

# **A Study on Comparability of Environmental Reports in Three Industries: Automobile, Beer Brewery and Chemicals**

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## **1. Introduction**

For several years now, the number of Japanese companies which publish environmental reports has been increasing. In compiling environmental reports, most people refer to the Environmental Reporting Guidelines (Ministry of the Environment, 2001a, 2001b) issued by the Ministry of the Environment. As indicated in the Guidelines, as basic principles of these reports, relevance, reliability, clarity, comparability, verifiability, and timeliness are indispensable. When dealing with numerical data about environmental impact in particular, comparability is very important.

In comparing numerical data, there are three cases: (1) a company's past performance is compared with its present performance; (2) numerical data are compared between companies in an industry; (3) numerical data are compared between different industries. In this study we focus on the automobile, beer brewery and chemical industries and consider comparisons between companies mainly in an industry. The goal of this study is to analyze, from the point of view of the comparability of environmental reports among companies, to what extent numerical data recorded in environmental reports are comparable under present circumstances, what issues should be discussed, and what conditions are required, in order to increase the comparability of numerical data. It is believed that such analysis will provide useful suggestions when the MOE's Environmental Reporting Guidelines are revised in future.

In structure, the present study first states background and goals and reviews previous comparability studies. Next, major companies and various parameters for an analysis of comparability are extracted, and mention is made of the "significant components" as suggested in the Environmental Reporting Guidelines relating to the analysis parameters used in the present study. We then compare and analyze the contents recorded in the environmental reports by companies in three industries: automobile, beer brewery and chemicals. Most of the corporate environmental reports which formed the object of the present study were published in 2000, although reports issued in 2001 were also touched upon in our comparative analysis. Finally, paying attention to similarities and differences among the three industries, we made observations and drew a conclusion, and made recommendations for the Environmental Reporting Guidelines.

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## **2. Previous Studies on Comparability between Environmental Reports**

There are several previous studies relating to the comparability of numerical data as performance indicators in environmental reporting.

Kawaguchi (1999) carried out a comparative analysis of three beer brewing firms and evaluated their environmental efficiencies. As for five factors which have an environmental effect, namely, the global warming and energy consumption; water control; waste disposal; air pollution; environmental investment and costs, Kawaguchi evaluated absolute values and also values per production volume unit (divided by the production volume) for environmental impact data. Her results indicate that changes (improvements or deteriorations) in environmental efficiency could be grasped to a certain extent by comparing numerical data disclosed every year by individual companies. Moreover, Kawaguchi states that simple, inter-company comparisons are difficult to make because each company's data range and calculation basis are unclear, then she attempted data comparisons for the same parameters, assuming that the calculation basis for numerical data was identical. She then showed that various factors including differences in companies' manufacturing facility and technology, differences in the type of fuel used, co-generation and environmental impact from clerical jobs are inextricably involved, undermining comparability.

A study by Kawano (2001) looks at the environmental reports of 193 listed companies published between 1999 and 2000, divides their contents into five components: basic information; policies, goals, and plans relating to environmental conservation; state of environmental management; state of environmental performance; third party opinions and verifications, and makes a detailed analysis of these five, touching upon inter-company comparability as a future issue. He points out that, although in cases where many companies in the same industry publish environmental reports it is necessary to grasp improvement trends from year-to-year comparisons of data from each company, from now on it will be important to explore ways to facilitate such comparisons between different companies in the same industry. Kawano also states that while specific compilation guidelines will have to be drawn up first, it will probably be some time before these are published.

Saka et al (2000) discuss inter-company comparisons of environmental reports in Chapter 5 of their "The Theory and Practice of Environmental Reporting." Here they select three industries whose environmental reports from 1999 provide a relatively full spectrum of information: household electrical appliance, construction, and automobile, and attempt a detailed inter-company comparison of the environmental activities of five or six companies within an industry. Attention is drawn to the fact that from the point of view of inter-company comparison, there are many issues and problems even in the case of companies within the same industry. These include variations in the amount of information disclosed in environmental reports, differences in numerical data units, and differences in terminology. The authors give particular prominence to the murkiness surrounding the calculation basis for numerical data and

the range covered by the data. In this way, from now on, ensuring comparability will become one of the major themes in compiling environmental reports and by doing so, a company which compiles an outstanding environmental report will be able to back up its competitive superiority.

There are also comparability case studies. The authors of “Environmental Reporting Benchmarks 1999” (Environmental Auditing Research Group, 1999) investigated the characteristics of the chemicals/food and assembly/manufacturing industries and performed a comparative analysis of beer brewing companies and automobile companies as benchmark examples. This report indicates, as one of the trends for “21<sup>st</sup> century environmental reports,” that stronger emphasis will be placed upon ensuring comparability among companies.

An investigative report entitled “Kankyo-keiei ni kansuru doko (Trends in environmental management),” by the Osaka Industrial Association (2001) investigated and analyzed the disclosures in environmental reports published in 2000, and also performed a comparative analysis of the industrial characteristics in terms of environmental performance of the food, chemical and transportation equipment industries. At the same time, the report also mentions the industrial characteristics seen from the disclosures in environmental accounting.

The “Environmental Report Network Research Activity Report for Fiscal 2000,” (Network for Environmental Reporting, 2001), in the form of a report by a subcommittee on environmental accounting, discusses how to assure reliability and comparability in environmental accounting, shows a case study of comparison in environmental accounting between Kirin Brewery Co., Ltd., a parent company, and an affiliate (site), and reviews a comparative analysis of three companies in the convenience store industry in order to examine possibilities for comparison between different companies within the same industry. However, this report also points out that although comparability is an important factor of environmental reports, when the primary object of environmental reporting, premised upon voluntary efforts, is taken into account, some people might see difficulties in focusing attention exclusively on information which can be compared.

### **3. Parameters of Comparability Analysis and Suggestions in the MOE’s Guidelines**

For the industries and the major corporations which form the object of our comparability analysis, we selected the automobile, beer brewery, and chemical industries, as shown in Table 1, and extracted three or four well-known companies from each.

**Table 1 Industries as objects of our comparability analysis and companies selected for the analysis**

| Industry   | Major companies chosen for analysis                                   |
|------------|---|
| Automobile | Toyota Motor Corp.<br>Nissan Motor Co., Ltd.<br>Honda Motor Co., Ltd. |

|              |   |
|--------------|---|
| Beer brewery | Kirin Brewery Co., Ltd.<br>Asahi Breweries, Ltd.<br>Sapporo Breweries Ltd.<br>Suntory Ltd.                                  |
| Chemicals    | Sekisui Chemical Co., Ltd.<br>Asahi Chemical Industry Co., Ltd.<br>Mitsubishi Chemical Corp.<br>Sumitomo Chemical Co., Ltd. |

In examining comparability we also selected, in accordance with the MOE's Environmental Reporting Guidelines, as shown in Table 2, (1) two parameters as basic information for environmental reporting and (2) six parameters as environmental performance indicators concerning a reduction in environmental impact.

**Table 2 Parameters of comparability analysis**

| Classification   | Parameters of analysis  |
|--|---|
| Basic information<br>(foundations of reporting)            | -coverage (covered organization or boundary of reporting organization)<br>-summary of business (sales and output)   |
| Environmental performance indicators based on numeric data | -energy consumption and CO <sub>2</sub> emissions<br>-amount of water used<br>-NO <sub>x</sub> and SO <sub>x</sub> emissions, etc<br>-COD level<br>-waste emissions and recycling rate<br>-substances subject to PRTR law |

In our comparative analysis using these parameters, we used the components of environmental reporting as suggested in the MOE's Guidelines as reference. The "significant components" suggested in the MOE's Guidelines are summarized in Table 3.

**Table 3 Significant components suggested in the MOE's Environmental Reporting Guidelines**

| Parameter   | Significant components (information) suggested by the Guidelines  |
|---|---|
| Coverage (covered organization or boundary of reporting organization) | Basic information including the organization, period and fields covered by the report should be given.<br>The definition of the "organization," should include information concerning which factories, business sites and/or subsidiaries are covered and whether the report provides either consolidated or non-consolidated data and whether it covers domestic or overseas operations or both.<br>Numerical data given in the report should cover the same "period" as far |

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|  | <p>as possible. If not so, that should be mentioned clearly.</p> <p>As for “fields,” inclusion of not only the environmental aspect but also social and economic aspects is more desirable as sustainability reports are spreading in the U.S. and European countries.</p>  |
| Summary of business                              | <p>The type of business of the reporting company and its size should be stated. Concretely, lines of business, main products and services, sales and output, No. of factories/sites, No. of employees should be mentioned. This information can be used as basic data for calculation of eco-efficiency.</p>  |
| Energy consumption/<br>CO <sub>2</sub> emissions | <p>“Total energy consumption and measures for its reduction” as well as “renewable energy consumption and measures for its increase” should be stated. Data should be in joules (J). To estimate total energy consumption, consumption of electricity and fuels should be measured.</p> <p>“CO<sub>2</sub> emissions and measures for their reduction” should be stated. Data should be in t-CO<sub>2</sub>. Emission coefficients of electricity and fuels should be used for calculation.</p> |
| Amount of water used                             | <p>The “amount of water used and measures for its reduction” as well as the “amount of sustainable use of water within a business and measures for its increase” should be stated. Data should be in m<sup>3</sup>.</p>   |
| NO <sub>x</sub> /SO <sub>x</sub> emissions       | <p>As significant components for specific industrial sectors, “NO<sub>x</sub> emissions and their mitigation measures” and “SO<sub>x</sub> emissions and their mitigation measures” should be stated by companies involved in materials or processing/assembly. Data should be in tons (t). Companies involved in materials, assembly/processing or construction should give information on the maximum allowable concentrations (ppm) specified by themselves.</p>                             |
| COD level  | <p>As significant components for specific industrial sectors, “COD level, nitrogen and phosphorus emissions and their mitigation measures” should be stated by companies involved in materials, processing/assembly, distribution or construction. Data should be in tons (t). Disclosure should be made on a site-by-site basis.</p>   |
| Amount of wastes/<br>recycling rate              | <p>As information on the “total amount of wastes and measures for its reduction,” not only total amounts of wastes including recyclable resources but also amounts of reuse, recycle and thermal recycle of recyclable resources and measures to increase them should be stated. The rest of wastes should be classified into wastes to be incinerated or wastes to be disposed of.</p>   |
| Substances subject to<br>PRTR law                | <p>Regarding chemical substances subject to the Law Concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and</p>   |

|  |   |
|--|---|
|  | Promoting Improvements in Their Management (PRTR Law), amounts of emissions/transfers ((1) emissions to the air, (2) emissions to waters or soils and (3) transfers as wastes) should be calculated and stated. |
|--|---|

#### 4. Analysis of Environmental Reporting in the Automobile Industry<sup>3</sup>

##### (1) Coverage

Toyota defines their coverage as “business activities focusing on automobile production in Japan,” and subsidiaries in the Toyota Group to be covered by consolidated data, and gives the names of representative companies separately in each industrial sector, domestic and overseas. Nissan shows their coverage to include “the global Nissan Group, including overseas operations, (Nissan and affiliated subsidiaries in the Group)” and gives the names of representative companies under the heading of “environmental data from affiliated subsidiaries’ major plants.” Honda states that in their environmental report, they “focus principally on environmental efforts made in Japan,” and shows “environmental data and examples of activities in major production bases overseas this year.”

Although information on “coverage” (range covered by an environmental report) is the most fundamental parameter when it comes to examining comparability, at present it is virtually impossible to grasp which extent is covered by numerical data in environmental reports, and this in turn makes comparison difficult. In comparing environmental reports between companies, it is of paramount importance to clarify the coverage and it is a prerequisite to ensure uniformity in coverage.

##### (2) Summary of Business

Toyota records both non-consolidated and consolidated data for sales, number of vehicles produced, and number of vehicles sold, while Nissan records only consolidated data for sales and number of vehicles sold. Honda includes data for sales and for number of vehicles sold according to category: two-wheeled vehicles, four-wheeled vehicles, and general purpose products. Since information on sales and production volumes is fundamental in calculating the environmental impact per unit product value and the product value per unit environmental impact, it is important from the point of view of comparability.

##### (3) Energy Consumption and CO<sub>2</sub> Emissions

Toyota shows the amount of energy used in the automobile production process (CO<sub>2</sub> emissions expressed in thousands of tons of CO<sub>2</sub>) and CO<sub>2</sub> emissions per unit sales amount (unit: tons/100 million yen) and clearly sets out the percentage of each type of energy used as well as the CO<sub>2</sub> conversion factor. Nissan discloses the total amount of CO<sub>2</sub> emissions (unit: 1000 tons of

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<sup>3</sup> For detailed information, refer to the IGES Kansai Research Center Discussion Paper.

carbon) and amounts of CO<sub>2</sub> emissions per 100 million yen (unit: tons of carbon/100 million yen) and shows the amount used and the thermal conversion factor for each type of fuel. Honda discloses the amount of CO<sub>2</sub> emissions (unit: 10,000 tons of carbon) and the energy consumption per unit sales amount (unit: kl/100 million yen). In this way, the unit for CO<sub>2</sub> emissions is sometimes CO<sub>2</sub> and sometimes carbon and if emissions are to be compared, the need for conversion arises. In addition, the fact that all the three companies do not use the same units renders comparison impossible.

#### **(4) Amount of Water Used**

Toyota records changes in the amount of water used (unit: m<sup>3</sup>/vehicle) for each vehicle produced at the four plants which have a water-guzzling paint process. There are no numerical data for the entire production process. Nissan records changes in the amount of water presumed to be used in the entire production process (unit: m<sup>3</sup>). Honda shows changes in the amount of water used at production bases (expressed as an index with 100 in 1993 as the base) and water consumption per unit sales amount (unit: tons/100 million yen). Obviously, a comparison among all the three companies of the amount of water used cannot easily be made. Preferably, the total amount of water used in the entire production process should be recorded.

#### **(5) NO<sub>x</sub> and SO<sub>x</sub> Emissions**

NO<sub>x</sub> and SO<sub>x</sub> emitted from the automobile production process are generated mainly by the boiler, the drying furnace, the melting furnace and the incinerator. All the three companies record the concentration control limit and the measured maximum concentration for the NO<sub>x</sub> emitted by each of these furnaces (unit: ppm). Honda also records the average concentration obtained by the series of measurements. It is possible to compare numerical data for each facility, but it is impossible to compare total emission amounts since the total emission amount for the entire production process in each plant is not mentioned.

Concerning the amount of SO<sub>x</sub> emissions, all the three companies record the total amount control limits and actual total amounts (unit: Nm<sup>3</sup>/h) for each plant. Toyota and Nissan also graphically show changes over years in emissions (unit: m<sup>3</sup>/year) for the entire production process. A comparison in site data between plants is possible.

#### **(6) COD Levels**

Toyota, Nissan and Honda all show site data on COD levels for each plant, and record control limits, and actual maximum, minimum and average levels (unit: mg/l). For some plants, Nissan and Honda also record control limits and actual levels (unit: kg/day) regarding total COD levels. Again, a comparison in site data between plants is possible.

Nissan separately records changes over years in the amount of pollution load (unit: kg/day) for the entire production process, but figures on this topic do not appear in the environmental reports of Toyota and Honda.

### **(7) Wastes and Recycling Rate**

Toyota provides a flow chart outlining the waste processing and disposal process, and shows actual levels (unit: thousands of tons/year) in the chart. Toyota also shows changes over years in the amount of wastes and waste materials generated and the amount of waste materials generated per vehicle (unit: kg/vehicle) and records a breakdown of waste. Nissan shows a waste processing flow chart with various actual data. Nissan also shows changes over years in the amount of waste subjected to landfill disposal per unit production value and indicates a breakdown of waste. Honda does not provide a flow chart, but does show the annual amount of waste processed externally, and provides actual waste breakdown data. The use of flow charts is to be encouraged since they show waste flows in a way that is easy to understand. However, each company compiles its own flow chart which is unhelpful for comparative purposes. A standardized flow chart compilation method should be developed.

Turning now to recycling rates, Toyota provides a graph of these, showing changes over years, and reports that in 1999 they achieved a figure of 95.5 percent. Nissan shows total recycling rates in their waste processing flow chart and records a figure of 96.3 percent. A breakdown of the recycled material is given in a pie chart. Honda shows changes over years in recycling rates in a graph and records a figure of 94 percent in 1999. Under present circumstances the recycling in the production process is complicated, and terminologies differ. This seems to make it difficult to treat the disclosed data equally and make a comparison accurately.

### **(8) Substances Subject to PRTR Law**

Toyota states the amounts of PRTR substances which are handled, emitted and transferred as site data for each plant and shows the total data for all fifteen plants as material balance in a flow chart. Nissan records, for each of 36 substances used in their production process, the amounts handled, emitted and transferred and ranks them in terms of toxicity. Honda records, for 16 substances, the amounts handled, emitted and transferred at their five manufacturing plants (seven business sites) within Japan. The number of PRTR substances disclosed varies with each company and it seems likely that coverage also varies, making comparison impossible. Inter-company comparability would be enhanced by specifying the important substances which should be disclosed and by recording data for the entire company.

Table 4 shows comparability for each of the above parameters where comparability is divided into three levels (○: comparable, □: conditionally comparable, ×: incomparable) and made visually reader-friendly. Although parameters on which comparison between two companies is possible are included, there are no parameters on which comparison can be made among all three companies.



**Table 4. Comparability of three companies in the automobile industry**

| Parameter                                       | No. of disclosing companies | Comparability              | Remarks  |
|---|-----------------------------|----------------------------|--|
| Coverage  | 3                           | ×                          | Which subsidiaries or departments are covered by consolidated data is unknown.                       |
| Sales/output                                    | 3                           | □                          | If Honda's data is consolidated data, comparison of sales data among the three companies is possible |
| Energy consumption<br>CO <sub>2</sub> emissions | 3                           | ×                          | Since only one company shows the conversion factor used, direct comparison is impossible.            |
| Amount of water used                            | 3                           | ×                          | Coverage differs.  |
| NOx emissions                                   | 3                           | Per facility: □<br>Total:× | Site data is comparable.   |
| SOx emissions                                   | 3                           | Per site: ○<br>Total: □    | Total data is comparable between Toyota and Honda.   |
| COD level                                       | 3                           | Per site: ○<br>Total:×     | Site data is comparable.   |
| Amount of wastes                                | 3                           | ×                          | Discrepancy in terminology   |
| Recycling rate                                  | 3                           | ×                          | Discrepancy in terminology   |
| Emissions of substances subject to PRTR law     | 3                           | □                          | Total data is comparable between Nissan and Honda.   |

○: comparable

□: conditionally comparable

×: incomparable

## 5. Analysis of Environmental Reports in the Beer Brewing Industry<sup>4</sup>

### (1) Coverage

Kirin states that their report covers beer breweries and looks at five affiliated subsidiaries which own manufacturing processes, unless otherwise specified. Asahi states that the figures in their environmental accounts are non-consolidated data, but does not mention how far their environmental report covers. Sapporo states that the figures for environmental conservations costs cover their beer production division, research center, part of the distribution division and

<sup>4</sup> For detailed information, refer to the IGES Kansai Research Center Discussion Paper.

the environmental section of the Head Office, but again, when it comes to the range covered by their environmental report, they use only the expression “Sapporo Beer,” which leaves coverage vague. Suntory states in their environmental accounts that the figures do not cover the affiliates in the group, but does not give any indication of how far their environmental report covers. Since all the four companies are basically concerned with beer brewing factories, they are probably easier to compare than companies in other industries, but the range covered by the data needs to be more clearly stated.

## **(2) Summary of Business**

All the four companies record information such as capital, sales, number of employees and number of affiliates. In connection with sales, Kirin and Suntory record figures for both non-consolidated and consolidated sales, while Asahi record only non-consolidated figures. Sapporo records both non-consolidated and consolidated sales for each department. Non-consolidated and consolidated sales and production volumes should be recorded because they are important basic data for comparing numerical data on environmental impact for a given amount of something.

## **(3) Energy Consumption and CO<sub>2</sub> Emissions**

All the four companies provide beer brewing material flow charts of which the elements are virtually identical. These are: (1) amount of energy used in beer production; (2) beer production volume; (3) amount of air pollutants emitted in beer production; (4) amount of air pollutants emitted by distribution; (5) amount of CO<sub>2</sub> emitted in consumption; and (6) recycling rate for containers. Since numerical data are recorded for each element, a simple inter-company comparison would be possible if the units were equal.

## **(4) Amount of Water Used**

The amounts of water used are recorded in the material flow chart provided by all the four companies. The unit is cubic meters (m<sup>3</sup>) and since these are simply expressed in ten thousands or thousands of cubic meters in the flow charts, comparison among companies is possible. The volume of beer produced is also recorded, so from the point of view of eco-efficiency, the “amount of beer produced for a given amount of water” could be tentatively calculated and compared. Table 5 shows comparisons of amounts of water used based on the material flow charts. It is possible to grasp that approximately 10 percent of the water used by all the four companies is transformed into product.

## **(5) NO<sub>x</sub> and SO<sub>x</sub> Emissions**

The “material flow chart” of each company includes data on NO<sub>x</sub> and SO<sub>x</sub> emissions from production and distribution. All data are in tons, which facilitates inter-company comparisons. It is also possible to compare eco-efficiency by calculating the volume of beer produced per unit volume of NO<sub>x</sub> or SO<sub>x</sub> emitted. Since NO<sub>x</sub> and SO<sub>x</sub> are closely related to fuel used, the situation at each company could be more easily grasped if a breakdown of fuel used were

included.

**Table 5 Beer production per cubic meter of water used, based on material flow charts (eco-efficiency)**

|   | Kirin                     | Asahi                     | Sapporo                   | Suntory                   |
|---|---------------------------|---------------------------|---------------------------|---------------------------|
| Amount of water used<br>(as stated)                       | 29,700,000 m <sup>3</sup> | 22,072,000 m <sup>3</sup> | 11,683,000 m <sup>3</sup> | 13,299,000 m <sup>3</sup> |
| Amount of water used<br>(in thousands of cubic<br>meters) | 29,700                    | 22,072                    | 11,683                    | 13,299                    |
| Beer production<br>(in thousands of<br>kiloliters)        | 2,860                     | 2,542                     | 1,111                     | 1,479                     |
| Beer production/<br>water used (kl/m <sup>3</sup> )       | 0.096 kl/m <sup>3</sup>   | 0.115 kl/m <sup>3</sup>   | 0.095 kl/m <sup>3</sup>   | 0.111 kl/m <sup>3</sup>   |

#### **(6) COD Levels**

Kirin discloses COD concentrations in water effluents from one brewery (BOD for other breweries) as site data. Sapporo shows COD levels in tons for the entire company in the material flow chart, and also records the maximum levels (monthly) and the annual total levels as site data for each brewery. Neither Asahi nor Suntory mention COD levels. Comparison is possible among different Sapporo breweries, but not between different companies. Since beer production uses more water than other industries, water quality degradation is particularly significant. The amount of data disclosed by each company is small and more data disclosure is anticipated for.

#### **(7) Amount of Wastes and Recycling Rate**

All the four companies classify this topic into two categories: (1) by-products and wastes and (2) recycling of containers.

Concerning category (1), Kirin, Asahi and Sapporo use a flow chart to record the types and recycling applications of by-products and wastes generated by the beer production process. All the four companies record in the form of a table the amount (in tons) of each type of by-product and waste generated and the recycling rate. All the four beer brewing companies have a recycling rate of 100 percent. A simple comparison among the companies for each type of by-product and waste is possible.

In connection with category (2) (recycling of containers), individual recycling efforts by the four companies exist alongside the efforts in the recycling industry. Individual efforts involve only a returnable beer bottle system and here there is nothing to be drawn between the companies, all of which have a return rate of around 100 percent.

### (8) Substances subject to PRTR Law

As food and beverage manufacturers, the beer brewing companies, in comparison to companies in other industries, deal with fewer types and smaller amounts of PRTR substances. What is reported by all the companies in connection with this topic is principally concerned with a description of the PRTR system and at present includes no information which could be compared.

Table 6 shows whether comparison among the four companies in terms of the various parameters is possible or not. In beer brewing there are many parameters or topics on which comparison can be made among all the four companies and if conditionally comparable parameters are also included, then comparison is possible for the majority of parameters. However, when it comes to the basic “coverage” information, as in other industries, there is the need for more detailed information in order to enhance comparability.

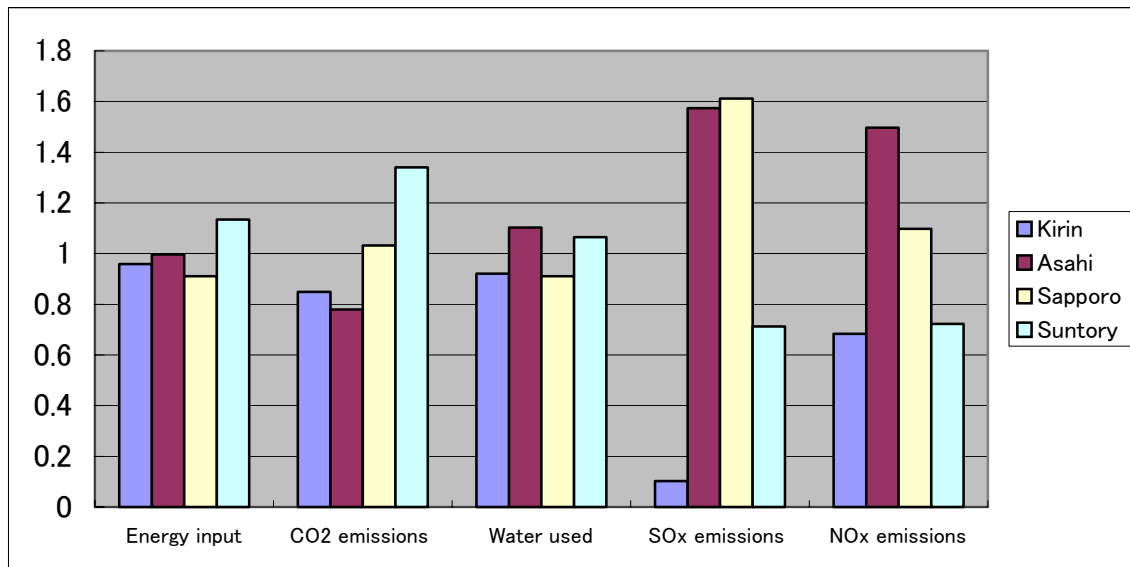
**Table 6. Comparability of four companies in the beer brewery industry**

|   | No. of disclosing companies | Comparability | Remarks  |
|---|-----------------------------|---------------|--|
| Coverage                                    | 2                           | □             | Comparable if calculation criteria for consolidation is clear.                         |
| Sales/output                                | 4                           | ○             | All the companies disclose sales and beer production data.                             |
| Energy consumption                          | 4                           | ○             | All the companies disclose fuel (kl) and electricity (kWh) consumption data.           |
| CO <sub>2</sub> emissions                   | 4                           | □             | Comparable if converted into commensurable data.                                       |
| Amount of water used                        | 4                           | ○             | All the companies state amounts of water used.   |
| NO <sub>x</sub> /SO <sub>x</sub> emissions  | 4                           | ○             | All the companies state emissions from manufacture and distribution.                   |
| COD level                                   | 0                           | ×             | Any of the companies does not provide calculated data on their total COD level.        |
| Amount of wastes                            | 4                           | ○             | All the companies state amounts of byproducts, etc.                                    |
| Recycling rate                              | 4                           | ○             | All the companies state amounts of byproducts, etc. and recycling rates of containers. |
| Emissions of substances subject to PRTR law | 4                           | ×             | All (except one company) state that they do not release any such substances.           |

- : comparable
- : conditionally comparable
- ×: incomparable

Fig. 1 shows comparison among the four companies in eco-efficiency where eco-efficiency (beer production/amount of environmentally hazardous substances) is calculated for each parameter, each company's ratio is worked out from the mean value for all the four companies and a comparison is made. The figure can be interpreted to suggest that the larger each company's eco-efficiency, the better. However, Suntory includes not only beer but also other beverages and it can be assumed that coverage varies slightly among the companies and the integration accuracy varies among the companies, so a simple comparison poses problems.

**Fig.1 Comparison among the four companies in eco-efficiency (beer production/ environmentally hazardous substances)**



## 6. Analysis of Environmental Reports in the Chemical Industry<sup>5</sup>

### (1) Coverage

Sekisui states that their report covers nine principal factories, four research centers and twenty-one production affiliate sites. Asahi covers the parent company and its domestic subsidiaries in the Group and shows factories in various regions on a map of Japan. Mitsubishi and Sumitomo do not mention coverage. Since general chemical manufacturers are engaged in a wide range of businesses and the importance of the materials they handle varies from company to company, it is important from the viewpoint of comparability that coverage, in

<sup>5</sup> For detailed information, refer to the IGES Kansai Research Center Discussion Paper.

particular, be clarified.

## **(2) Summary of Business**

Sales are an important business indicator in a company profile. Sekisui shows both non-consolidated and consolidated sales while Asahi shows only consolidated sales and the proportion represented by each business sector. Neither Mitsubishi nor Sumitomo records any sales data at all. Without basic data on sales and production volumes, environmental impact numerical data based on such data cannot be made on a basis of per unit amount of production, sales or the like, or in terms of eco-efficiency.

## **(3) Energy Consumption and CO<sub>2</sub> Emissions**

Only Asahi integrates numerical data, in a user-friendly manner, into a chart showing the overall picture of the environmental impact from the factories in the Group. In their report, the amounts of energy consumed are converted into crude oil volumes and a comparison is made using unit indices with a specific year as the base. CO<sub>2</sub> emissions are converted into carbon volumes. Sekisui records the amounts of energy consumed (in terms of crude oil) and energy consumption per unit sales (kl/million yen) and similarly records the amounts of CO<sub>2</sub> emissions and tons of CO<sub>2</sub> per unit sales (t-CO<sub>2</sub>/million yen). Mitsubishi records energy unit indices and the amounts of CO<sub>2</sub> emissions in terms of carbon. Sumitomo also records the amounts of energy consumed (kiloliters of crude oil) and energy consumption per unit volume of ethylene (kl/ethylene T).

Only Sekisui shows numerical figures for this parameter on a graph. When numerical figures are not shown, mistakes in reading the data may arise and comparison may become less accurate.

## **(4) NO<sub>x</sub> and SO<sub>x</sub> Emissions**

Sekisui indicates total emissions of NO<sub>x</sub> and SO<sub>x</sub> (in tons) for the entire company, while Asahi discloses the entire company's annual emissions (tons/year) and unit indices. Both Mitsubishi and Sumitomo record changes in emissions over a period of 30 years (in tons). By reading numerical data on graphs, it is possible to compare total company-wide emissions among the companies.

## **(5) COD Levels**

Sekisui shows total company-wide COD levels (in tons) and discloses COD levels as COD concentrations (ppm) taking one Sakai factory as an example. Asahi discloses total company-wide COD levels and total company-wide annual COD levels (in m<sup>3</sup>/year). Both Mitsubishi and Sumitomo record only company-wide COD levels. Since the unit is the same for total company-wide COD levels, comparison is possible.

## **(6) Amount of Wastes and Recycling Rate**

Sekisui graphically shows the total amount of wastes generated and the amount consigned for external disposal, both for the parent company and the entire Sekisui Group. As for the recycling rate, Sekisui divides their recycling activities aiming for zero emissions into three categories and gives a description of each category. Asahi shows the amounts of waste disposed of externally and also gives a breakdown of waste in a pie chart. They list materials to be recycled, but do not provide any numerical explanation. Mitsubishi and Sumitomo graphically show the amount of waste disposed of externally and the amount of landfill and both companies record the amount of materials recycled.

Although the terminology – amount consigned for external disposal, amount disposed of externally, amount of landfill – varies slightly among companies, it seems that all these terms ultimately refer to the amount of waste for final disposal. In addition, since the unit is the same, comparison among companies is possible. However, as far as the recycling rate is concerned, explanations and expressions relating to handling differ, which hinders comparison.

#### **(7) Substances Subject to PRTR Law**

Sekisui provides non-consolidated and consolidated data on total amounts of emissions and transfers of PRTR substances. Concerning each of the twenty-seven main PRTR substances, they also give a list showing the amounts used, emitted and transferred by each of the thirty business sites in the Group. Asahi graphically shows changes over years in emissions of each of nine substances, among toxic air pollutants, whose reduction is a matter of priority. Mitsubishi and Sumitomo also record on a graph the changes over years in emissions of each of nine substances. It is possible to make a simple inter-company comparison in connection with the nine substances stipulated under the worldwide chemical industry's Responsible Care program, but there is no sense in an inter-company comparison of total amounts since types and volumes of substances dealt with differ.

Table 7 sets out the comparability situation among the four companies for each parameter. While some types of data are conditionally comparable, there are also many types of data which are incomparable.

**Table 7 Comparability of four companies in the chemical industry**

| Parameter          | No. of disclosing companies | Compa-rability | Remarks  |
|--------------------|-----------------------------|----------------|--|
| Coverage           | 2                           | □              | They clarify coverage but their selection criteria is unknown.                         |
| Sales/output       | 2                           | □              | Their consolidated sales are comparable but their non-consolidated sales incomparable. |
| Energy consumption | 4                           | ×              | Total amounts are incomparable.  |

|   |   |  |  |
|---|---|--|--|
| CO <sub>2</sub> emissions                   | 4 | Total: □<br>Per unit: ×                  | Conversion into commensurable data is necessary.                                   |
| NO <sub>x</sub> /SO <sub>x</sub> emissions  | 4 | Total: □<br>Per unit: ×                  | Graphically shown (interpretation needed)  |
| COD level                                   | 4 | Total: □<br>Per unit: ×                  | Graphically shown (interpretation needed).   |
| Amount of wastes                            | 4 | Final disposal (total): □<br>Per unit: × | Graphically shown (interpretation needed).<br>The same terminology should be used. |
| Recycling rate                              | 4 | ×  | There are many complicated or ambiguous factors.                                   |
| Emissions of substances subject to PRTR law | 4 | □  | Comparison among three companies is possible.                                      |

□: conditionally comparable

×: incomparable

## 7. A Comparison between 2000 and 2001 Editions of Environmental Reports

### (1) Automobile Industry

We also analyzed the 2001 editions of the environmental reports of the three companies whose 2000 versions had been analyzed. As a result, a number of improvements can be seen: for example, in some cases, data disclosure items have been increased, and explanations of the meaning of data have been added. It appears that the trend is toward enhanced comparability.

More specifically, improvements could be seen in the following points. Toyota newly added a graph showing changes in the total amount of water used by the automobile production plants, so it is now possible to compare the amounts of water used by the three companies in the entire production process. In addition to the data on COD levels in effluents from each Toyota plant, Toyota also includes a graph showing “changes in COD levels in effluents.” Honda newly provided information about emissions of VOC at their Suzuka and Saitama plants.

In connection with wastes, Nissan newly included a graph showing amounts of waste generated each year. Toyota provided a new definition of recycling in a mathematical expression. The fact that Toyota and Nissan provide expanded information relating to underground water pollution deserves special mention.

The parameter “coverage” is the most fundamental information for an examination of comparability and the remarks made on this subject by Toyota and Nissan show no difference between 2000 and 2001. Toyota describes as, “business activities focusing on automobile production in Japan” and Nissan, “the global Nissan Group, including overseas operations.” Honda however, which stated in their 2000 edition “(they) focus principally on environmental



efforts made in Japan,” and “environmental data and examples of activities in major production bases overseas,” changed in their 2001 edition to the phrase, “(they) cover mainly Honda Motor Co., Ltd., Honda R&D Co., Ltd. and Honda Engineering and also some overseas production companies and local overseas subsidiaries.” In this way, mentioning companies within Japan by name, Honda has become more specific in defining their coverage. In the automobile industry, there are companies carrying out a wide range of businesses in addition to automobile production and clarification of coverage should be the first step in enhancing comparability in this industry.

## **(2) Beer Brewery Industry**

The beer brewery industry is well advanced in information disclosure, and all the four companies are continuing to redouble their efforts. Below is a description of environmental reporting in the industry, including principal changes.

The environmental reports of all the four companies increased in volume. Asahi’s report volume has increased by 50 percent, Suntory’s by 44 percent and Sapporo’s by 25 percent. Although Kirin’s report volume has slightly decreased, they include a CD-ROM and add site reports, so overall their report shows a considerable increase in volume.

Newly added information include expansion of data for each brewing factory, expansion of information in the social aspect to reflect the GRI guidelines, and expansion of environmental communication. Both Kirin and Suntory state clearly that their reports were based on the GRI guidelines.

While three out of the four companies did not include enough information on “coverage and covered period” in their 2000 editions, all the four have attained the same level of disclosure in their 2001 editions. In 2001 Asahi clearly distinguishes between non-consolidated and consolidated data, while Suntory includes a new section entitled, “Overseas Efforts.”

Concerning “summary of business,” in 2000 only one company mentioned “sales by department,” but three out of the four companies record information on this in 2001. Eco-efficiency in relation to beer production volumes was calculated based on the information in the 2000 edition, and the 2001 edition seems to make comparison of eco-efficiencies in relation to sales a little easier.

Points which do not show much progress are that energy is not expressed in joules; the consumption of reusable energy is recorded for model breweries only, making comparisons with total energy consumption for the entire company impossible; and calculations and breakdowns of greenhouse effect gases lack consistency or clarity. Further efforts by all the four companies in these areas are to be hoped for.

## **(3) Chemical Industry**

If we look at the information which the four companies offer about coverage in their 2001 editions, we find that Sekisui has classified business sites, factories and affiliates according to

their newly introduced “company” system, adding an explanation of their basic policy in selecting which business sites are covered. Asahi has expanded their coverage to include the whole Group and increased the number of affiliates covered. They also additionally record not just the names of the factories in various regions, but also the contents of each factory’s business and the items produced there. Mitsubishi gives the names of their business sites, factories and affiliates in the section describing the summary of business and it is assumed that those named here are those covered in their environmental report. Sumitomo newly provides coverage information, and states that they have totaled the numerical data for “all factories in Japan (five).”

All the four companies have expanded information on sales. Both Sekisui and Asahi newly provide bar charts showing consolidated sales over the past three years and record numerical data on their actual performance. Mitsubishi has started to provide a summary of business and record figures for both non-consolidated and consolidated sales. Sumitomo newly adds non-consolidated sales within the summary of business section.

Concerning how to present environmental performance data, Sekisui, in their 2001 edition, has adopted the approach of having actual performance numerical data appear on all graphs. This approach is to be applauded since in the aspect of comparability, numerical data shown on a graph enhance accuracy in comparison.

Sekisui, Asahi and Mitsubishi have each newly compiled a flow chart of waste generation and processing, for the section in their environmental reports dealing with wastes and recycling rates. Actual values for the amount of wastes generated, the amount of wastes subjected to intermediate treatment, the amount of wastes recycled, and the amount of wastes disposed of are shown in a flow chart which makes comparison between companies easier. Sumitomo does not provide a flow chart, but they add a graph showing the amount of wastes generated to the graphs on the amount of landfill waste and the amount of wastes externally recycled, so comparison with other companies is possible by reading the numerical data from the graphs.

Mitsubishi and Sumitomo have also expanded their disclosure concerning PRTR substances and give lists showing the emissions and transfers of the main PRTR substances.

Table 8 shows the particular disclosure items which have been newly added and expanded in the 2001 editions of environmental reports.

**Table 8 Newly added and expanded items in the environmental reports issued in 2001  
(compared with those in 2000)**

| Industry     | Coverage, sales/output, etc.   | Environmental performance data, etc.   |
|--------------|--|--|
| Automobile   | <p>[Coverage]<br/>Honda gives the names of three domestic companies and states that their report covers some of their overseas manufacturing companies and local subsidiaries (no change in information provided by Toyota and Nissan)</p> <p>[Sales/output, etc.]<br/>Nissan newly discloses a consolidated number of vehicles produced (no change in information provided by Toyota and Honda).</p>  | <p>(1) Since Toyota graphically shows changes in the total amount of water used over years, comparison among the three companies in the amount of water used in their entire production process is now possible.</p> <p>(2) As for amounts of wastes, Nissan graphically shows amounts of wastes generated each year. Toyota indicates a new mathematical expression which defines a recycling rate.</p> <p>(3) Toyota and Nissan provide a lot of information on groundwater pollution.</p> |
| Beer brewery | <p>[Coverage]<br/>The quantity and quality of information provided by the four companies are similar. Asahi distinguishes between consolidated and non-consolidated; Suntory adds a section which explains overseas environmental efforts.</p> <p>[Sales/output, etc.]<br/>The number of companies stating sales department by department has increased from 1 to 3.</p>   | <p>(1) Asahi, Sapporo, and Suntory newly add site data or reports on environmental impact concerning individual business sites, factories and affiliates.</p> <p>(2) In Kirin's report, the attached CD ROM graphically documents their environmental efforts and gives actual performance data in detail.</p>   |
| Chemicals    | <p>[Coverage]<br/>The four companies give more information in 2001 than in 2000. Efforts in this direction should be continued.</p> <p>[Sales/output, etc.]<br/>The four companies give adequate levels of sales data. Sekisui and Asahi show consolidated sales in the past three years in the form of bar charts with numeric data. Mitsubishi newly adds a summary of business and gives both consolidated and non-consolidated sales data. Sumitomo newly adds non-consolidated sales data to the summary of business.</p> | <p>(1) As for information on amounts of wastes and recycling rates, Sekisui, Asahi and Mitsubishi provide flowcharts showing flows of waste generation and processing.</p> <p>(2) Mitsubishi and Sumitomo provide detailed information relating to the PRTR law along with lists of emissions and transfers of PRTR substances.</p> <p>(3) Sekisui newly adds numeric data on actual performance to all bar graphs showing environmental impact data.</p>                                    |

## **8. Arguments and Conclusions**

The eleven companies in three industries surveyed in the present study, which compiled their environmental reports, are all household-name Japanese companies in these industries and their environmental reports are benchmarks.

The automobile industry has been one of the front runners in terms of its advanced efforts towards environmental disclosure. Environmental reports by companies in this industry contain a large amount of information which is wide-ranging in content. In this industry, detailed disclosure of environmental impact data for various plants and business sites is also well in progress. These reports clearly state how far they cover, or which domestic factories, business sites and affiliates and overseas operational bases and affiliates are covered. This enables readers to grasp fairly well the range covered by each report. It can be, therefore, said that coverage information is clearly given, but there still remains inconsistency in the type of information between companies and there are cases where the covered business sites and affiliates are unidentified, which hinders comparison of numerical data on environmental impact. The problem of coverage information is not confined to the automobile industry, but runs through the beer brewery and chemical industries surveyed in the present study.

All the four companies in the beer brewery industry have achieved zero emissions and their efforts to tackle environment issues are progressing. All the companies include a material flow chart in their environmental report showing the overall picture and since the manufacturing processes of these companies are similar, comparison is easy. Actual environmental impact data are provided for various parameters in flow charts, and of the three industries surveyed in the present study, beer brewing probably came top in terms of comparability of environmental impact data. Moreover, all the four companies record beer production volumes, which means it is possible to compare eco-efficiencies by calculating beer production volumes for each environmental impact parameter.

The chemical industry is a typical industry where the production process involves high energy consumption and high CO<sub>2</sub> emissions. It has also taken the lead in voluntary environmental, safety and health controls through Responsible Care efforts. However, companies involved in the chemical industry handle a wide range of chemicals and manufacture many different types of products, which hinders comparability of numerical data. In particular, comparison is difficult when the extent of coverage by the report is vague or unknown. In the chemical industry, comparability would be effectively increased by showing actual environmental impact data in a manner that the factories and business sites covered in the report are first identified and the input and output for each manufacturing process are shown in a flow chart.

If we look at the 2001 editions for the purpose of comparison, we can find traces everywhere of steady attempts by companies in all the three industries towards improving their environmental reports, including an increase in data disclosure items, expansion of contents, additional explanations of data, interpretation of definitions, and efforts towards

easy-to-understand coverage information. Since prior to the publication of the 2001 editions, the Ministry of the Environment issued Environmental Reporting Guidelines in February of the same year, it seems likely that the improvements in the 2001 editions of environmental reports are attributable to these Guidelines under the influence of which they are assumed to have been compiled.

From the above discussion, it is clear that as far as numerical data contained in environmental reports are concerned, there are substantial discrepancies in comparability depending on the industry. However, for the sake of enhancing comparability, companies in all industries should continue efforts to give more clear and more standardized information on the extent of coverage by their reports. It is also important to move towards further standardization in the ways of calculating and expressing numerical data and using unit systems for them. Further painstaking efforts in this direction should be continued.

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