used for decision-making within companies, however, there are ambitious attempts to announce the results of "economic evaluation of environmental conservation effects." Progress of announcement is significant in terms of development of research. In this case, the following points should be noted.

- Clarify the technique and preconditions
    - As described in Item (1), there is no common standardized technique for "economic evaluation of environmental conservation effects" at this stage.  
The following are some examples of techniques.
      - i) Evaluate in a monetary value the damage that was avoided by the environmental conservation measures.  
<Example> Monetary value of the agricultural products that are damaged by air pollution
      - ii) Evaluate using the amount of money that is intended to be paid by the people (WTP\*) for environmental conservation or the result of the investigation carried out on the monetary value (WTA\*) that is to be accepted as the compensation of environmental influence. (Example: CVM\*)
    - \*WTP: Willingness to Pay  
WTA: Willingness to Accept  
CVM: Contingent Valuation Method
  - There are substantial differences in actual evaluation results according to the technique and preconditions applied. For instance, when the result is evaluated based on the monetary value of the damage, the evaluation result varies greatly depending on how many damage types are covered.
  - Therefore, the practical technique and preconditions must be described in announcement of environmental accounting information that was obtained through economic evaluation of environmental conservation effects.
  - Users of environmental accounting information should note that simple comparison of these results is meaningless when multiple economic evaluation results are assessed under different techniques or preconditions.
- Clearly indicate the source
  - When using results of the past research, clearly indicate the source (announcer, year of announcement, and the title)
- Supplement information in description as required
  - In particular, in comparison between "Economic evaluation of environmental conservation effects" and "Environmental conservation cost", it is important to provide supplementary descriptive information on the background and intention of input of the "Environmental conservation cost."
  - At the same time, users of environmental accounting information should judge the adequacy of environmental conservation measures by the company, including the descriptive information as well as the monetary value of evaluation results.

### **(3) Future issues**

In the future environmental accounting, it is necessary to proceed with research in techniques in various social sectors including administration for "Economic evaluation of environmental conservation effects" to be useful information in terms of the internal/external function.

Organization of usable data in "Economic evaluation of environmental conservation effects" as a result of the research is significant. For instance, the coefficient that can be used for conversion to a monetary value (monetary value produced by converting environmental conservation effects by the amount of reduction of environmental impact) should be organized through examination of the assessment technique, precondition (example: region in which the coefficient was assessed), and adequacy of the assessment result.

As the precondition of "Economic evaluation of environmental conservation effects", it is important to establish the technique for measuring the environmental conservation effects themselves. The techniques are being summarized by the Ministry of the Environment as "Environment Performance Indicators for Business (2000 version) (February, 2001)." This matter is being examined continuously.

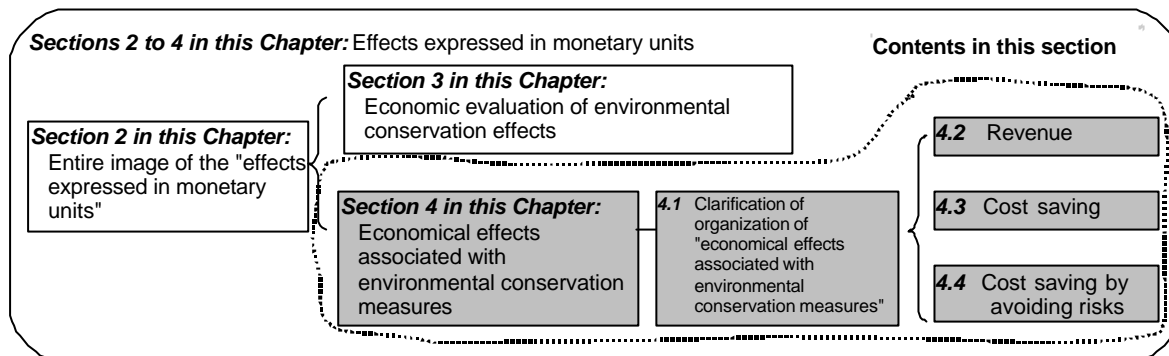
## 4. Economical Effects Associated with Environmental Conservation Measures

### Introduction

Of the two types of effects that are expressed in monetary units, "Economic evaluation of environmental conservation effects" and "Economical effects associated with environmental conservation measures," this section focuses on the latter.

As described in Section 2, measuring of "Economical effects associated with environmental conservation measures" is important for companies to combine management with consideration to the environment and improvement of profitability.

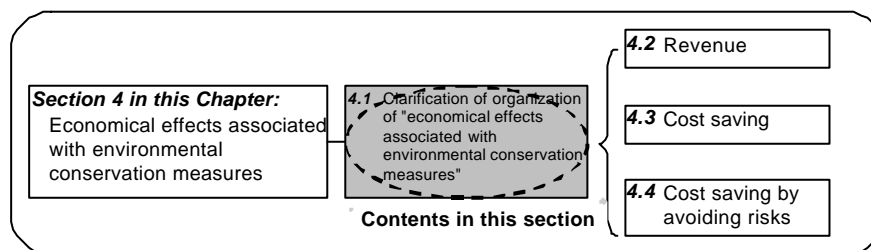
This chapter clarifies the organization of "Economical effects associated with environmental conservation measures" and summarizes the contents into three categories; "revenue", "cost saving", and "cost saving by avoiding risks."



### 4.1 Clarification of Organization of "Economical Effects Associated with Environmental Conservation Measures"

#### Introduction

"Economical effects associated with environmental conservation measures" are discussed in the "Environmental Accounting Guideline (2000 Version)." This section further examines the contents and clarifies the organization.



#### (1) "Economical effects associated with environmental conservation measures" in the "Environmental Accounting Guideline (2000 Version)"

The "Environmental Accounting Guideline (2000 Version)" indicates the following effects as "economical effects associated with environmental conservation measures."

- Economical effects that are calculated based on credible basis
  - <Example> Saving the cost for raw materials and energy
  - Saving the waste disposal cost
  - Revenue by sale of valuable materials by recycling
- Economical effects based on hypothetical calculation
  - Accidental economical effects (economical effects by avoiding risks)
    - <Example> Saving the cost for environment restoration
    - Avoidance of operation loss

## Avoidance of reparations/compensation to residents

### - Profit contributed assumed effects

As shown above, the "Environmental Accounting Guideline (2000 Version)" classifies "Economical effects associated with environmental conservation measures" according to the degree of credibility of the basis and the contents. Initially, the guideline classifies the effects into "Economical effects calculated based on credible basis" and "Economical effects based on hypothetical calculation" by focusing on the degree of credibility of the basis. The latter effects are classified into "Accidental economical effects (economical effects by avoiding risks)" and "Profit contributed assumed effects" focusing on the contents.

Is the following case applicable to "Economical effects associated with environmental conservation measures" in the "Environmental Accounting Guideline (2000 Version)"?

Assume that the insurance premium corresponding to environmental damage could be saved by pollution prevention activities. The insurance premium against environmental damage is equivalent to the "Economical effects by avoiding risks" in terms of the contents. However, it may be equivalent to the "Economical effects calculated based on credible basis" when the degree of credibility of the basis is focused since the economical effects was actually generated by the saving of the insurance premium against environmental damage.

To understand accurately the characteristics of "Economical effects associated with environmental conservation measures", the organization must be clarified further including the points that are indicated above.

## (2) Organization and classification in this Chapter

Based on the contents discussed in (1), this Chapter organizes "Economical effects associated with environmental conservation measures" based on the following two categories.

- Revenue/cost saving
- Degree of credibility

By focusing on the contents, the "Economical effects associated with environmental conservation measures" are classified into the following three types.

- Real effects
- Profit contributed assumed effects
- Estimated effects by avoiding risks

Mapping 2 illustrates the standard of organization and the classification that were indicated above.

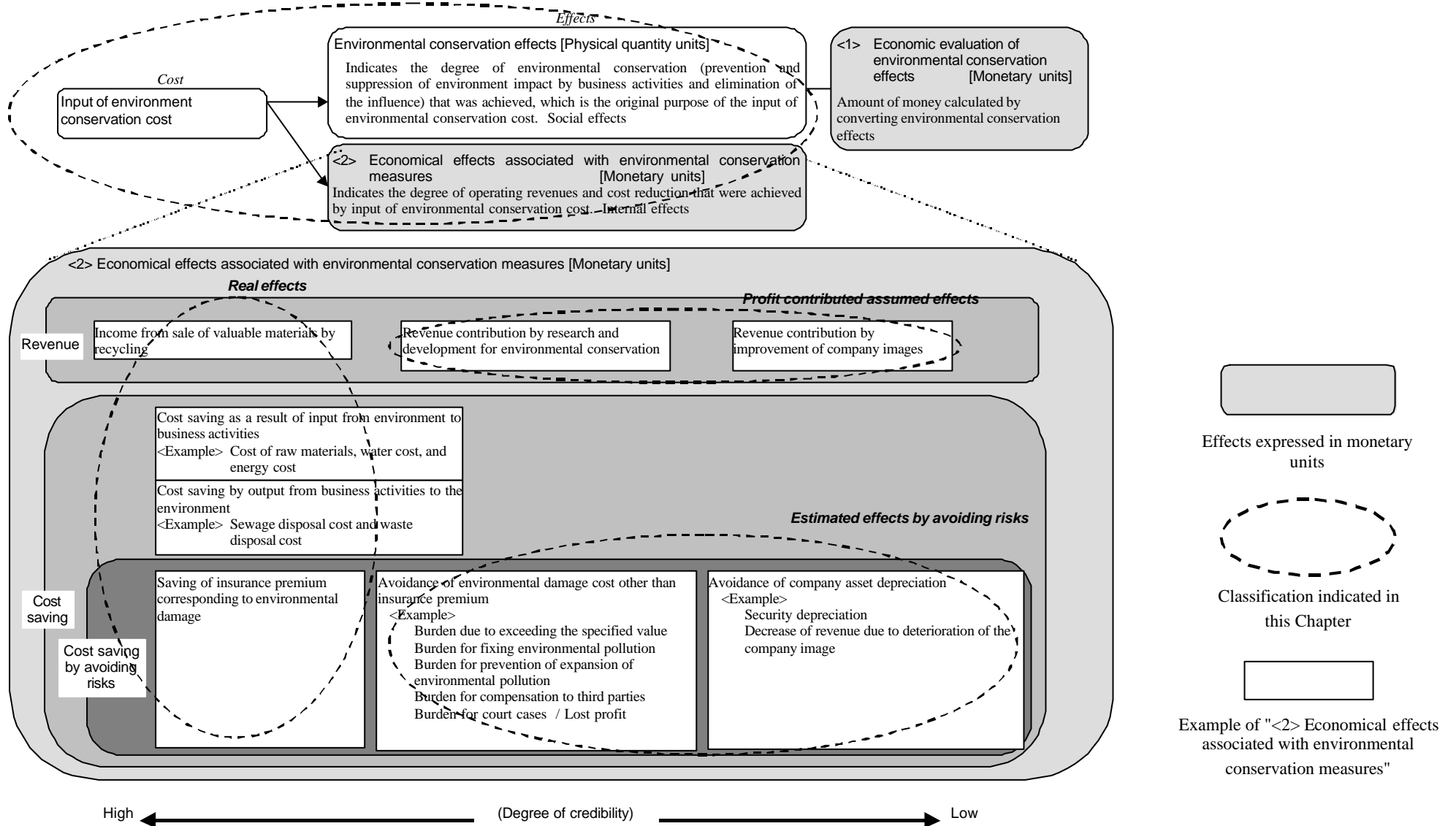
Mapping 2 summarizes "Economical effects associated with environmental conservation measures" using the "revenue/cost saving" as the row and the "degree of credibility" as the column. Three categories, "real effects", "Profit contributed assumed effects", and "Estimated effects by avoiding risks", are indicated by (dotted line ellipse).

The Reference Drawing shows classification in the "Environmental Accounting Guideline (2000 Version)."

Details of the organization and classification described above are provided below.

**Mapping 2** Organization and classification of "Economical effects associated with environmental conservation measures"

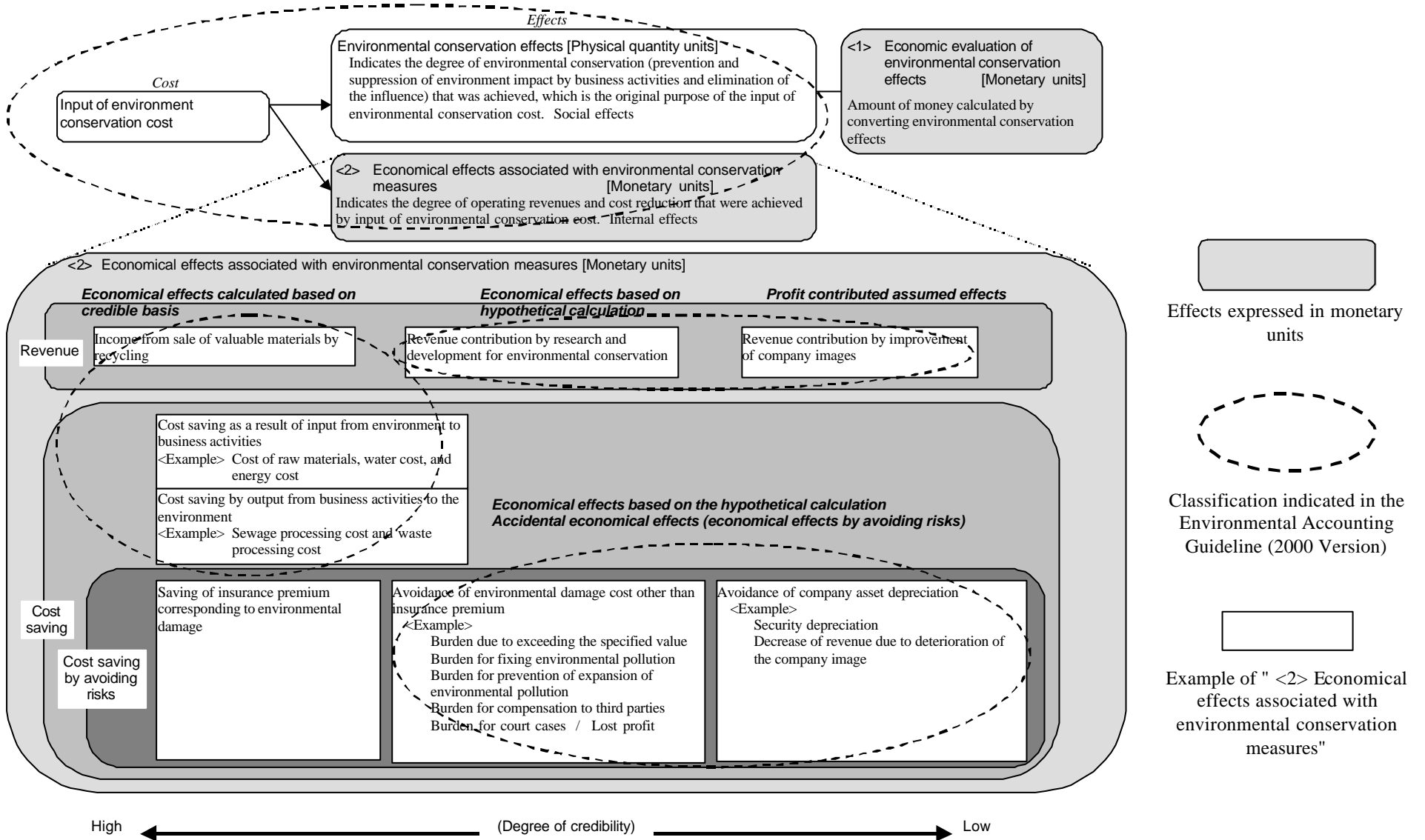
**"Environmental Accounting Guideline (2000 Version)"**



**Reference Drawing**

Classification of "Economical effects associated with environmental conservation measures" in the "Environmental Accounting Guideline (2000 Version)"

**"Environmental Accounting Guideline (2000 Version)"**





## a. Axes of organization

As described in the previous section, this Chapter organizes "Economical effects associated with environmental conservation measures" with the following two categories.

- (a) Revenue/cost saving
- (b) Degree of credibility


### (a) Revenue/cost saving

This Chapter organizes "Economical effects associated with environmental conservation measures" based on the factors, "revenue" and "cost saving", and then further organizes the "cost saving" based on whether the effect is applicable to "cost saving by avoiding risks" (see [Mapping 2](#)). Here, avoiding risks refers to avoidance of any economical burdens for companies due to environmental pollution inflicted by the companies.

The "cost saving by avoiding risks" was focused because avoidance of economical burdens caused by environmental pollution that is inflicted by companies is becoming extremely important in management of enhancement of the global environmental regulations. For instance, under the so-called Super Fund Law in the USA, it is known that the company's burden of pollution purification cost may become exorbitant. It is important to measure the monetary amount of the economical burden that is avoided by pollution prevention activities by companies.

### (b) Degree of credibility

This Chapter organizes "Economical effects associated with environmental conservation measures" according to the degree of credibility.

The degree of credibility may not be indicated quantitatively. In [Mapping 2](#), items of "Economical effects associated with environmental conservation measures" (indicated by  in the Mapping) are arranged from the highest degree to the lowest degree from the left to the right. However, the position of each item is relative.

As shown in [Mapping 2](#), "Economical effects associated with environmental conservation measures" vary, from the one with high degree of credibility to the one with low degree of credibility. Some examples are as follows.

- The item that can be assessed as a single item such as "income from sale of valuable materials by recycling" is assumed to have a high degree of credibility.
- For "cost saving as a result of input from the environment to business activities" and "cost saving as a result of output from business activities to the environment", the amount of cost saving is assessed by the difference with the previous year or the basic year. For instance, assume the degree of credibility is assessed by the difference with the basic year. If the business activities would have decreased during the same period, it could be assumed that the difference contains the mixture of the effects of the environmental conservation measures and the decrease of the business activities. Therefore, it is necessary to measure the section attributed to the "environmental conservation measures" from the difference. The degree of credibility will decrease although it varies according to the assessment method.
- Some standard is also necessary for "revenue contribution by research and development for environmental conservation" also for assumption and consequently, the degree of credibility will decrease. Furthermore, assumption of "revenue contribution by improvement of company images" will be fairly uncertain.

- Among the "cost saving by avoiding risks", the degrees of credibility of "avoidance of cost by environmental damage other than insurance premium", "avoidance of depreciation of company assets", and "avoidance of deterioration of company images" will be low although they depend on the assumption method. This is based on the following two reasons.
  - i) Estimation is necessary for the amount of economical burden that is avoided  
The amount of economical burden that is avoided includes the environmental damage cost other than the insurance premium, depreciation of company assets, and decrease of revenue due to deterioration of the company image.
  - ii) Involvement of contingent elements:  
"Whether a situation of causing economical burden for the company due to environmental pollution inflicted by the company" is a stochastic incident that is influenced by the pollution occurrence possibility, the future law enhancement and possibility of post facto application, and is related to contingent elements.

In environmental accounting, are the items that are included as "Economical effects associated with environmental conservation measures" to be limited to only those that retain a high degrees of credibility? Or, is it more preferable to include items with lower degree of credibility in "Economical effects associated with environmental conservation measures", emphasizing the coverage?

The method selected varies according to the status of the company or the purpose of the evaluation. This is because the features and merits are different between the case where only the items with high degree of credibility are selected, and the case where the items with low degree of credibility are also included. The actual details are described below.

- Case where items are restricted to only those with high degree of credibility  
The range of the items that are included as "Economical effects associated with economical conservation measures" becomes narrow. However, since the uncertainty of assessment result is low and more conservative assessment results are produced, conservative decision-making is enabled. As the additional advantage, data can be collected easily. In particular, for a company that has developed globally, data may not be collected easily in some regions. Therefore, this merit is considered to be substantial.
- Case where items that require estimation are included in the coverage  
Although the degree of credibility becomes low, economical merits of companies are widely assessed. Therefore, environmental conservation measures can be carried out easily and the results can be used as the driving force of the environmental conservation measures.  
To enhance the degree of credibility in the future, a wide range of discussions is necessary regarding the reasonable estimation method. Development of practical exercises by companies and accumulation of knowledge are expected.

## **b. Classification**

Based on the "revenue/cost saving" and "degree of credibility" that were described in "a. Categories of organization", this Chapter classified "Economical effects associated with environmental conservation measures" as follows, focusing on the contents further (see [Mapping 2](#)).

### (a) Real effects

Effects that can be calculated in terms of accounting among the effects contributed to profits by environmental conservation measures

### (b) Profit contributed assumed effects

Effects that are calculated by estimation among the effects contributed to profits by environmental conservation measures

### (c) Estimated effects by avoiding risks

Economical effects achieved by avoidance of economical burdens (example: cost by environmental damage that may have occurred by pollution prevention activities)

\*: "Estimation in (c) contains the following two meanings:

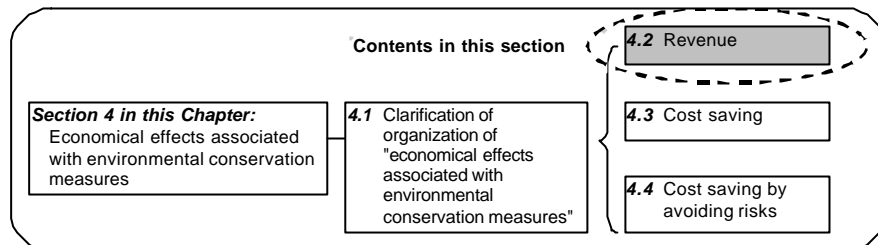
- Estimation of the amount of economical burden
- Estimation of probability of the occurrence of an incident that causes economical burden for the company due to environmental pollution inflicted by the company

## 4.2 Revenue

### Introduction

While Section 4.1 clarifies organization of "Economical effects associated with environmental conservation measures", Sections following Section 4.2 summarize the contents of "economical effects associated with environmental conservation measures" in the order of "revenue", "cost saving" (excluding cost saving by risk avoidance), and "cost saving by avoiding risks."

Section 4.2 of this Chapter describes "revenue."



Among the "economical effects associated with environmental conservation measures", revenue indicates a revenue contribution brought by input of environmental conservation cost as the result. That is, among the numeric values that are expressed as the accounting revenue, the section corresponding to the environmental conservation cost is to be measured.

The following items are referred to as revenues here.

- Income of sale of valuable materials by recycling
- Revenue contribution by research and development for environmental conservation
- Revenue contribution by improvement of company images

Revenues are found to be applicable to the following two categories among the "economical effects associated with environmental conservation measures" that were indicated in Section 4.1, as a result of summary of these revenues according to the degree of credibility (see [Mapping 2](#) in the previous section).

- a. Real effects
- b. Profit contributed assumed effects

#### a. Real effects

When a revenue contribution corresponding to environmental conservation cost can be credibly calculated in terms of accounting, the revenue is classified as a "Real effect."

For instance, when income is generated from sale of valuable materials by recycling, the income from the sale can be credibly calculated and can be classified as a "Real effect" since it is assumed to be a revenue contribution as the result of environmental conservation measures.

#### b. Profit contributed assumed effects

When estimation such as apportionment is necessary in assessment of revenue contribution corresponding to environmental conservation cost, the revenue is classified as a "Profit contributed assumed effect." The degree of credibility of the "Profit contributed assumed effect" is lower than that of the "real effect" that is described in a.

Practically, "revenue contribution by research and development for environmental conservation" and "revenue contribution by improvement of company images" are classified as "Profit contributed assumed effects." The "revenue contribution by improvement of company images" cannot be estimated easily and the degree of credibility becomes substantially low.

As the future objective for measuring "Profit contributed assumed effects", it is necessary to examine reasonable estimation methods for revenue contribution corresponding to environmental conservation cost.

**<Column> Effects achieved by research and development for environmental conservation**

What effects are available as the effects of research and development for environmental conservation?

In addition to revenue contributions in companies, economical merits for consumers or social effect may be generated.

For instance, consumers can save light and fuel expenses as a result of research and development in energy conservation when using the products so that the research and development also contribute to the society through alleviation of exhaustion of energy resources.

Measuring the effects and efficiency of research and development for environmental conservation is important in terms of both business management and environmental conservation. The methods of measuring and analyzing the effects need to be examined in the future.

**<Column> Difference between business revenue and revenue as a result of environmental conservation measures**

Is it appropriate to include revenues from environmental business (manufacturing of pollution prevention equipment, environment consultant, waste disposal and recycling business, etc.) as "Economical effects associated with environmental conservation measures"?

In this case, revenues from environmental business are considered to be the results of the cost required in the entire environmental business, rather than the result of environmental conservation measures (effects of input of environmental conservation cost). Therefore, the items to be included as "Economical effects associated with environmental conservation measures" should be revenue contributions as a result of environmental conservation measures in environmental business (effects corresponding to input of environmental conservation cost), not the revenues of such environmental business.

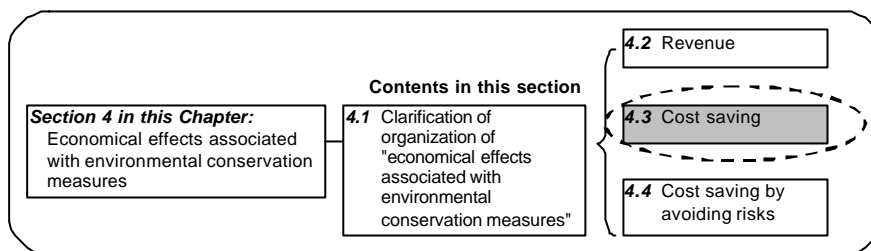
The measuring of revenues of environmental business itself is meaningful in terms of business management. In addition, revenues generated by environmental business are recognized and the environmental business becomes more active, and consequently, greater environmental conservation effects may be achieved.

Above all, it is necessary for creators and users of environmental accounting to recognize that revenues from environmental business are basically different from the effects corresponding to environmental conservation cost.

### 4.3 Cost Saving

#### Introduction

This section describes "cost saving" among "Economical effects associated with environmental conservation measures." Section 4.4 describes "cost saving by avoiding risks" of the "cost saving."



While the object of the previous Section is to measure the part that corresponds to the environmental conservation cost among the values that are indicated as accounting revenues as the "revenue", "cost saving" in this section indicates the saving effects contributed by input of environmental conservation cost. This section describes the attempt to measure how much of the "economical burden" that is assumed without input of environmental conservation cost could be avoided by inputting environmental conservation cost.

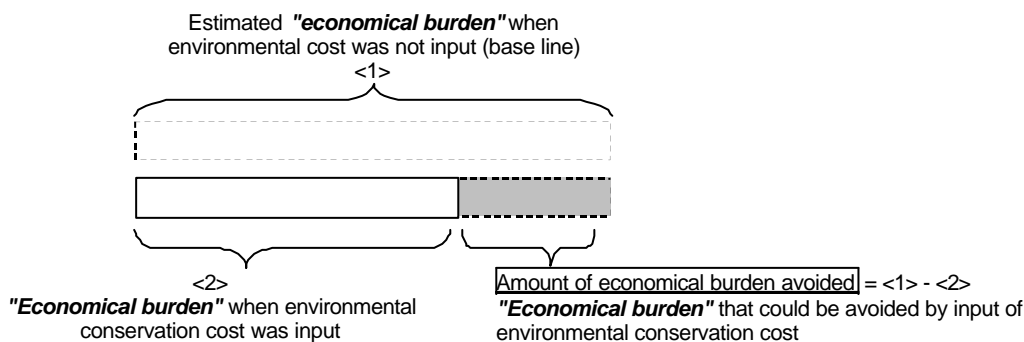
The following table shows examples of correspondence between input of environmental conservation cost and the "economical burden" that is avoided as a result.

Example of environmental conservation costs	Example of "economical burden" that is avoided	
	Cost associated with input from environment to business activities	Cost associated with output from business activities to environment
Resource circulation costs (introduction of chemical reutilization equipment, etc.)	Raw materials costs	
Resource circulation costs (introduction of water conservation equipment, etc.)	Water costs	
Global environment environmental conservation costs (introduction energy conservation equipment, etc.)	Energy costs	
Resource circulation costs (introduction of wash water recycling equipment)		Sewage disposal cost
Resource circulation costs (cost for waste recycling, etc.)		Waste disposal cost*

\* In the "Environment Accounting Guideline (2000 Version)", waste disposal cost is regarded as environmental conservation cost.

The avoided "economical burden" amount is not indicated as an accounting value. Therefore, it is necessary to set the "economical burden estimated when environmental conservation cost was not input" as the base line and assess the amount by comparison. The procedure is described below.

- 1) Set the "estimated economical burden when environmental conservation cost is not input" (base line) (<1> in the diagram below) using some method.
- 2) Assess the amount of the burden that could be avoided by subtracting "economical burden when the environmental conservation cost was input" (<2> in the diagram below) from <1>.



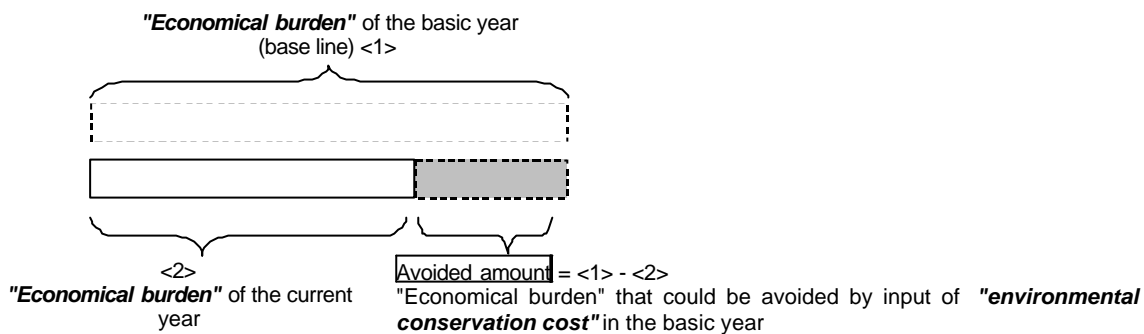
Where, "economical burden":  
 Cost associated with input from environment to business activities  
 <Example> Raw material cost, water cost, and energy cost  
 Cost associated with output from business activities to environment  
 <Example> Sewage disposal cost, waste disposal cost, etc.

Since the avoided amount varies according to the element that is set as the base line, the method to set a base line must be clearly indicated.

As one of the methods to set a base line, "economical burden of the basic year" can be used as the base line. In this case, the avoided amount can be assessed as follows.

- 1) Set the "economical burden of the basic year" (<1> in the diagram below) as the base line.
- 2) Assess the avoided amount by subtracting the "economical burden of the current year" (<2> in the diagram below).

When the year immediately before the facility investment for environmental conservation is selected as the basic year, the avoided amount that was assessed can be considered as the effect of burden reduction as a result of the facility investment. However, the result of simple subtraction of <2> from <1> includes the influence of operation fluctuation in addition to the effect of burden reduction. Therefore, a method of comparing with the value per unit requirement such as production unit or sales unit can be considered to exclude such influence.



\* Note that the value produced by <1> - <2> includes the influence of operation fluctuation, etc.

If the purpose of the environmental conservation measures of the current year is reduction of the environment impact from the previous year, the amount reduced can be assessed by comparison with the amount of the previous year.

That is, the result produced by subtracting the economical burden of the current year (<2>) from the economical burden of the previous year (<1>) is regarded as the reduction effect achieved as a result of the environmental conservation cost of the current year. However, in this case also, since the value produced by simple subtraction of <2> from <1> includes an operation fluctuation in addition to the reduction effect as a result of the facility investment in the same way as for comparison with the basic year, the comparison can be made using the unit requirement to exclude such influence.

In assessment of the avoided amount, it is necessary to keep in mind what is the corresponding to environmental conservation cost.

When the avoided amount is assessed through comparison with the basic year, an investment at one point of the past is assumed as the environmental conservation cost. That is, the effect of the investment made at one point in the past appears in the difference in the economical burdens between the basic year and the current year (amounts of burdens such as cost associated with input from the environment to business activities and cost associated with output from business activities to the environment).

Regarding comparison with the previous year, the effect of the environmental conservation cost appears in the difference of economical burdens between the previous year and the current year.

That is, the comparison method for evaluating the avoided amount by input of environmental conservation cost is determined by each company through selection of the range of environmental conservation cost.

**<Column> How to set a period for assessing environmental conservation cost and the effects in environmental accounting**

How can a period for assessing environmental conservation cost and the effects be set in environmental accounting?

One method is to display environmental conservation cost and the effects on an annual basis. The purposes for displaying the information on an annual basis are to provide explanation to top management and disclose the information externally in periodic form.

Another method is to compare environment conservation cost and the effects in a related period of a project. (Example: Segment environmental accounting implemented by Ricoh Co., Ltd.)

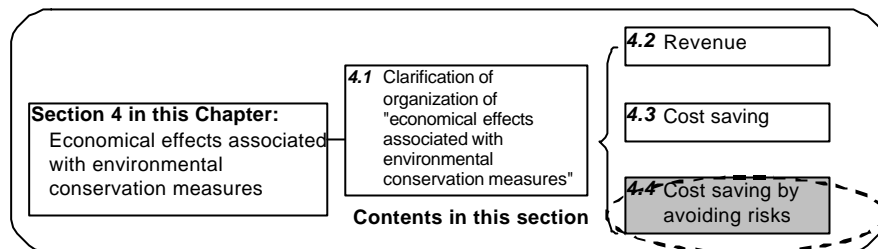
The purposes for displaying the information on a project basis are to verify the effects of the past investments and use the information as the basic information for decision-making of the future investments (whether investments are to be made or not or selection from plans for investments).



## 4.4 Cost Saving by Avoiding Risks

### Introduction

This section describes "cost saving by avoiding risks" among the "economical effects associated with environmental conservation measures."



As described before, "cost saving by avoiding risks" indicates "cost saving by avoiding a possible economical burden for the company due to the environmental pollution inflicted by the company."

With the increasing awareness towards environmental conservation, environmental law and regulations are becoming stricter globally. In addition, the concept of extended producer responsibility (manufacturers should be responsible for the environmental influence imposed from production to disposal of products) is advocated and some of the global environmental laws and regulations have started to introduce this concept. That is, the range of responsibility for environmental pollution prevention by companies is expanding.

Under such a background, when a company generates environmental pollution under its responsibility, the company may have to bear a vast amount of environmental damage cost to handle the pollution (fine/charges, cost for restoration from environmental pollution, and cost for court cases). In particular, when the company was implementing business activities without noticing the emission of pollutants exceeding the law and regulation, a considerable amount of environmental pollution must have been accumulated in the soil or underground water (so called stock pollution) by the time that the pollution is discovered, causing a vast amount of economical burden such as environmental damage cost.

Implementation of pollution prevention activities by a company leads to avoidance of such economical burden as described above, in addition to the effect of prevention of environmental pollution and the measuring of the avoided amount is important in terms of management. As the result of pollution prevention activities, an emission reduction amount of the substance causing the pollution can be expressed as an environmental performance indicator and the economical burden that could be avoided can be measured in terms of environmental accounting. These information items are useful for implementation of effective and efficient pollution prevention measures.

The contents are summarized below under the following headings to assist companies to recognize the risks of such economical burdens and measure "cost saving by avoiding risks."

- (1) Organization of "cost saving by avoiding risks"
- (2) Example of assessment in environmental accounting
- (3) Future objectives

### (1) Organization of "cost saving by avoiding risks"

This section organizes "cost saving by avoiding risks" from the following angles.

- a. Types of environmental pollutions as the causes
- b. Types of pollution prevention activities as avoiding risks methods
- c. Types of economical burdens that can be reduced or avoided

### a. Types of environmental pollutions as the causes

This section summarizes environmental pollutions as described below based on the following four viewpoints to assist for recognition of environmental pollutions as the causes of risks: <1> Environmental media that are polluted, <2> Where damages occur, <3> Condition of the cause, and <4> Pollution coverage.

- <1> Environmental media that are polluted: Air, oceans, soil, ground water, etc.
- <2> Where damages occur: People, ecosystem, etc.
- <3> Condition of the cause
  - Emitted by an accident
  - Emitted during normal operation
    - Although the emission exceeded the specified value, the incident was unnoticed.
    - Although the emission was within the specified value, it damaged third parties.
    - Although the emission satisfied the specified value, the law was tightened and the law was applied retroactively.
- <4> Pollution coverage
  - Within the business area
    - <Example> Soil pollution limited to the area of business premises
  - Outside of the business area
    - <Example> Soil and underground pollution covering outside of business premises
    - Pollution of rivers and waters by waste water
    - Air pollution by exhaust gases

### b. Types of pollution prevention activities as risk avoidance methods

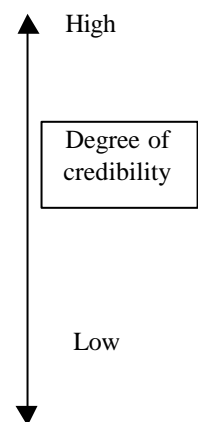
This section shows examples of the types of pollution prevention activities as risk avoidance measures. The cost required for these pollution prevention activities applies to environmental conservation cost.

- Avoidance or reduction of substances causing pollution
  - <Example> Use of alternative raw materials, effective use of resources, process modification, etc.
- Avoidance or reduction of emission of substances causing pollution
  - <Example> Facility improvement (recovery facility, emission prevention facility, etc.), monitoring, recycling, control system (improvement of manuals and education/training), etc.

### c. Types of economical burdens that can be reduced or avoided

The following types of economical burdens can be reduced or avoided as a result of input of environmental conservation cost for implementation of pollution prevention activities as described in the above b. section.

- Insurance premium for environmental damage
- Cost for environmental damage other than insurance premium
  - <Example> Burden due to exceeding the specified value (fines/charges, etc.)
  - Burden for restoring environmental pollution (pollution purification expenses, etc.)
  - Burden for prevention of environmental pollution expansion (facility replacement cost, etc.)
  - Burden for Compensation to third parties (damage compensation, resident compensation, etc.)
  - Burden for court cases (legal expenses, conciliation money, etc.)
  - Lost profit (reduction of sales due to operation halt)
- Depreciation of company assets
- Reduction of revenue due to deterioration of the company image



These saving and avoidance of economical burdens are applicable to the following two categories among the "Economical effects associated with environmental conservation measures" that were described in Section 4.1 as a result of classification based on the degree of credibility (see Mapping 2 that was shown before).

- (a) Real effects
- (b) Estimated effects by avoiding risks

(a) Real effects

For a "insurance premium against environmental damage", since the amount saved can be measured from the difference with the insurance premium of the previous year, the degree of credibility is high and the effect is applicable to the "real effects".

(b) Estimated effects by avoiding risks

The degree of credibility is low for "environmental damage cost other than insurance premium", "depreciation of company assets", and "reduction of sales due to deterioration of the company image" in comparison to the "real effects." There are two reasons as described in Section 4.1 also.

a. Estimation of the amount of economical burden that is avoided is necessary.

The amount of economical burden that is avoided refers to the amount of "environmental damage cost other than insurance premium", "depreciation of company assets", or "reduction of revenue due to deterioration of the company image." Estimation of latter ones is harder, consequently, the degree of credibility is lower.

b. Involvement of accidental elements

"Whether a condition for generating economical burden for the company due to environmental pollution inflicted by the company" is a stochastic event and accidental elements are involved.

The "concept of evaluating verified effects" and the "concept where expected effects are evaluated" are available for handling accidental elements that are described in b. as a result of summary based on the examples that are currently announced. Caution is necessary since the evaluation contents of these two concepts are different.

- Concept of evaluating verified effects

- In this concept, the amount of economical burden that could be avoided (pollution purification expenses, etc.) is evaluated when avoidance of the risk was verified by the pollution prevention activities that were implemented in the past.

<Example> IBM Japan transferred a tank from underground to the surface and installed a dike to prevent soil contamination by leakage of a chemical substance from the underground tank. When leakage from the tank on the surface is prevented by the dike, the environmental damage cost that was avoided (pollution purification expenses, legal expenses, operation loss, etc.) is evaluated, based on the judgment that soil contamination by the leakage from the underground tank was prevented.

- Since the effects are evaluated after verification of risk avoidance, the "accidental elements" that were described in item b. above can be excluded. Therefore, the effects are close to the "real effects" among the "estimated effects by avoiding risks" except the "necessity for estimation of the amount of economical burden (pollution purification cost, etc.)" which was described in item a. .
- Such evaluation results can be used for post-evaluation of pollution prevention activities.

- Concept where expected effects are evaluated

- In this concept, the amount of economical burden (pollution purification expenses, etc.) that is expected "to be avoided in the future by pollution prevention activities that are currently implemented" is evaluated.

- In comparison to the "verified effects" that were described before, the degree of credibility is low since the risk avoidance has not been confirmed.
  - As described above, since accidental elements are involved, the estimated value for the amount of the economical burden (pollution purification expense, etc.) is multiplied by the probability for evaluation. However, when estimation of the probability is difficult, some alternative method may be used.
  - The evaluation result can be used as an index of prior evaluation of pollution prevention activities or an index of the degree of achieving the environment improvement target in an environment management system.
- As a concept of pollution prevention activities, when a pollution is detected, other similar facilities may also be improved without waiting for occurrence of pollution as well as the facility that caused the pollution (corresponding activities of pollution prevention). Evaluation of the avoided amount for the economical burden in corresponding activities (pollution purification expense, etc.) as this case can also be assumed as "a cost saving by avoiding risks". This belongs to the category of "expected effects."

In the same way as for Section 4.3, "Cost Saving," it is necessary to keep in mind the correspondence between "environmental conservation cost" and the "amount of economical burden". This is the principle of period matching cost and effect.

The "concept of evaluating verified effects" that was discussed above suggests the substitution of the effect corresponding to the cost of the current period with the occurrence of the fact of actual avoidance of pollution. Strictly speaking, the cost release that attributed to avoidance of the pollution may have occurred before the current period, however, if the amount of the cost release and the amount of the effect are similar in every period, it is possible to assume that the period matching cost and effect is maintained.

The "concept of evaluating expected effects" is the method that estimates and includes the expense (pollution purification expense, etc.) that is expected to be avoided as the effect corresponding to the expense of the current period. In this concept, the effect for the cost that is released is logically estimated and the period matching cost and effect is more accurate, however, a higher proportion of estimation element is involved in the effect estimation method.

The relationship between "environmental conservation cost" and the "effect" needs to be examined in the future including the handling of depreciation costs.

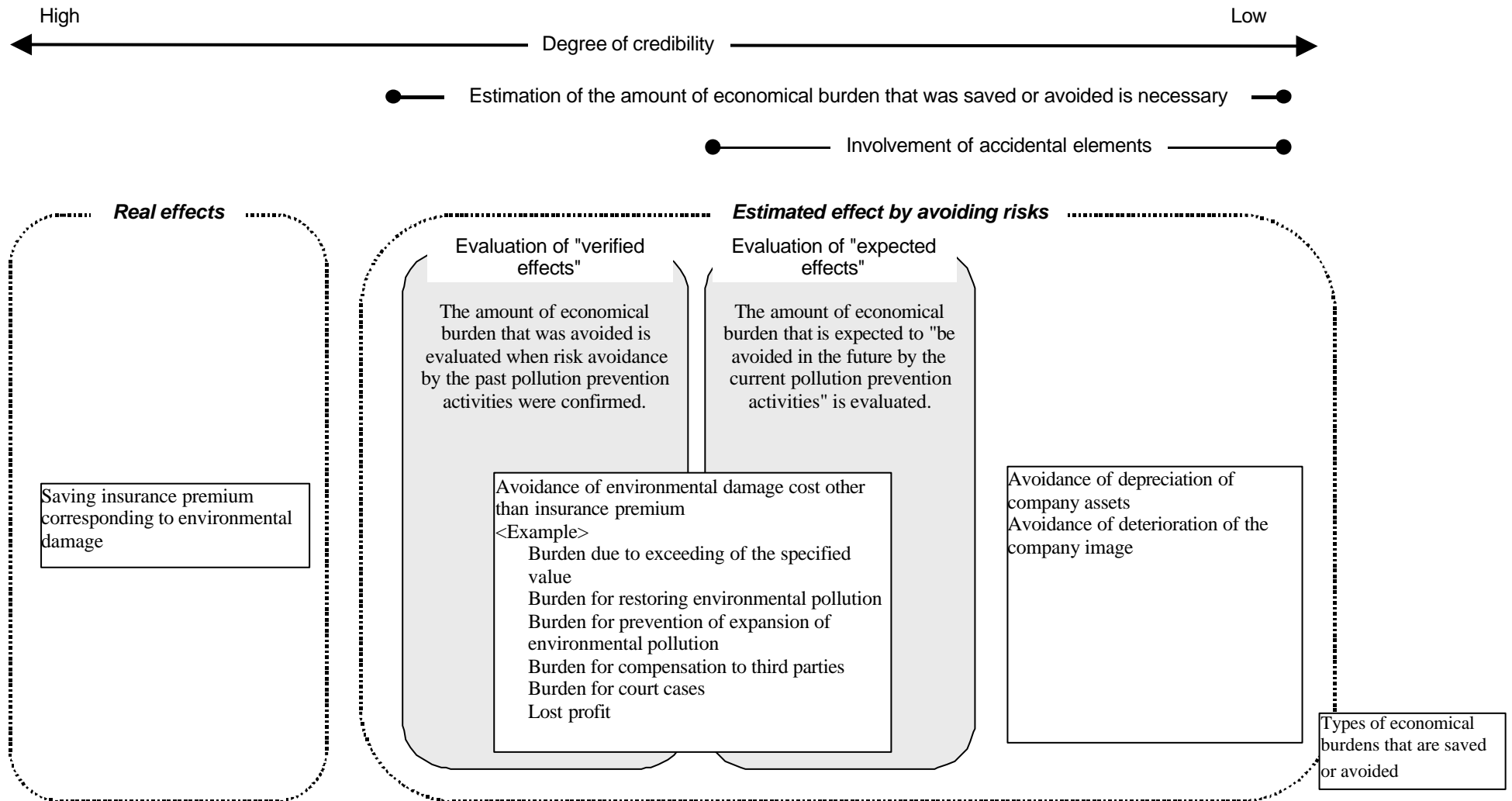
Item c., "Types of economical burdens that are saved or avoided" discussed that "insurance premium against environmental damage", "environmental damage cost other than insurance premium", "depreciation of company assets", and "revenue reduction due to deterioration of the company image" are classified into "(a) real effects" and "(b) estimated effects by risk avoidance" according to the degree of credibility.

Two reasons were indicated for a low degree of credibility of "(b) estimated effects by avoiding risks", "a. Estimation of the amount of economical burden is necessary" and "b. Involvement of accidental elements". Furthermore, as the handling of accidental elements, two concepts were summarized based on the examples that are currently announced, "concept of evaluating verified effects" and "concept of evaluating expected effects."

Mapping 3 illustrates the summary.

**Mapping 3** Cost saving by avoiding risks

"Types of economical burdens that are saved or avoided" and "real effects" and "estimated effects by avoiding risks"



## (2) Examples of assessment in environmental accounting

As examples of assessment of "cost saving by avoiding risks" in domestic environmental accounting, there are cases in IBM Japan, Fujitsu, and Ricoh.

The features of these companies are summarized below.

### a. IBM Japan

- The evaluated items include saving of the insurance premium by avoidance of soil contamination, avoidance of the outflow improvement expense (pollution purification expense), and avoidance of the law and regulation compliance expenses (legal expenses, operation loss, etc.)
- The saving of insurance premium, avoidance of the outflow improvement expense, and avoidance of the law and regulation compliance expense are the effects that can be included due to the presence of the Super Fund Law in the USA.
- IBM has factories worldwide and by setting IBM specific rules, environmental measures are implemented under the globally standardized form. Risk avoidance assessment is also globally standardized.
- As the evaluation method, the following amounts that could have incurred is evaluated assuming that those expenses could be avoided at the time of accident (chemicals leaked from the tank on the surface was prevented by the dike) by the past pollution prevention activities (transfer of a tank to the surface and installation of a dike): pollution purification expense by soil contamination (assuming the Super Fund Law), legal expenses, and operation loss.  
The past internal record and analysis of EPA in USA were used for calculation of the value as the reference data.  
An accident occurrence probability is not considered.
- Through such assessment of risk avoidance effects as this, effects of the past pollution prevention activities are verified.  
Both the investment amount and effect are included on an accrual basis.

### b. Fujitsu

- For avoidance of pollution emission exceeding the amount specified in the law and regulations, the following items are evaluated: amount of operation loss that is avoided associated with air pollution and water pollution, the penalty of the Environment Act, and penalty that is calculated from the improvements indicated by the internal environmental auditing and external environmental auditing relating to nonconformance to the law and regulations.  
Initially, for the amount of operation loss that is avoided regarding air pollution and water pollution, the number of operation days that are lost is set according to the amount of the facility investment and the added value per day of the factory is multiplied by the number of days lost. The number of days lost is calculated based on the recovery of Akashi Factory that was damaged by the Hanshin Awaji Earthquake as the example.  
Initially the amounts of agricultural and fishery damages were evaluated from court cases, but they are no longer evaluated from fiscal 2000 since there are no such direct influences around the factory.  
An accident occurrence probability is not taken into account since the assessment is difficult.  
The effect amount in improvements indicated by internal and external auditing is calculated by multiplying the number of improvements by the simple average value of the penalty of the 9 typical Environment Acts.
- For the effect of soil and ground pollution measures, the resident compensation amount required when the ground water pollution covered the neighboring areas is calculated (assumed) using the judgments of past pollution court cases as the references and the effect is evaluated assuming that the payment of the amount was avoided.
- These effect amounts are not used for decision-making of environmental investments (whether investments are to be made).
- For prevention of risk occurrence, efficient risk management is implemented by setting out the environmental pollution risk management regulation and the soil and ground water evaluation standards to be applied at site purchase or building demolition.

### c. Ricoh

- The following amounts that were avoided as a result of air pollution, water contamination, and soil

contamination measures are evaluated: pollution purification expense, court case expense, and operation loss.

- As the evaluation method, the amounts of the pollution purification expense, court case expense, and operation loss that could be avoided corresponding to the annual pollution prevention activities (environmental investment) are calculated, considering the pollution occurrence coefficient (coefficient that reflects likeliness of occurrence, rather than the occurrence probability itself) and the coverage (inside or outside of the premises, etc.)

Of the expenses that are used as the standard amount (MAX), the pollution purification expense is calculated from the past result, the court case expense is estimated from the result of other civil actions, which are not related to environmental problems, and the amount of operation loss that is avoided is calculated for each office using three days of operation stop period as the maximum.

- The evaluation result is used for evaluating the degree of target achievement of environmental improvements in each office as a part of pollution prevention of the environmental management system. At this point, the result is not used for decision-making for environmental investment (whether investment is to be made).
- Implementation of efficient risk management that leads to prevention of risks in each office is examined for the future.

The following table shows the summary of the features of the three companies that were described in a. to c. based on the "organization of cost saving by avoiding risks" discussed in (1).

Examples of assessment of "cost saving by avoiding risks" in environmental accounting

Standard of organization		IBM Japan	Fujitsu	Ricoh	
a. Types of environmental pollution* that becomes the cause * Environmental pollution that is targeted in assessment of "cost saving by avoiding risks" of each company	Environmental medium that is polluted	Air			
		Waters			
		Soil and ground water			
		Others			
	Condition of the cause	Emitted as a result of accident			
		Emitted by normal operation			
Coverage of pollution	Within business area				
	Outside of business area				
b. Types of pollution prevention activities(*) as the risk avoidance measures * Indicates pollution prevention activities that are considered as risk avoidance measures in assessment of "cost saving by avoiding risks" of each company	Reduction/avoidance of pollutant (cause)				
	Reduction/avoidance of emission of pollutant				
c. Types of the cost saved	Real effects	Insurance premium against environmental damage (Soil)			
	Estimated effect by avoiding risks	Burden due to exceeding the specified value (Example: fines, charges)		(Air/water)	
		Burden for restoring environmental pollution (Example: Pollution purification expense)	(Soil)		(Soil)
		Burden for prevention of expansion of environmental pollution (Example: Facility replacement cost)	(Soil)		
		Burden for compensation to third parties (Example: Damage compensation, resident compensation)		(Soil/ground water)	
		Burden for court cases (Example: Legal expense, conciliation money)	(Soil)		
		Lost profit (Example: Reduction of sales due to operation halt)	(Soil)	(Air/water)	
		Depreciation of company assets			
		Reduction of revenue due to deterioration of the company image			
When "estimated effects by avoiding risks" is assessed in c.: Handling of accidental elements	Evaluation of "verified effects" (The amount of economical burden that was avoided is evaluated when risk avoidance by the past pollution prevention activities was confirmed)				
	Evaluation of "expected effects" (The amount of economical burden that is expected "to be avoided in the future by the current pollution prevention activities" is evaluated.)		(The occurrence probability is not taken into account.)	(The likelihood of occurrence is taken into account, rather than the occurrence probability itself.)	



### **(3) Future objectives**

The following future objective are considered for measuring "cost saving by avoiding risks."

- "Environmental damage cost other than insurance premium" was indicated as an example of economical burden that can be actually saved or avoided as "cost saving by avoiding risks" in c. of (1).

<Example>

- Burden due to exceeding of the specified value (Fines and charges)
- Burden for restoring environmental pollution (Pollution purification expense)
- Burden for prevention of expansion of environmental pollution (Facility replacement cost)
- Burden for compensation to third parties  
(Example: Damage compensation, resident compensation)
- Burden for court cases (Legal expense, conciliation money)
- Lost profit (Reduction of sales due to operation halt)

Amounts of these burdens vary according to the volume of the pollutant that was emitted, the degree of environmental pollution, and the degree of exposure of pollution to humans and ecosystem. The future objectives are to make actual achievement values of these amounts as the burdens available widely through databases, etc. and establish reasonable estimation methods.

- Item c. in (1) indicated that there is a method for evaluating "expected effects" considering the environmental pollution occurrence probability. It is necessary to establish such an occurrence probability estimation method is necessary.

### **5. Objectives Relating to Measuring of "Effects Expressed in Monetary Units" (Road Map)**

In the previous sections, "effects" in environmental accounting were summarized focusing on the "effects expressed in monetary units". As the "effects expressed in monetary units," "economic evaluation of environmental conservation effects" and "economical effects associated with environmental conservation measures" were indicated and organized focusing on the latter. Various objectives have been clarified during the process.

Although not discussed in this text, examination of comparison possibility and the analysis method for the information regarding effects will be included as the objectives. To utilize the information on "effects expressed in monetary units" for communication between the society and companies, examination of easy-to-understand expression methods such as supplementation of descriptive information may be necessary.

The following page shows objectives in each field in organization of "effects expressed in monetary units" as **Road Map**. Further discussion, research, and implementation of these objectives are expected for further development of environmental accounting.

# Road Map Objectives Relating to the Measuring of "Effects Expressed in Monetary Units"

