Chapter 3
Report from the Food Working Group

Task of Segment Environmental Accounting Focusing on the Material Flow

Contents

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1. Issues to Be Examined by the Food Working Group

(1) Purpose of establishing the Food Working Group

As a basic guideline for environmental accounting, the "Environmental Accounting Guideline (2000 version)" issued by the Ministry of the Environment indicates the basic attitude of giving flexible consideration to the operation of various business types and emphasizes the standardization of principles to be commonly utilized.

Since the release of the "Environmental Accounting Guideline (2000 version)", many companies have stared to introduce environmental accounting, while in the food industry, only specific categories of businesses and large companies are executing it.

The Food Working Group, established inside of the "Study Group on Practical Matters for Introducing Environmental Accounting", aims at the following objectives, based on the basic attitude of the Guideline (2000 version).

<1> Spread further environmental accounting technique in the food industry.

<2> Intensify the discussion about environmental accounting and examine new styles of use, applicable for other industries.

The food industry includes various business categories such as food manufacturing industry, food distribution industry, and food service industry. Since most of the members of the Study Group come from the food manufacturing industry, the discussions by the Study Group focus on the food manufacturing industry.

(2) Selecting environmental characteristics and discussion theme of the food manufacturing industry

The "Environmental Accounting Guideline (2000 version)" defines environmental accounting as a mechanism that enable enterprises to measure, analyze and announce the cost for environmental conservation in business activities and the effects quantitatively (monetary units or physical quantity units) as much as possible – effects that were achieved by the activities – for promoting the tackling of environmental conservation efficiently and effectively while maintaining the friendly relationship with the society in order for sustainable development.

Furthermore, the Guideline (2000 version) indicates the flow of the identification, analysis, and announcement of environmental accounting information handled in the entire company: as well as the idea, "Partial introduction (in the unit of site, business department, managerial item, etc.), which gradually widens the range of item, summary and release, is also effective if the objective for the utilization is clear."

Referring to the concept of the Guideline (2000 version), the Food Working Group discussed the Group's purpose of the examination of the food manufacturing industry that is the most progressive in terms of installing environmental accounting and has carried out the following examination based on the environmental characteristics of the food manufacturing industry.

Figure 1 shows a model of the material flow of the food manufacturing industry by dividing the flow into a business area and its upstream and downstream components. In the introduction of environmental accounting, initially the business range of the company is to be defined, and in the range, the environmental conservation costs and effects associated with the business activities should be measured. The range will be set by placing the business area in the center of the whole area. It is necessary to consider whether there are any business activities, which would cause environment impacts from the upper stream (companies that has a raw material manufacturing departments) and from the lower stream (handling waste and reused products after use).

In terms of the material flow, energy and water consumption, exhaust and processing of byproducts, container packaging and other waste are assumed to be the main cause of environmental problems in the processes of food manufacturing.

In the food manufacturing industry, because of its characteristics of producing food, safety and sanitation in the manufacturing processes and products as well as the food safety for consumers are emphasized.

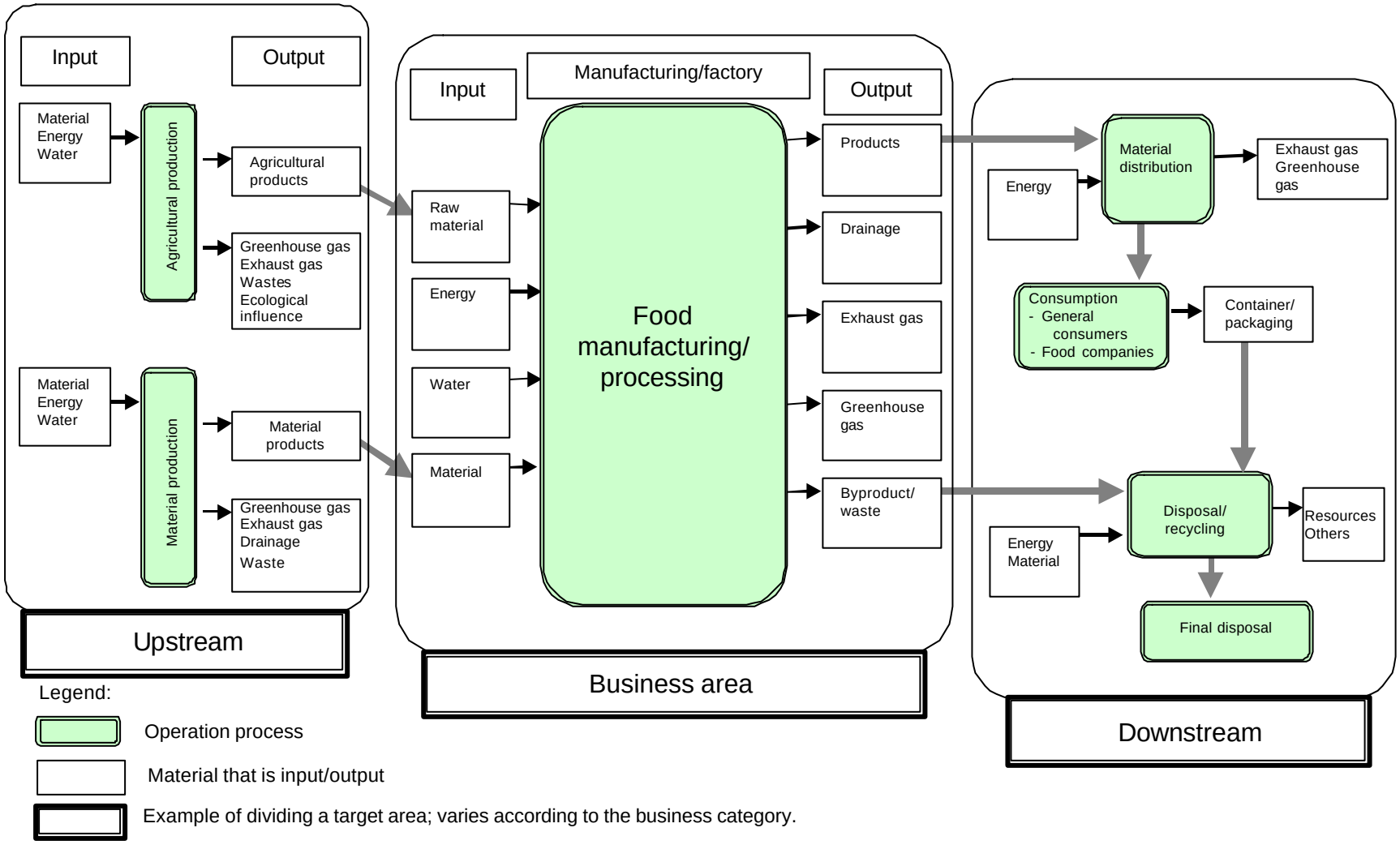
The food manufacturing industry is considered to have comparatively low environmental impact due to the reduced usage rate of chemicals and low amount of carbon dioxide emission compared to other manufacturing industries. At the same time, at the stage of preservation and packaging, the view points of being safe, sanitary, and convenient for users are important, as well as environmental conservation.

Since foods are familiar day-to-day items, consumers are quite interested in the attitude and activity of a company toward environmental conservation. The way of tackling environmental conservation by each food manufacturing company has a feature of handling many schemes that attract much social attention such as efficient use of raw materials, reduction of the use of energy and water and the amounts of byproducts, and recycling. In addition, it is required to comply with Container and Packaging Recycling Law and Food Recycling Law and it is necessary to present such tasks to consumers in a transparent manner.

In addition, the food manufacturing industry includes many small companies. Therefore, to expand environmental accounting in the industry, it can be meaningful to examine a technique for introducing environmental accounting in stages by focusing on a specific section in terms of the ease of use and the effectiveness for the internal use, as well as the technique for measuring for the entire company.

Considering these points described above, the Food Working Group decided to focus on the possibility and effectiveness of partial environmental accounting after organizing the relationship between business activities and environmental conservation of a company as the Group's target for the examination.

Figure 1 Material flow of the food manufacturing industry



2. Introduction and Utilization of Environmental Accounting

(1) Introduction patterns of environmental accounting

The following introduction methods are assumed for environmental accounting (see Figure 2).

<1> Corporate Environmental Accounting: The main objective is to measure environmental accounting of the entire company

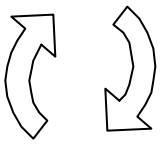
<2> Segment environmental accounting: The target unit of environmental accounting is each site or division, or some business activities or projects

The Guideline (2000 version), mainly targets corporate environmental accounting, indicates that partial introduction (in the unit of site, division, or management item) and subsequent expansion of environmental accounting are effective if the purpose of the utilization is clear.

Figure 2 Relational diagram of corporate environmental accounting and segment environmental accounting (1)

<table>
<tr><td colspan="3">Corporate environmental accounting</td></tr>
<tr><td colspan="3">Measure the cost and effects of environmental conservation of the entire company (group)

<Reference material>
● "Environmental Accounting Guideline (2000 version)" etc,</td></tr>
<tr><td>From partial to entire area as the first step of introduction

<Reference material>
● “Environmental Accounting Manuals for the Food Manufacturing Industry - First Step Guide” issued by the Ministry of Agriculture, Forestry, and Fisheries, etc.</td><td>  </td><td>From Part to Total by focusing on a specific issue</td></tr>
<tr><td colspan="3">Segment environmental accounting</td></tr>
<tr><td>[the unit of department]

● The following may be the reasons for starting segment environmental accounting.
1) Since the entire image is difficult to measure, an area group such as a factory or a specific manufacturing process is targeted.
2) A site that is assumed to have many issues is focused and the points to be improved are extracted.

<Reference material>
● "Environmental Accounting Guideline (2000 version)"
● This report, etc.</td><td colspan="2">[the unit of measure]

● The following may be the reasons for starting segment environmental accounting.
1) A measure that is to be tackled urgently is selected and measured.
2) A small area such as each measure is targeted in order to clarify the cause in the process of solving some issues.

<Reference materials>
● "Environmental Accounting Guideline (2000 version)"
● This report, etc.</td></tr>
<tr><td colspan="3">Note: It contains many common items in terms of partial introducing.</td></tr>
</table>

As shown in Figure 2, there are two methods for introducing segment environmental accounting:

- Mainly focusing on a specific section because of the ease of introduction
- Focusing on a specific section for solving administrative issues

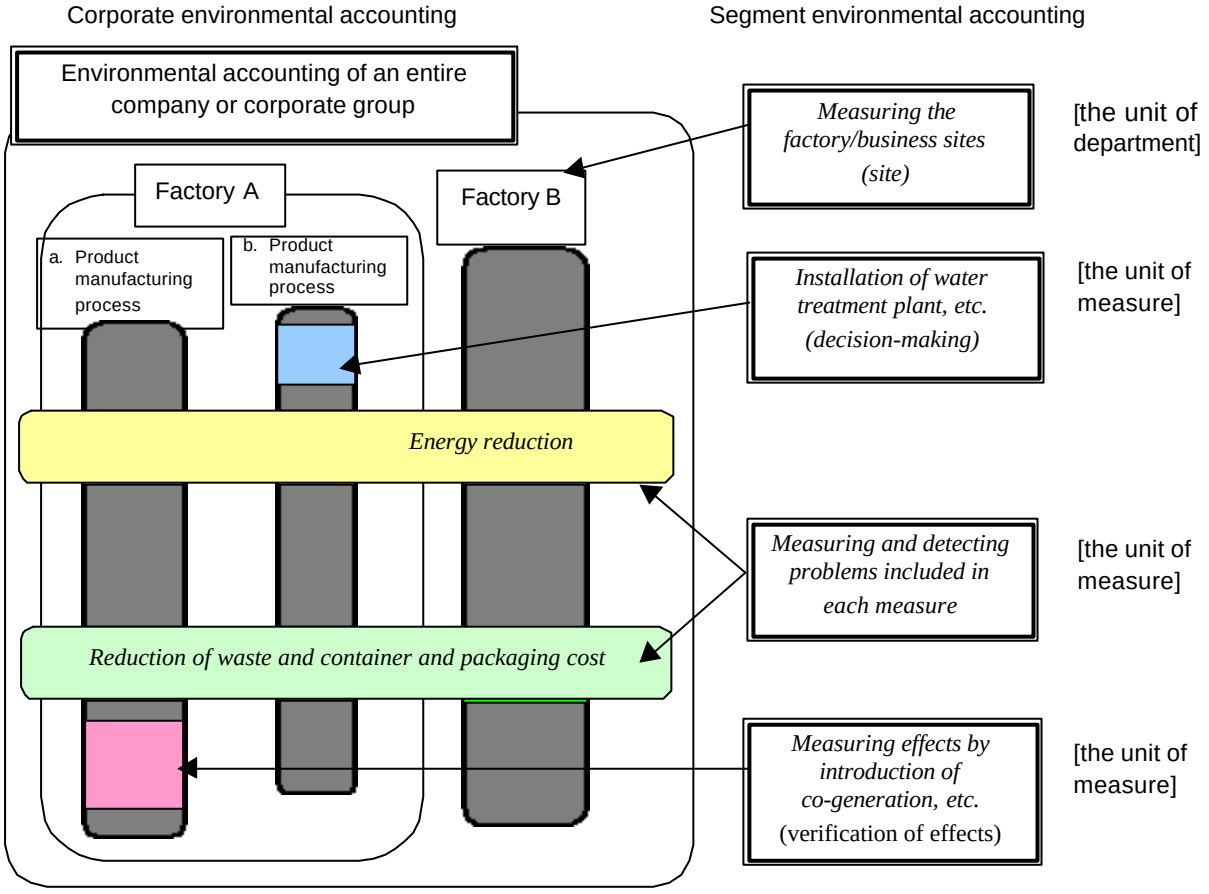
First method applies to an introductory stage of environmental accounting and will be a trigger for future development to corporate environmental accounting.

Second one aims to solve various problems existing in the company and, in many cases, a company that has already introduced corporate environmental accounting tackles the task as the next development.

Figure 3 shows the differences between corporate environmental accounting and segment environmental accounting in a model format.

There are two types of segment accounting, <1> environmental accounting, introduced by targeting a small section such as a factory or a business site is applicable to [the unit of department] in the diagram and <2> environmental accounting that is focused on the section of each issue for solving problems is applicable to [the unit of measure] in the diagram. In the process of analysis of the current condition or extracting issues for preparing segment environmental accounting [the unit of measure], a case of organizing environmental accounting information targeting a small section such as a factory and a manufacturing process can also be assumed.

Figure 3 Relationship between corporate environmental accounting and segment environmental accounting (2)



(2) Features of segment environmental accounting

Segment environmental accounting can be implemented easily, since the target is selected. This is an advantage for small to medium companies. In addition, if segment environmental accounting is created by focusing on major processes of small to medium companies, the information tends to outline the environmental accounting information of the company. In this sense, segment environmental accounting is significant.

It is predicted that many companies, trying to introduce segment environmental accounting for solving problems, would often be engaged in the task as the application stage of corporate environmental accounting. A general procedure for building corporate environmental accounting is to organize information for each process, summarize the information for each site, and organize the result as the information of the entire company. Problems may be detected during the process. Therefore, each information item that is used as the basis for creating corporate environmental accounting can also be used for segment environmental accounting.

However, although segment environmental accounting may trigger the development of corporate environmental accounting, previous experiences in segment environmental accounting are not necessarily essential for introducing corporate environmental accounting to be introduced.

(3) Segment environmental accounting as an introductory stage

As the Guideline (2000 version) recommends staged introduction of environmental accounting, it is a practical method for a company, which is introducing environmental accounting for the first time, to expand the introduction range in stages. In this case, the company would have many means to select the unit to introduce the environmental accounting, such as the unit of site/division/department, and manufacturing line. It is also possible to organize information by focusing on the major environment impact within a range.

"Environmental Accounting Manual for Food Manufacturing Industry - First Step Guide" issued by the Ministry of Agriculture, Forestry, and Fisheries is available as the guide for introducing environmental accounting focusing on main environmental impacts. This manual focuses on energy consumption, emission of carbon dioxide, use of water, water pollution, waste disposal, and container packaging.

Enquiries for the "Environmental Accounting Manual for Food Manufacturing Industry - First Step Guide"

Food Marketing Research and Information Center
Telephone: ++81-(0)-3-5567-1991

(4) Segment environmental accounting for solving issues

Segment environmental accounting can be used for identifying a section that is considered to have problems and solving them by controlling the specific section.

Specifically, segment environmental accounting can be used as a tool for detecting and solving the following problems.

- Extraction of significant problems in the site unit
- Detection of inefficiency in business activities (pursuing efficient use of cost and raw materials)
- Examination of expected effects from individual environmental conservation measure and decision-making (prior evaluation)
- Assessment and verification of the effects achieved by individual environmental conservation measure (post evaluation)

"To use segment environmental accounting for these purposes is applicable to one of the internal functions of environmental accounting, however, segment environmental accounting can also be used as an external function by announcing the information that is attracting extensive social interest.

The differences between corporate environmental accounting and segment environmental accounting are described in Section 2, "Introduction and Utilization of Environmental Accounting." The following sections mainly show the examination results of the techniques for building segment environmental accounting to solve problems. In terms of partial introduction, to install segment one would be useful for building environmental accounting. Segment environmental accounting has many parts, applicable to environmental accounting that measures activities in the unit of department, such as regarding the site.

3. The Procedure to Introduce Segment Environmental Accounting for Solving Problems

The following diagram shows the procedure for each company to measure the significant problems of each section to be solved, to apply environmental accounting to the sections, and to proceed to environmental conservation measures while managing both the costs and effects.

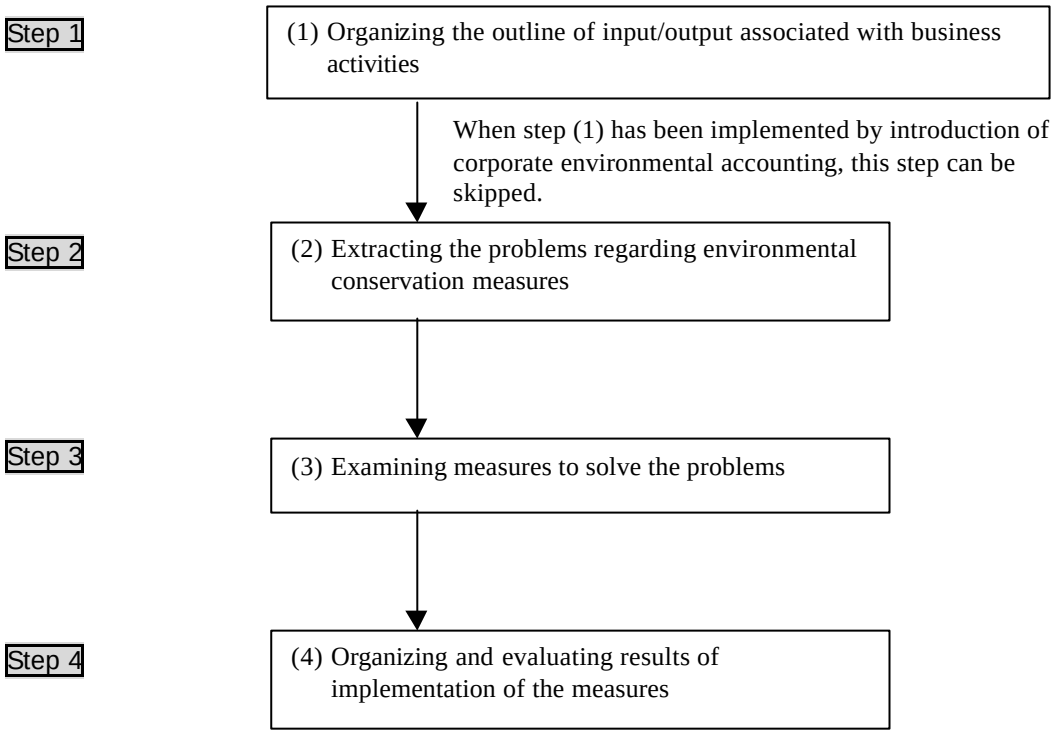


Figure 4 Flow of introduction of segment environmental accounting for solving problems

Step 1

(1) Organizing the outline of input/output associated with business activities

Firstly, organize the items that are input (submitted) and output (emitted) of the business activities flow and each process to measure the connection between business activities and the environment.

It is useful to measure which and how many items are input or output and how much cost is required from that input/output for judgment of the degree of connection and influence of the input/output on business activities (administration).

Therefore, measure the amount and cost of input/output as much as possible. If it is difficult to identify the amount and cost from each process, as another approach to do it on the basis of the entire business.

a. Measuring the entire image of business activities and creating an operation flow

Firstly, decide on which range segment environmental accounting is to be introduced in the entire business activities (see Figure 1 Material flow of food manufacturing industry).

Secondly narrow down the targets to the factory, process, or product, which would have businesses to deal with as well as problems to be solved.

After setting the range, create a simple operation flow of it. The manufacturing flow should be divided so as to extract problems of Step 2 in Figure 4.

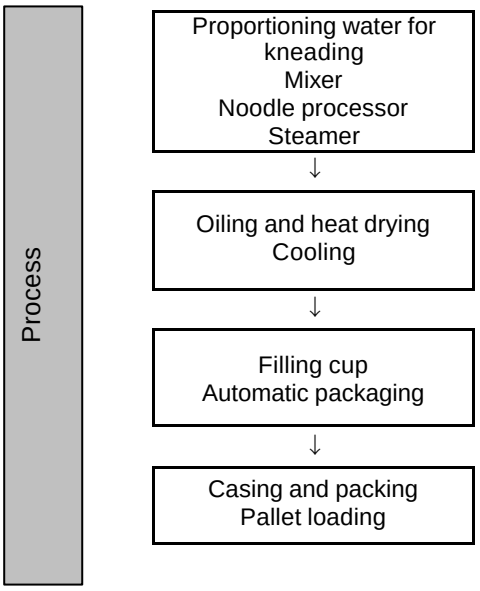


Figure 5 Operation flow (Example: Fried noodle manufacturing factory)

b. Measuring the amount and cost of the items that are input/output

Itemize the resources that are input to each process and items that are output from each process in the operation flow created in a. Input includes raw materials and energy. Output includes emitted gases, drained water, byproducts, and waste.

After that, identify the amounts and the cost as shown in Table 1.

The cost includes the cost for purchasing resources, disposing and recycling waste such as food byproducts and container packaging, and it can also include associated labor cost (see [Reference] Example of cost items associated with input and output in factory b of beverage manufacturer A).

Collect the available information on the items and the amounts that are input or output and the associated cost in possible units. If the information cannot be easily collected by process, measure the information on a larger unit such as the entire business.

Collecting year-to-year data helps clarification of the trend. Also, it is important to collect information continuously under the same methodology in order to identify issues. (Reference the concept of selecting issues: Example 2.)

If the amount and cost of input and output change as the result of environmental protection measures, the changes mean "environmental conservation effects" and "economical effects associated with environmental conservation" in (4) "Organizing and evaluating the results of implementation of measures"

The company that has already implemented an environmental management system can use the result of identification of environmental aspects. Another suggestion is to collect information on input/output (items, amounts, associated cost) by selecting the target according to the purpose of using environmental accounting.

Table 1 Image of organizing input and output (Example: Fried noodle manufacturing)

Input			Process	Output			
Type	Amount	Cost		Type	Amount	Processing method	Cost
• Raw material	Kg	Yen	Proportioning water for kneading Mixer Noodle machine Steamer	◆ Byproduct/waste		◆ Byproduct/waste disposal	
• Water	t	Yen		- Carton box	Kg	- Recycling (used paper)	Yen
• Electric power	KWh	Yen		- Paper bag	Kg	- Recycling (used paper)	Yen
• Steam	t	Yen		- Plastic bag	Kg	- Incineration	Yen
				- Noodle scrap	Kg	- Recycling (animal feed)	Yen
				◆ Exhaust	m^3	◆ Releasing to the surrounding environment	
				◆ Drainage (including that of raw materials)	m^3	◆ Drainage treatment	Yen
				◆ Exhaust heat	Kcal	◆ Releasing to the surrounding environment	
• Frying oil	t	Yen	Drying by oil heat Cooling	◆ Byproduct/waste		◆ Byproduct/waste disposal	
• Steam	t	Yen		- Noodle scrap	Kg	- Recycling (animal feed)	Yen
• Electric power	KWh	Yen		◆ Drainage	m^3	◆ Drainage treatment	Yen
• Water	m^3	Yen		◆ Exhaust (including odor)	m^3	◆ Releasing to the surrounding environment	
				◆ Exhaust heat	Kcal	◆ Releasing to the surrounding environment	
• Cup/lid	Kg	Yen	Filling cup Automatic packaging	◆ Byproduct/waste		◆ Byproduct/waste disposal	
• Soup	t	Yen		- Carton box	Kg	- Recycling (used paper)	Yen
• Ingredients	t	Yen		- Cup/lid scrap	Kg	- Incineration	Yen
• Electric power	KWh	Yen		- Noodle scrap	Kg	- Recycling (animal feed)	Yen
• Packaging	t	Yen		- Soup scrap	Kg	- Incineration	Yen
• Stamp ink	t	Yen		- Ingredient scrap	Kg	- Recycling (animal feed)	Yen
• Double-sided tape	Kg	Yen		- Plastic bag	Kg	- Incineration	Yen
				- Scrap from (external) packaging	Kg	- Returning to the supplier	Yen
				- Scrap of double-sided tape	Kg	- Incineration	Yen
				◆ Exhaust	m^3	◆ Releasing to the surrounding environment	
				◆ Exhaust heat	m^3	◆ Releasing to the surrounding environment	
• Case/tray	pieces	Yen	Casing Loading on pallet	◆ Byproduct/waste		◆ Byproduct/waste disposal	
• Adhesive	Kg	Yen		- Carton box	Kg	- Recycling (used paper)	Yen
• Electric power	KWh	Yen		- Tray scrap	Kg	- Incineration	Yen
				- Adhesive residue	Kg	- Incineration	Yen
				- Wood pieces and wood chips	Kg	- Incineration	Yen
				◆ Exhaust	m^3	◆ Releasing to the surrounding environment	

[Reference] Example of the cost items associated with input and output in factory b of beverage manufacturer A

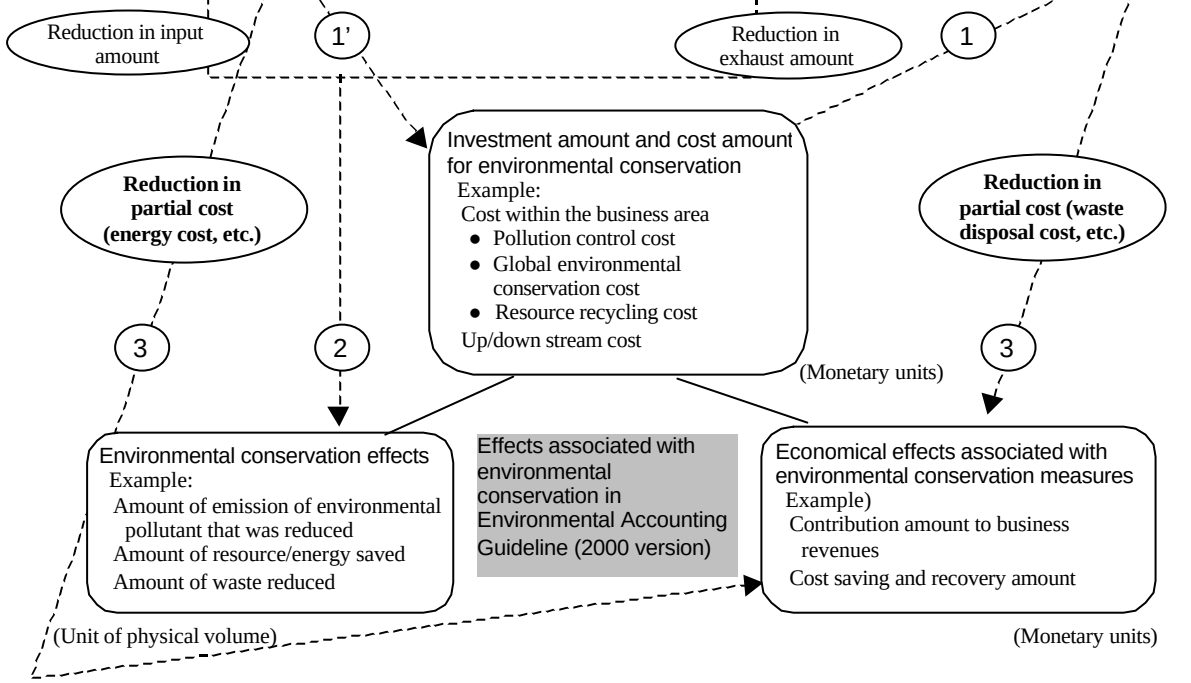
Cost items associated with input		
Raw material cost		Coffee Tea Milk Sugar, etc.
Submaterial cost	Submaterial cost	Cornstarch, etc.
	Container & packaging cost	Steel container Aluminum container Bottle PET bottle Cap Paper cup Label, etc.
	Packing material cost	Carton box Plastic case, etc.
	Material cost for facility operation	Machine oil, etc.
Water rate		Industrial water Clean water, etc.
Fuel cost		Electric power City gas Kerosene Natural gas (for automobile) Petrol (for automobile) Light oil (for automobile), etc.
Other cost	Material cost for recycling	Used container collecting bag Recycling box, etc.

Cost items associated with output		
Waste disposal cost	Processing cost	CFCs depletion Coffee deposit processing subcontracting Tea leaves processing subcontracting Carton box collection subcontracting Waste oil processing subcontracting Slug processing subcontracting Plastic processing subcontracting OA paper processing subcontracting, etc.
	Labor cost	Waste sorting labor cost, etc.
Recycling cost		Collecting expired products Container collecting sorting processing Paper cup recycling processing subcontracting PET bottle sorting processing subcontracting Empty container reuse subcontracting, etc. (Subcontracting contribution quota, etc.)
Drainage processing cost	Processing cost	Drainage processing chemical, etc.
	Labor cost	Labor cost for drainage processing, etc.
Exhaust gas processing cost	Processing cost	Activated charcoal for deodorization, etc.
	Labor cost	Labor cost for exhaust gas processing, etc.
Other cost	Penalty	Pollution impact charge, etc.

<Column> Relationship between the concepts in the material flow and terms used in the "Environmental Accounting Guideline (2000 version)"

[Amount of the items that were focused on in the material flow and associated cost]

Input			Process	Output			
Type	Amount	Cost		Type	Amount	Occurrence control/appropriate processing, etc.	Cost
● Raw material	Kg	Yen		◆ Byproduct/Waste		◆ Byproduct/waste disposal	
● Water	t	Yen		- Carton box	Kg	- Recycling (used paper)	Yen
● Electric power	KWh	Yen		- Paper bag	Kg	- Recycling (used paper)	Yen
● Steam	t	Yen		- Plastic bag	Kg	- Incineration	Yen
			Proportioning water for kneading	- Noodle scrap	Kg	- Recycling (animal feed)	Yen
				◆ Exhaust	m^3	◆ Releasing to the surrounding environment	
				◆ Drainage (including that of raw materials)	m^3	◆ Waste water treatment	Yen
				◆ Exhaust heat	Kcal	◆ Released to the surrounding environment	



<1> The cost for control of the exhaust output to the environment and the environmental conservation cost such as appropriate processing (cost for recycling) belong to the "environmental conservation cost" in the "Environmental Accounting Guideline (2000 version)." A part of the input cost such as energy cost for operation of pollution control facilities belongs to the "environmental conservation cost (<1>').

<2> When the amount of the item input or output is reduced as a result of environmental conservation measures (reduction of the amount of environmental pollutant emitted), the result belongs to the "environmental conservation effect" in the "Environmental Accounting Guideline (2000 version)."

<3> When a part of the cost associated with input (material cost, fuel cost, etc.) or a part of the cost associated with output (waste disposal cost, etc.) could be reduced, the result belongs to the "economical effects associated with environmental conservation measures" in the "Environmental Accounting Guideline (2000 version)."

The method for focusing on the material flow is also discussed in the specialist meetings of the United Nations Division of Sustainable Development (UNDSD) that was introduced in Chapter 2. The method is also described in Work book 1 that was prepared by organizing the concepts of environmental accounting, which are the actual results of research activities of UNDSD.

The concept of focusing on the material flow is not explicitly discussed in the "Environmental Accounting Guideline (2000 version)" issued by the Ministry of Environment, however, the concept is related. The contents indicated in this report by the Good Working Group is one of the ways of indicating the association.

Material flow cost accounting is available as a technique for detecting at which state of the process waste is generated and how much money was wasted, by measuring the material flow on the basis of both the physical quantity and the amount. This is considered to be the theme that contributes to particular improvement of internal functions of environmental accounting.

Step 2

(2) Selecting issues of environmental conservation measures

Selection of issues relating to the business management environment is based on the result of "(1) Organizing the outline of input/output associated with business activities."

View the outline of the target business activities in (1), proceed with examination based on the concept described below, extract and organize the issues that are to be emphasized such as the items that are to be actively managed or the items whose cost effectiveness is to be enhanced, and examine in detail the causes and direction of improvements.

[Concept of selecting issues Example 1] Extract issues according to the degree of importance.

- Select some of the important environmental conservation measures for the company and items that require high cost. (Analysis of the current condition)

⇩

- Examine any possibility for improvement in the activities for the items that were selected. (Selection of issues)

[Concept of selecting issues Example 2] Select issues according to the degree of changes or differences.

- Compare seasonal changes of the amounts and associated cost of the items that are input and output. It also makes comparison with other factories and examines if there are any considerable differences in terms of the amount and the cost. (Analysis of the current condition 1)

⇩

- Examine the cause of the considerable increase of amount or cost that might be produced for the potential changes or issues. (Analysis of the current condition 2)

  For instance, the following causes are assumed.
  - Change of the condition of the equipment (efficiency deterioration, etc.)
  - Deterioration of yield due to increase of spoilages
  - Price change, etc.

⇩

- After recognizing the cause, investigate the issues concretely for possible improvements. (Extraction of issues)

After selecting the issues, organize the issues as shown in the following.

Table 2 Example of organizing issues

Analysis of the current condition	Issue	Actual issue and improvement
High water consumption: the cost of industrial water and waste water treatment cost take up a large proportion of the cost.	Reduction in water consumption	● Prevention of water leakage from water pipes ● Further water re-use, etc.
Increase of energy consumption per unit manufacturing amount due to change of the equipment condition	Reduction in energy consumption per unit's requirement	● Deterioration of energy efficiency due to deterioration of equipment X of process Y. ● Deterioration of energy efficiency due to incomplete maintenance, etc.
Increase of waste disposal cost due to an increase of the unit of waste disposal cost	Reduction in waste disposal cost per unit	● Process control method that tends to produce spoilages ● Examination of use within the process ● Recycling byproducts ● 100% sorting, etc.

Selection of issues can also be examined based on the following items, instead of quantitative evaluation shown above.

[Concept of selecting issues Example 3]	Selecting issues based on the environmental policies or social situations.

- Item that requires environmental conservation measures corresponding to the policies or business plans of environmental conservation in the company or factory (environmental policies, purposes, targets, or plans for the industry who has an environmental management system).
- Item that requires environmental conservation measures corresponding to the environmental policies of the industry or the task implementation movement.
- Item that requires environmental conservation measures corresponding to amendment or enhancement of laws and regulations relating to environment
- Item for which environmental conservation measures are desirable as a response to the social interest

After organizing the issues, summarize together with the organized information on input and output, and issue as an internal report. Announcement of these information items to the concerned parties is useful for showing the current condition, the implementation attitude, and the concept of the company to the society.

Organization of information up to extraction of issues is applicable to segment environmental accounting by division.

[Reference] Example of selecting issues

Example 1 Selecting issues by comparing the unit requirement of the amount of input with those of other factories
(Reference: Concept of selecting issues Example 2)

Issue (1)

- Analysis of the current condition:
  Fuel consumption unit in the heating/boiling/sterilizing process of this factory: 10L/steam t
  Fuel consumption unit in the heating/boiling/sterilizing process of Factory A: 9L/steam t
  Fuel consumption unit in the heating/boiling/sterilizing process of Factory B: 8L/steam t
  The fuel consumption unit is higher than other factories by 15%.

- Issue: Reduction in fuel consumption per unit
- Actual issue: Energy efficiency is relatively low due to deterioration of the boiler

Issue (2)

- Analysis of the current condition:
  Water consumption unit in the package process of this factory: $10m^3$/product Kl
  Water consumption unit in the package process of Factory A: $9m^3$/product Kl
  Water consumption unit in the package process of Factory B: $8.5m^3$/product Kl
  The water consumption unit is higher than other factories by 15%.

- Issue: Reduction of water consumption per unit
- Actual issue: According to the difference of the recovery rate of final wash water in the bottle washing process. Improvement of the reuse rate of final wash water in the preprocess.

Example 2 Extraction of an issue corresponding to the task implementation movement relating to the environment in the industry
(Reference: Concept of selecting issues Example 3)

- Background of the examination: Distillation waste liquid generated from distilled liquors will no longer be disposed of into the ocean according to the decision made in the industry group.

- Current condition: Amount of distilled waste liquid generated: 40,000 t per year
  Cost for disposing of the waste liquid to the ocean: 4,100 yen/t

- Issue: Assuming land treatment for distilled waste liquid, the optimum comprehensive handling method is examined for the company in terms of "cost efficiency", "reduction of environment impact", and "promotion of recycling."

- Points of examination
  - Examine promotion of waste treatment considering recycling as the precondition, in terms of the "promotion of zero emission from factory" that was indicated as the environmental target.
  - Considering sales trends of distilled liquor products, examine the recycling technique that can cope with quantitative increase (securing exit of recycle products and verification of market scale).
  - Evaluate environment impacts that result from recycling and processing.
  - Evaluate the capital investment and running cost.
  - Degree of technical completeness

Step 3

(3) Examining measures for issues

Examine environmental conservation measures for solving the issues that were organized in "(2) Extracting issues of environmental conservation measures.' In examination of environmental conservation measures, initially select those from which the effects can be easily achieved.

While there is a concept of selecting measures of high economical rationality, there is another concept of selecting measures that match the policies of the company (environment) or measures of social value. Some measures that may not be economically advantageous in a short term may become advantageous in a long term.

Examination of environmental conservation measures is necessarily based on the concept or current condition of the company.

Examine environmental conservation measures that are suitable for the business of the company in terms of the following points:

[Concept of examination of environmental conservation measures]

- Improve facilities and/or consider alternatives
- Review the process and improve it
- Conduct 100% control
- Review of raw materials and materials.
- Review discharge, emission and treatment methods, etc.

[Reference] Example of examination of measures

Example: Energy conservation by increasing smaller boilers

The X process in Factory Y uses large water pipe boilers of central controlling type. Since the boilers cause considerable energy loss and would be expired soon, it is necessary to consider their replacement.

■ Current condition
- 38 t water pipe type boilers: 2 units
- Usage: Heating in the process, factory and office

  Since central controlling, the pipes are long, having considerable amount of energy loss during distribution.

  The large water pipe boilers are difficult for delicate control according to the demand. In particular, the efficiency deteriorates during the summer periods.

  The boilers use heavy oil with high CO_2 and SOx emission unit requirement.

■ Measures
- Distributed installation of smaller boilers

Heating process:	2t percolation type boiler:	30 units
Heating factory:	1t percolation type boiler:	5 units
Heating office:	2t percolation type boiler:	1 unit
	0.8t percolation type boiler:	1 unit

  The efficiency per unit function is improved by installation of new facilities.

  Delicate control according to the demand is possible and by introduction of distributed installation, the pipe lengths become shorter, reducing the energy loss during distribution.

- Replacing the energy

  Changing heavy oil to kerosene, LPG, or city gas

  By replacing the existing energy to energy of low CO_2 and SOx emission unit requirement, the CO_2 emission amount and SOx emission amount can be reduced.

In selection of environmental conservation measures, some measures may be compared and evaluated before making decisions. In such prior evaluation of measures, the cost associated with each environmental conservation measure may be correlated with the "environmental conservation effects" and "economical effects associated with the environmental conservation measure."

Table 3 Image of comparative evaluation of environmental conservation measures

	Cost associated with measures		Effects	
	Investment amount	Cost amount	Environmental conservation effects	Economical effects associated with the environmental conservation measure
Measure A				
Measure B				

* See "(4) Organizing and evaluating the results of implementing the measures" of the next section for how to fill in each column.

[Reference] Example of prior evaluation of environmental conservation measures that were collected

Example: Measure to process used containers that were collected

Currently, each office subcontracts processing of used containers that were collected to a waste disposal agent. (The total cost for subcontracting is 25 million yen.)

The change of processing method was examined for promoting recycling of used containers and more effective management.

The following table shows prior evaluation of two measures; one for subcontracting the process to a waste disposal agent collectively and the other for processing internally by establishing a recycling facility within the company.

	Cost associated with the measure				Effects (against the existing treatment method)	
	Investment amount		Cost amount		Environmental conservation effects	Economical effects associated with environmental conservation measure
	Item	Amount	Item	Amount		
Measure A Subcontract waste disposal to an agent collectively	None	0	Subcontracting waste disposal	15 million yen	(Since final disposal is subcontracted to a waste disposal agent, it is difficult for the company to trace the process up to the final disposal completely.)	Reduction of subcontracting cost: 10 million yen
Measure B Building an in-house recycling facility	Construction of recycling facility	100 million yen	Depreciation cost, operation cost, and maintenance cost, inspection cost, and miscellaneous cost of the building, machines, and facility	10 million yen 30 million yen 5 million yen	Control up to the final disposal. Reduction of the amount of waste to be incinerated by improvement of recycling rate Reduction of the amount of waste to be land filled by improvement of recycling rate	Reduction of subcontracting cost: 25 million yen Sale of recycled/reusable materials: 5 million yen

- The entire cost of measure A is lower than that of measure B although economical effects are expected from measure B. However, since more environmental conservation effects are gained from measure B, measure B was adopted.
- Assuming that the waste disposal cost will increase in the future, recycling rate was increased as a prior action.
- Development of know-how of an in-house recycling system is beneficial for the company.

Step 4

(4) Organizing and evaluating the results of implementing the measures

After implementing an environmental conservation measure, identify the cost of implementation of the measure and the environmental conservation effects and economical effects, and evaluate the influence and effects for the management. The information can be used for further examination of the measure and development (e.g. application of the same measure to other manufacturing lines) and for explanation of the necessity of budgets for environmental conservation.

Moreover the information may be not only used internally but also reported externally.

[Example of table of results]

Description of the measure	<2> Cost associated with the measure		Effects	
	Investment amount	Cost amount	Environmental conservation effects	Economical effects associated with the environmental conservation measure
<1>	<2> - 1	<2> - 2	<3>	<4>

<1> Description of the measure

Describe briefly the measure that was implemented.

<2> Cost associated with the measure

Organize the cost associated with the measure.

<2>-1 Investment amount

Indicate the amount invested for the measure.
(e.g. investment for installation of a new facility)

<2>-2 Cost amount

Indicate the cost required for operation of the measure. (e.g. the maintenance and management cost and the labor cost for operation).

Mainly itemize the cost that has changed dramatically after implementation of the measure.

[Example of cost]

Maintenance and management cost	Subcontracting cost Material cost required for maintenance and management Measurement cost for controlling status of equipments Measurement certification cost
Labor cost	Labor cost for facility operation and management

<3> Environmental conservation effects

Indicate the environmental conservation effects that were gained from this measure.

It is important to indicate environmental conservation effects quantitatively in the unit of physical volume.

A company may be implementing various environmental conservation measures concurrently and effects of each measure cannot always be evaluated. In this case, an estimated value or a predicted value may be used.

Environmental conservation effects include an amount of environmental impact after implementation of a measure and a change of amount after implementation of a measure.

Changes of the amounts of input and output identified in (1) after implementation of a measure are applicable to this category.

[Example of environmental conservation effects]

- Pollution control: Amount of emitted environmental pollutants (NOx, COD, etc.)
  Amount of harmful chemical substances that are emitted or moved
- Global environmental conservation:
  Amount of emitted greenhouse gas and energy consumption
- Resource recycling: Amount of waste generated, amount of final waste disposed, and amount of water used

Since these values may change according to the expansion or reduction of the business scale of the company, it is useful to create indicators of environmental efficiency such as converting the value to per unit production amount (monetary amount) for comparison with the value before implementation of the measure.

Some environmental conservation effects may not be measured quantitatively. An example is the effect

of preventing the environmental pollution by preventative environmental conservation measures. Environmental conservation effects that are difficult to express quantitatively may be expressed qualitatively.

Details of the concept of environmental conservation effects are described in the "Environmental Accounting Guideline (2000 version)" or the "Environmental Performance Indicators for Business Administrators -2000 version" issued by the Ministry of Environment.

<4> Economical effects associated with environmental conservation measures

The economical effects to the company will be indicated by implementation of the environmental conservation measure.

Here, the economical effects that can be assessed based on the credible basis should be entered as indicated below.

[Example of economical effects]

- Business revenue gained through recycling of resources or reutilization of byproducts within the process
- Amount of cost saved by the energy conservation measure
- Amount of cost saved by waste emission control, etc.

These items are mainly the cost gap of input and output, estimated in "(1) Organiz ing the outline of input/output associated with business activities", comparing before and after the implementation of the measure.

As indicated above, some economical effects cannot be estimated on the credible basis. One example is the cost, which would arise from environmental damage, would be avoided by implementation of the environmental measure in advance. In this case, the effects may be calculated hypothetically or the assumed effects may be indicated qualitatively.

Details of the concept of economical effects are described in the "Chapter 3 Report from the Electronic and Electric Working Group."

[Reference] Example of evaluation after the measure

Example: The result of CO_2 emission reduction measure by Factory A

This example shows the result of the following two environmental conservation measures that contributed to the reduction of the amount of CO_2 emitted. The measures were taken by screening issues corresponding to the environmental policies and targets in Factory A.

- Reduction in the fuel consumption by collecting steam discharged from the boiling pot using the steam exhaust collection equipment that is installed, compressing the steam, and using it as the heat source for the boiling pot
- Reduction in power consumption by installing new pump with inverter for drainage

Measure	Cost associated with the measure				Effects	
	Investment amount		Cost amount		Environmental conservation effects	Economical effects associated with environmental conservation
	Item	Amount	Item	Amount		
Installation of steam exhaust collection equipment	Cost for installation of stocking steam exhaust collection equipment	120 million yen	Additional operation cost (electricity) for the steam exhaust collection and compression facility	Electricity rate (1,200MWh/year)	Reduction in CO_2 by 5,400t/year	Reduction in fuel cost by 2,000 Kl/year (converted based on crude oil)
Installation of new pump with inverter for drainage	Replacement of drainage pump	1 million yen			Reduction in electricity by 50,000KWh (expected: 40,000KWh) Reduction of 1,920t-CO_2/year	Reduction in electric rate by 800,000 yen

Managerial judgment for the result

For the target of the CO_2 emission reduction in the entire factory, the reduced amount of fuel consumption gave a significant contribution by installation of the steam exhaust collection equipment.

The rate of contribution by the use of an inverter for the waste water pump for the target of CO_2 reduction is more than expected, even if reduction in the production volume is taken into account. Since the investment is comparatively low, it will be effective to actively apply the same measure to other factories.

4. Summary

The "Environmental Accounting Guideline (2000 version)" mainly discusses corporate environmental accounting that measures environmental accounting information of the entire company. The Food Working Group mainly examined a new concept called, 'Segment Environmental Accounting' that targets a specific section of a company.

Segment environmental accounting has a feature to be easily introduced due to its selected target and a feature for its effectiveness for solving environmental conservation issues. For these features, segment environmental accounting is expected to be more widely introduced in the food industry that comprises many comparatively small companies, promoting further environmental activities. Segment environmental accounting was proposed under such expectation.

Segment environmental accounting with the purpose of solving issues, which was presented as major targets in this report, adopted the concept of organizing input and output of the material flow in the targeted business activities.

By organizing the amount of input and output and associated cost for business activities, environmental conservation issues can be simplified, helping the understanding of segmentation.

The proposal of this report can also be applied for examination of environmental accounting in other industries. We hope this report will be of any use for future examination and development of environmental accounting.