Results of the 4th Follow-up to the Keidanren Voluntary Action Plan on the Environment

(Global Warming Measures; Report by Industry)

October 19, 2001

Japan Federation of Economic Organizations (Keidanren)

Guide to Reading the Section on Specific Industries

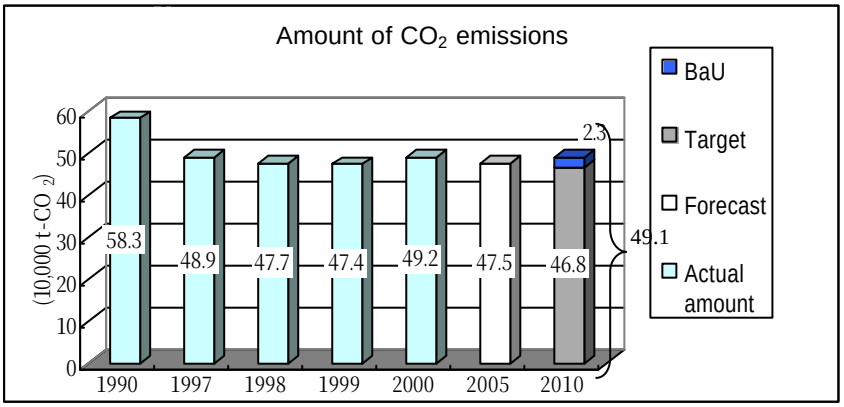
Name of Industry

Goals

1. Degree of progress toward goals

→ Graphic representation of the progress being made by each industry toward its declared goals. In the event of multiple goals, an industry's progress is depicted separately for each goal.

*BAU=Amount of increase in CO_2 emissions, energy consumption, CO_2 emissions intensity, or energy intensity, etc. that would be expected in fiscal 2010, if the action plan as of fiscal 2001 were not put into practice from fiscal year 2001 on.



If no measures were taken, CO_2 emissions in 2010 would be 0.491 million t-CO_2, more than the target amount by 0.23 million t-CO_2.

2. CO_2 emissions

→ Graphic representations of CO_2 emissions by each industry. For industries that have defined their goals in terms of CO_2 emissions, this graph appears under "Degree of progress toward goals," rather than under item 2.

3. Measures undertaken to achieve goals

●Major undertakings

→Major undertakings that each industry has included in its Voluntary Action Plan in order to achieve its target.

● Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

→Specific anti-global warming measures carried out in fiscal 2000, their investment costs and effects on CO_2 emissions reduction.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990-2000

→Major factors which account for the fact that CO_2 emissions in fiscal 2000 increased or decreased in comparison with 1990. The chart shows the increase or decrease attributed to each factor: improvements in electric power use per unit output; efforts to reduce emissions by various segments of the industry; economic expansion (change in quantities produced etc.).

5. Reference data

→ Prepared on the basis of data provided by the respective industries, other than that given above.

6. Other efforts to deal with global warming

●Emissions from offices and internal distribution

→ CO_2 emissions accompanying use of offices (headquarters, branches, etc.) and internal distribution.

●Contributions to the transportation, offices and households sector (effect of products and services)

→ Specific examples of efforts that are contributing toward the reduction of CO_2 from the transportation, offices and households sector.

●Measures to deal with greenhouse gases other than CO_2

→ Examples of measures being taken to reduce substitute chlorofluorocarbons (HFC, PFC, SF_6), methane, and nitrous oxide.

●Projects implemented with regard for the Kyoto mechanism

→ Examples of AIJ, JI, CDM or other activities, implemented with regard for the Kyoto mechanism.

7. Environmental management; environmental conservation in overseas business activities

→ Updates on ISO 14001 acquisition; reports on environmental conservation activities overseas.

Footnotes:

→ When necessary, the following kinds of information are recorded: basic data on each industry (e.g., principal products, percentage of participating companies, etc.); assumptions underlying the calculation of forecasts for fiscal 2010; methods to estimate CO_2 emissions by each industry (e.g., use of demand-end electricity rather than power generating-end electricity in calculations of electric power per unit of output); and so on.

Contents

- **The items in parentheses indicate the indices being used to define the goals of each industry.**
- **E: Energy Converting Sector, I: Industrial Sector, O: Offices and Households Sector, T: Transportation Sector**

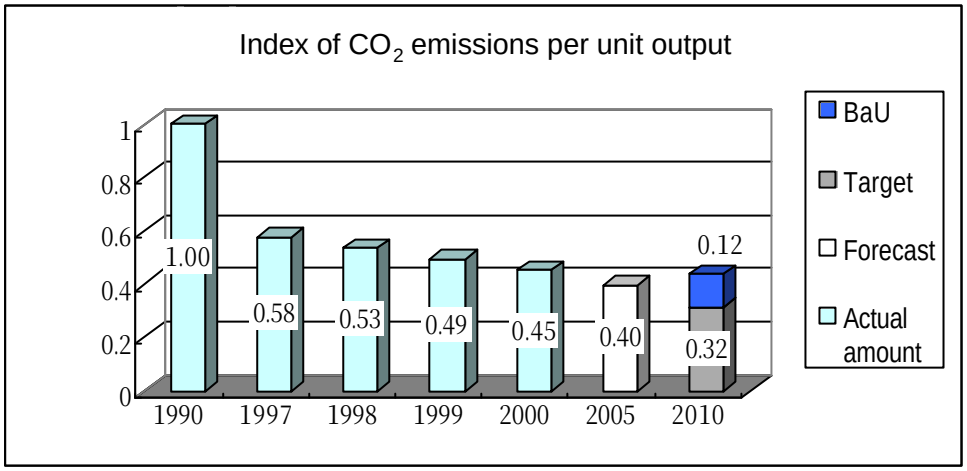
{Energy input per unit output}

{Others}

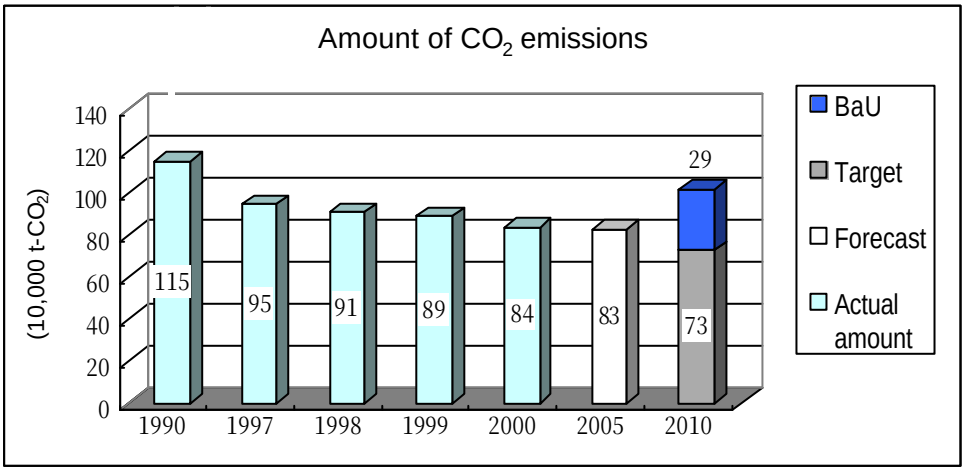
Japan Gas Association

Target: To reduce CO_2 emissions in fiscal 2010 to 730,000 t-CO_2 from 1.15 million t-CO_2 in fiscal 1990; this will be accomplished by reducing the index of CO_2 emissions per unit output (m^3 of gas) in city gas manufacturing and distribution to 1/3 of the level of fiscal 1990.

1. Degree of progress toward goal



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.



Note: Emissions are amounts resulting from the production and distribution of city gas.

Assuming a value of 1 for CO_2 emissions from city gas manufacture and distribution in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.58 in fiscal 1997, 0.53 in fiscal 1998, 0.49 in fiscal 1999, and 0.45 in fiscal 2000. The industry is forecasting an index value of 0.40 for fiscal 2005, and has established a target value of 0.32 for fiscal 2010. It has recorded the following amount of CO_2 emissions: 1.15 million t-CO_2 in fiscal 1990; 950,000 t-CO_2 in fiscal 1997; 910,000 t-CO_2 in fiscal 1998; 890,000 t-CO_2 in fiscal 1999; and 840,000 t-CO_2 in fiscal 2000, the last a 27% reduction compared

to fiscal 1990. As this trend indicates, it is on track toward achieving its target for fiscal 2010. The industry is forecasting emissions of 830,000 t-CO_2 in fiscal 2005, a 28% decline compared to fiscal 1990, and from there aims to reduce emissions to 730,000 t-CO_2 in fiscal 2010, 37% less than the level in fiscal 1990.

Were a voluntary action plan not executed for the years following fiscal 2000, the industry forecasts that CO_2 emissions would be 1.02 million t-CO_2 in fiscal 2010, or 21% more than in fiscal 2000 and 11% less than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Improved the manufacturing efficiency of city gas by converting to production of high-caloric gas made from natural gas and other sources
  - Reduced the amounts of heating fuel used by adopting highly efficient LNG (liquefied natural gas) gasification facilities in place of reforming facilities, which burn naphtha, LPG, or other fuels and create reactions at high temperatures
  - Promoted various energy-conservation measures at city gas manufacturing plants

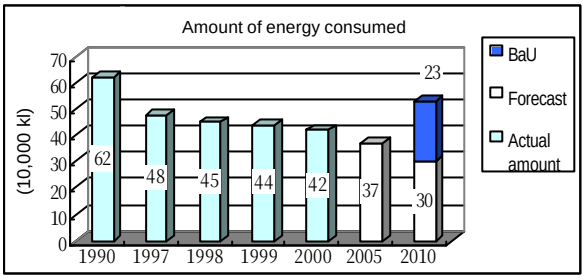
- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impacts made
  - Suppressed CO_2 emissions by reducing amounts of heating fuel used by converting to manufacture of high-caloric gas made from natural gas, etc.
  - Promoted various energy-conservation measures at city gas manufacturing plants
    a. Reduced the power required for compression by using LNG generation and by re-liquefying BOG (gas formed through spontaneous gasification within LNG tanks)
    b. Increased efficiency of LNG gasification facilities and sea water pumps

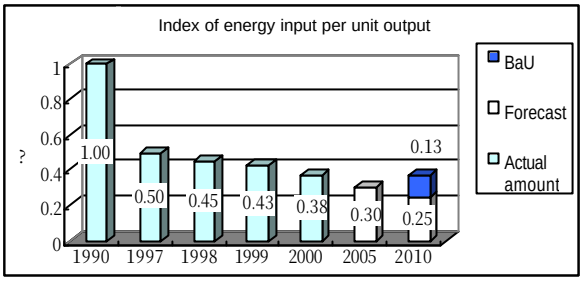
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The following is an analysis of the factors contributing to the 27% decline in CO_2 emissions between fiscal 1990 and fiscal 2000. For electric power, BAU on a fiscal 1990 basis for fiscal 2000 was calculated using standard per-unit-of-output figures for thermal electricity.

Improvement in electric power input per unit output	-20,000 t-CO_2	-2%
Efforts to reduce emissions by various segments of the industry	-1,130,000 t-CO_2	-98%
Economic expansion (changes in production output, etc.)	840,000 t-CO_2	73%
Total	-310,000 t-CO_2	-27%

5. Reference data





Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

The industry has recorded the following amounts of energy consumption (in terms of crude oil equivalents): 620,000 kl in fiscal 1990; 480,000 kl in fiscal 1997; 450,000 kl in fiscal 1998; 440,000 kl in fiscal 1999; and 420,000 kl in fiscal 2000. It is forecasting consumption of 370,000 kl in fiscal 2005 and 300,000 kl in fiscal 2010, 40% and 52% reductions, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, energy consumption in 2010 would be 530,000 kl, a 15% decline compared to fiscal 1990. Finally, assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit output stood at 0.50 in fiscal 1997, 0.45 in fiscal 1998, 0.43 in fiscal 1999, and 0.38 in fiscal 2000. The industry is forecasting index values of 0.30 and 0.25 for fiscal 2005 and 2010, respectively.

6. Other efforts to deal with glo bal warming

- Emissions from offices and internal distribution

In both fiscal 1999 and 2000, the industrial emitted 110,000 tons of CO_2 from its offices and other locations, consuming 50,000 kl worth of energy in each of those years. Also in fiscal 1999 and 2000, it emitted 10,000 tons of CO_2 through activities related to internal distribution, consuming 10,000 kl worth of energy in each of those years.

- Contributions to the transportation, offices and households sector (effect of products and services)
  - Reduced CO_2 emissions by fostering wider use of cogeneration and dispersed power sources, such as fuel cells
  - Reduced emissions of atmospheric pollutants by promoting wider use of vehicles powered by natural gas

7. Environmental management; environmental conservation in overseas business activities

- 13 firms obtained ISO 14001 certification. The amount of gas manufactured at facilities operated by these firms accounted for approximately 83% of all gas manufactured nationwide.
- With a focus primarily on the developing nations, companies are involved in technology transfer of anti-global warming technologies. Examples include:

a. Participation in the establishment of a city gas and community air conditioning joint venture, and provision of technology to the joint venture (Malaysia)
b. Provision of independently developed afforestation technology that uses microorganisms to reestablish forests in environmentally devastated areas (Indonesia)
c. Provision of technology for waste-water treatment facilities (China)

Note 1: The principal product of this industry is city gas, and the percentage of companies participating in this follow-up survey was 100% (238 producers). CO_2 emissions related to offices and transportation are the summation of figures provided primarily by three firms (which accounted for 75% of gas sold nationwide).

Note 2: In calculating CO_2 emissions resulting from the purchase of electricity, the industry has used figures on a power demand-end basis.

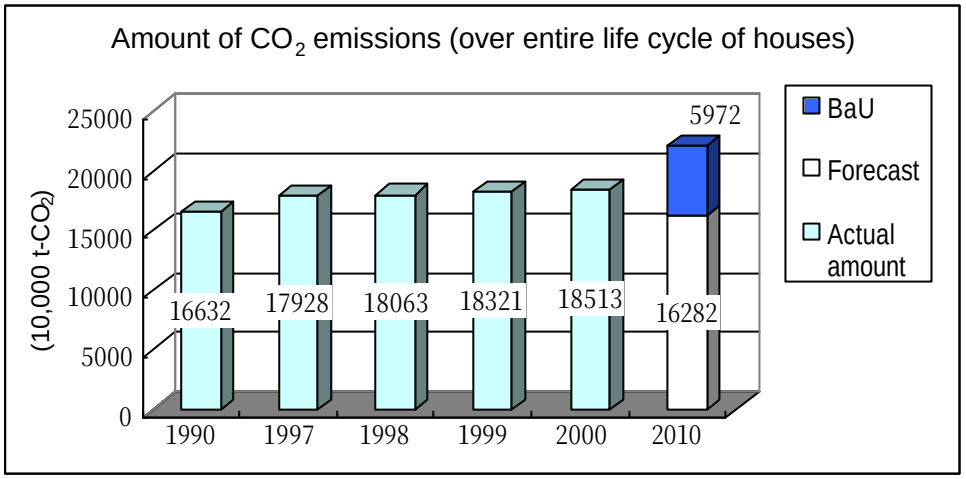
Note 3: Emissions in fiscal 2010 on a business as usual basis, in case a voluntary action plan were not executed for the years following fiscal 2000, were calculated by multiplying the gas manufacturing ratio in 2010 by the amount of CO_2 emissions in fiscal 2000. The difference in CO_2 emissions resulting from differences in amounts of electricity purchased under the target scenario vs. the BaU scenario were calculated using standard per-unit-of-output figures for thermal electricity.

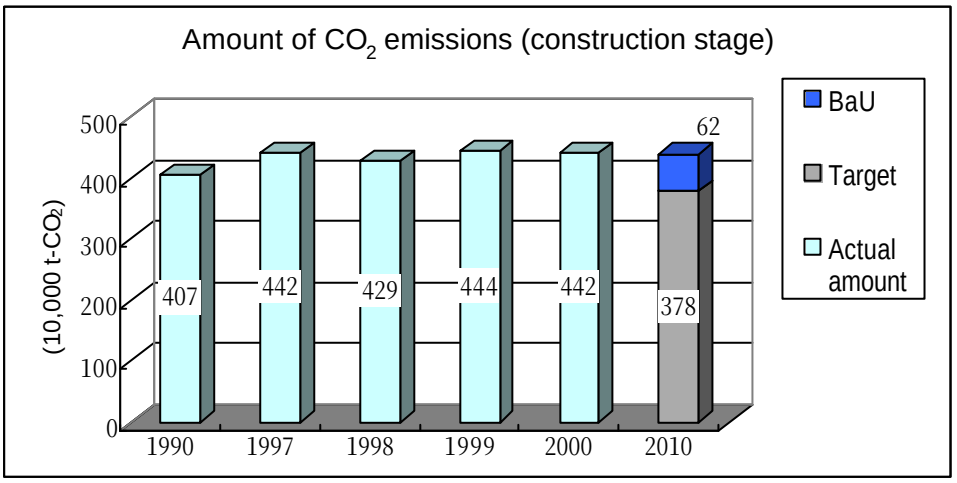
Note 4: City gas manufactured in fiscal 2000 totaled 25.3 billion m^3 (converted at 41,860 kJ/m^3), or approximately 1.6 times the amount manufactured in fiscal 1990. The industry forecasts that city gas production in fiscal 2010 will be roughly twice the amount produced in 1990 (estimating that production will be 32.0 billion m^3, based on forecasts of long-term energy demand).

Japan Federation of Housing Organizations

Target: To reduce CO_2 emissions at each stage of the housing life cycle, and, collectively, to stabilize emissions over the entire life cycle of houses at fiscal1990 levels by fiscal 2010.

1. Degree of progress toward goal





The housing industry estimates that, over their entire life cycles, houses have emitted the following amounts of CO_2: 166.32 million t-CO_2 in fiscal 1990; 179.28 million t-CO_2 in fiscal 1997; 180.63 million t-CO_2 in fiscal 1998; 183.21 million t-CO_2 in fiscal 1999; and 185.13 million t-CO_2 in fiscal 2000. The industry forecasts emissions of 162.82 million t-CO_2 in fiscal 2010, a 2% decline compared to fiscal 1990.To achieve its goals, it is evaluating and preparing housing construction guidelines on adoption of environmentally sensitive construction methods, use of wood from tropical regions, etc. for each stage of the housing life cycle. Were the voluntary action plan not executed, CO_2 emissions in 2010 would be 222.55 million t-CO_2, 34% higher than in fiscal 1990.

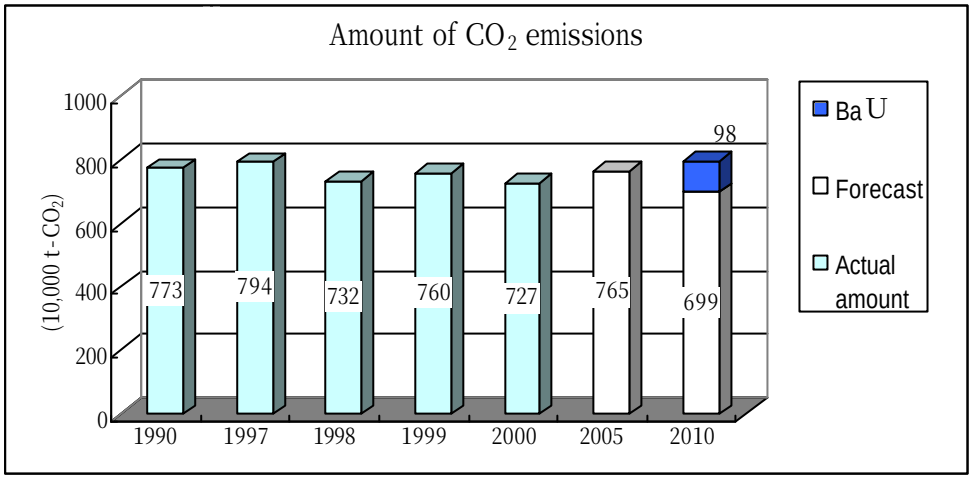
The industry estimates that it has emitted the following amounts of CO_2 during the construction of housing: 4.07 million t-CO_2 in fiscal 1990; 4.42 million t-CO_2 in fiscal 1997; 4.29 million t-CO_2 in fiscal 1998; 4.44 million t-CO_2 in fiscal 1999; and 4.42 million t-CO_2 in fiscal 2000. Its goal for fiscal 2010 is 3.78 million tCO_2, a 7% reduction compared to fiscal 1990. Were a voluntary action plan not executed, emissions in 2010 would be 4.40 million t-CO_2, or 8% more than in fiscal 1990.

Note: The housing life cycle is divided into the following stages: materials stage; construction stage; use stage (renovations); use stage (energy consumption); demolition stage; and disposal stage. The following assumptions are built into the forecast targeted for fiscal 2010--new housing starts (average): 1.46 million/year for fiscal 1990~2000; 1.39 million/year for fiscal 2001~2005; 1.23 million/year for fiscal 2006~2010; and 860,000/year for fiscal 2011~2020. The forecast also assumes that size of construction (floor space per unit) will maintain the same pace of growth per unit as it did over the most recent 10-year period (from fiscal 1986–fiscal 1995), during which time floor space expanded by 1.14 times.

Japan Auto Parts Industries Association

Target: To reduce CO_2 emissions by 7% of the level of fiscal 1990 by fiscal 2010.

1. Degree of progress toward goal



The auto parts industry has emitted the following amounts of CO_2: 7.73 million t-CO_2 in fiscal 1990; 7.94 million t-CO_2 in fiscal 1997; 7.32 million t-CO_2 in fiscal 1998; 7.60 million t-CO_2 in fiscal 1999; and 7.27 million t-CO_2 in fiscal 2000. It is forecasting emissions of 7.65 million t-CO_2 in fiscal 2005, a 1% decline compared to fiscal 1990. It is aiming for a 7% reduction in emissions in fiscal 2010 compared to fiscal 1990; the outlook now is for it to achieve a 10% reduction in that year vis-à-vis 1990 to 6.99 million t-CO_2. Were the voluntary action plan not executed, the forecast for CO_2 emissions in fiscal 2010 would be 7.97 million t-CO_2, 3% higher than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Improving methods of operation, including ending the practice of keeping machinery on during off-production times
  - Improving the efficiency of equipment and machinery
  - Rationalizing processes
  - Co-generation and other methods of recovering waste energy
  - Mutual awareness-raising and sharing of information on energy-saving technologies.

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

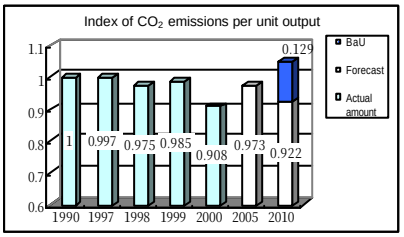
  Because this industry uses a broad spectrum of manufacturing processes, it is

difficult gauge the effectiveness of energy-conserving implementations on a unified basis. Consequently, the association is in the process of surveying energy conservation implementations for the five categories of "daily management," "operational management," "process improvements," "introduction of energy-conserving equipment," and "heat source/fuel conversion and heat recovery," as a means of promoting the sharing of information on the various conservation measures and technologies implemented by its members. Furthermore, the association seeks to acquaint its members with new energy conservation technologies. Many companies are developing energy conservation measures as part of their efforts to acquire ISO 14001 certification.

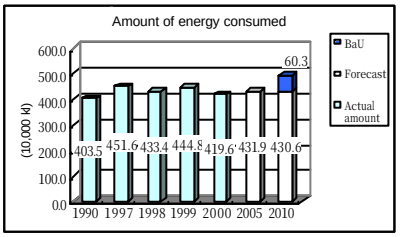
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

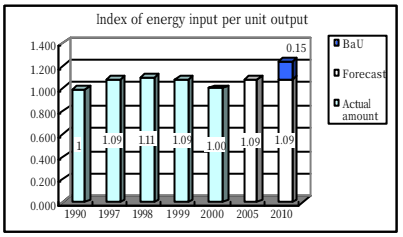
- Due to a rise in the value of shipments, consumption of electricity, the main energy source for the industry, rose by 3.5%, but significant changes occurred in other energy forms: coal consumption dropped by 17% and class-A heavy oil consumption fell by 19.1%. Consequently, the amount of CO_2 emissions declined as energy conservation efforts continued to take root, with many member companies introducing cogenerating devices and other energy-saving equipment, and pursuing conservation activities as part of ISO 14001 efforts.
- The decline in CO_2 emissions of energy sources other than electricity was a large 7.3%, contributing to a total decrease of 4.4%.

5. Reference data



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.





Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

Assigning a value of 1 to amounts emitted in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.997 in fiscal 1997, 0.975 in fiscal 1998, 0.985 in fiscal 1999, and 0.908 in fiscal 2000. The industry is forecasting index values of 0.973 in fiscal 2005 and 0.922 in fiscal 2010.

The industry has recorded the following amounts of energy consumption: 4.035 million kl in fiscal 1990; 4.516 million kl in fiscal 1997; 4.334 million kl in fiscal 1998; 4.448 million kl in fiscal 1999; and 4.196 million kl in fiscal 2000. It is forecasting consumption of 4.319 million kl in fiscal 2005 and 4.306 million kl in fiscal 2010, both levels 7% higher than in fiscal 1990. Were a voluntary action plan not executed, energy consumption in fiscal 2010 would be 4.909 million kl, or a 22% increase over fiscal 1990.

Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit of output stood at 1.09 in fiscal 1997, 1.11 in fiscal 1998, 1.09 in fiscal 1999, and 1.00 in fiscal 2000. The industry is forecasting index values of 1.09 for both fiscal 2005 and fiscal 2010.

6. Other efforts to deal with global warming

- Measures to deal with greenhouse gases other than CO_2

With regard to coolants in car air conditioning systems, the industry is collecting and decomposing designated chlorofluorocarbons (CFC 12) and substitute chlorofluorocarbons (HFC 134a) using systems developed by the Automobile Recycling Promotion Center.

7. Environmental management; environmental conservation in overseas business activities

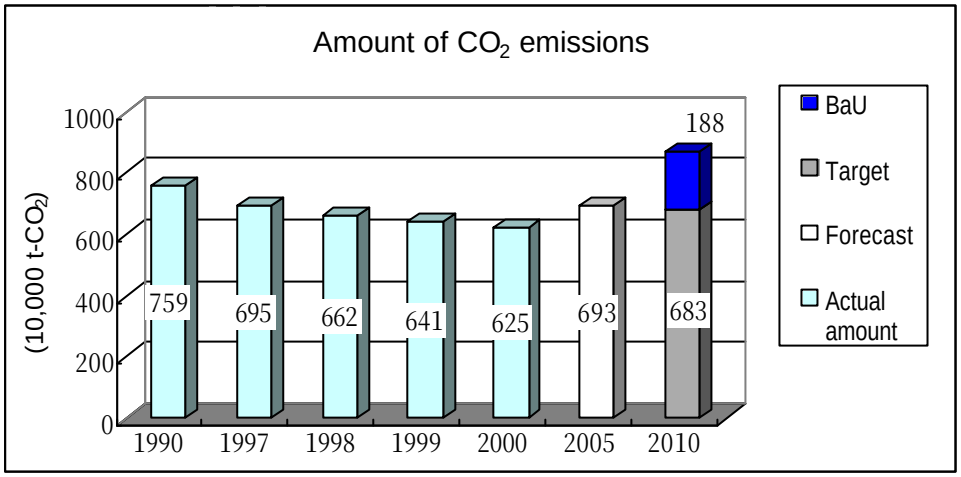
The association is advancing efforts by small and medium-sized companies to acquire ISO 14001 certification through guidance in green procurement methods. The association also supports training for certification consultants and internal auditors. Although the association has not specified any particular guidelines for overseas business activities, the member companies are voluntarily implementing environmental management in such operations.

Note: The principal products of this industry are automobile parts (excluding tires, batteries, window glass, etc.). The participation rate by companies in this follow-up survey was 40.6% (183 out of 451 companies), representing a coverage of approximately 66% in terms of energy consumption. Based on the outlook for value of production through fiscal 2005, the industry is forecasting that the value of shipments of auto parts in fiscal 2010 (including exports and overseas production) will remain mostly flat at just over ¥13 trillion throughout the forecast period. CO_2 emission amounts were calculated from the data of association members (86 companies) and companies responding to the association's questionnaire, i.e., the data pool that serves as the base for the association's annual survey report. The association calculated the CO_2 emission ratio against the value of shipments for both sets of companies, and used this ratio with the association's total value of shipments to calculate the entire CO_2 emission amount for all association companies together.

Japan Automobile Manufacturers Association

Target: To reduce CO_2 emission from production plants in the automobile industry by 10% of the level of fiscal 1990 by fiscal 2010.

1. Degree of progress toward goal



The automobile industry has emitted the following amounts of CO_2 through its manufacturing activities: 7.59 million t-CO_2 in fiscal 1990; 6.95 million t-CO_2 in fiscal 1997; 6.62 million t-CO_2 in fiscal 1998; 6.41 million t-CO_2 in fiscal 1999; and 6.25 million t-CO_2 in fiscal 2000. The industry is aiming to achieve CO_2 emissions of 6.93 million t-CO_2 in fiscal 2005 and 6.83 million t-CO_2 in fiscal 2010, the latter representing a 10% decrease compared to fiscal 1990. Were a voluntary action plan not executed, emissions in fiscal 2010 would be 8.71 million t-CO_2, 15% higher than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Applying energy conservation measures to all phases of production as has been done to date (measures dealing with supplies of energy, and with equipment consuming large amounts of energy)
  - Enhancing the sophistication of operations and control technology (establishing careful controls over different forms of energy use, such that energy consumption is linked to the quantity of production)
  - Increasing the efficiency of materials handling processes, through use of lighter materials, reductions of portions needed to be machined and trimmed, etc.

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

In fiscal 2000, the industry not only continued the ongoing environmental efforts it adopted in previous years, but also aggressively engaged in the integration and elimination of equipment and many other measures for conserving energy and reducing the amount of CO_2 emissions. The major energy-conserving measures that were undertaken are as follows.

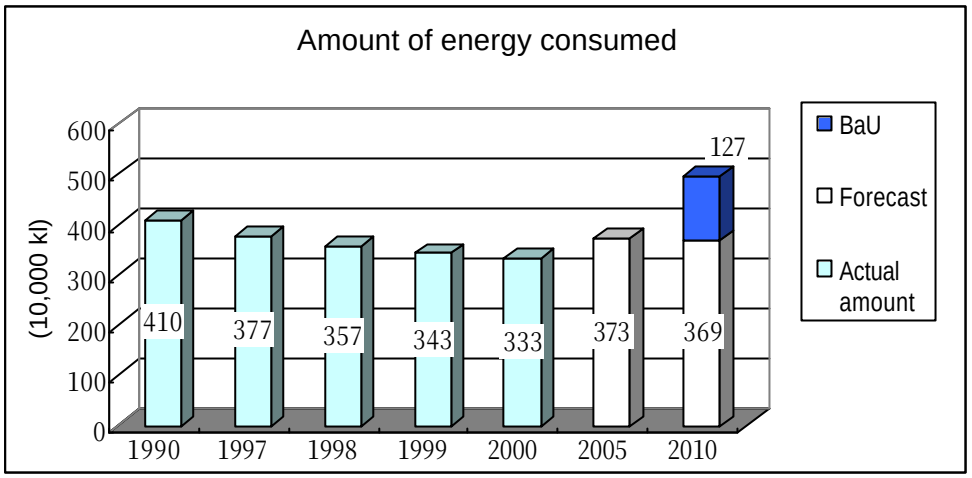
- Equipment-related measures: As measures for improving energy supply, automakers introduced co-generation, made improvements to compressors and air conditioners, and raised the efficiency of boilers and steam feeders. As measures for reducing energy consumption, automakers introduced energy-conserving production lines, installed regenerating burners, installed inverters into pump controls, and improved the casting process.
- Improvement of productivity: Manufacturers enhanced operational management by improving the heated air ratio of drying furnaces and optimizing the air flow in paint booths, combined and eliminated production lines to correspond production volume.
- Conversion to other fuels.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

As a result of the continuation of ongoing measures and the vigorous adoption of new energy conservation measures, the amount of CO_2 emissions dropped to 6.25 million t-CO_2 in fiscal 2000. This amount was 17.7% less than that of fiscal 1990, a decline greater than the 10.8% drop in production volume, and thus it indicates solid progress in the reduction of CO_2 emissions. Moreover, the amount of CO_2 emissions in fiscal 2000 was 2.6% lower than that of fiscal 1999, even though production volume increased by 5.5%, further demonstrating the effectiveness of the industry's CO_2 reduction efforts.

- Increasing factors: Increased production, responses to product demands (increase in clean-energy vehicles, expanded use of safety devices and environment-related equipment), and improvements to the working environment
- Decreasing factors: Measures for improving equipment in terms of both energy supply (introduction of co-generation and improvement of compressors) and energy consumption (introduction of energy-conserving lines), enhancement of productivity through improved operational management and integration of lines, and conversion to other fuels

5. Reference data



The industry has consumed the following amounts of energy: 4.1 million kl in fiscal 1990; 3.77 million kl in fiscal 1997; 3.57 million kl in fiscal 1998; 3.43 million kl in fiscal 1999; and 3.33 million kl in fiscal 2000. It is forecasting consumption of 3.69 million kl in fiscal 2010, representing a 10% decrease compared to fiscal 1990. Were a voluntary action plan not executed, consumption would be 4.96 million kl in fiscal 2010, a 21% increase over fiscal 1990.

6. Other efforts to deal with global warming

- Contributions to the transportation, offices and households sector (effort of products and services)

The industry is promoting measures to increase fuel efficiency in automobiles and to develop and propagate clean-energy vehicles. It is also participating actively in Intelligent Transportation Systems in order to improve traffic flows. Moreover, by quickly committing itself to the production of vehicles that meet the fuel consumption standards of the revised energy conservation law, it is expected to achieve further improvements in automobile fuel efficiency hereafter, and thereby broadly reduce CO_2 emissions by the government's target of 3.2 million t-CO_2 in 2010.

- Measures to deal with greenhouse gases other than CO_2
  - Recovering designated chlorofluorocarbons (CFC 12) and employing technologies to decompose such gases

    From the standpoint of protecting the ozone layer and slowing the progress of global warming, the industry took action to rapidly convert from use of CFC 12 to HFC 134a as the coolant used in car air conditioning systems. In 1998, in cooperation with the auto parts, sales and servicing industries, the industry also began using an integrated system that enables it to collect and decompose CFC 12 from scrapped automobiles. Through August 2001, it had decomposed approximately 333 tons of CFC 12.

- Curbing emissions of HFC 134a
  HFC 134a, the coolant now used in car air conditioners, has one-sixth the impact on global warming as CFC 12. Moreover, the industry believes that, through its efforts to reduce the amounts of coolants used, to prevent leakage, and to improve methods of refilling, it has been able to reduce HFC 134a's global warming effects over its life span to around one-fifteenth that of CFC 12. The measures for curbing HFC 134a emissions are as follows.
  (1) Developing and using reduced-coolant air conditioners
  (2) Research on air conditioning systems that do not use HFC 134a
  (3) Construction and operation of HFC 134a recovery and decomposition systems

7. Environmental management; environmental conservation in overseas business activities

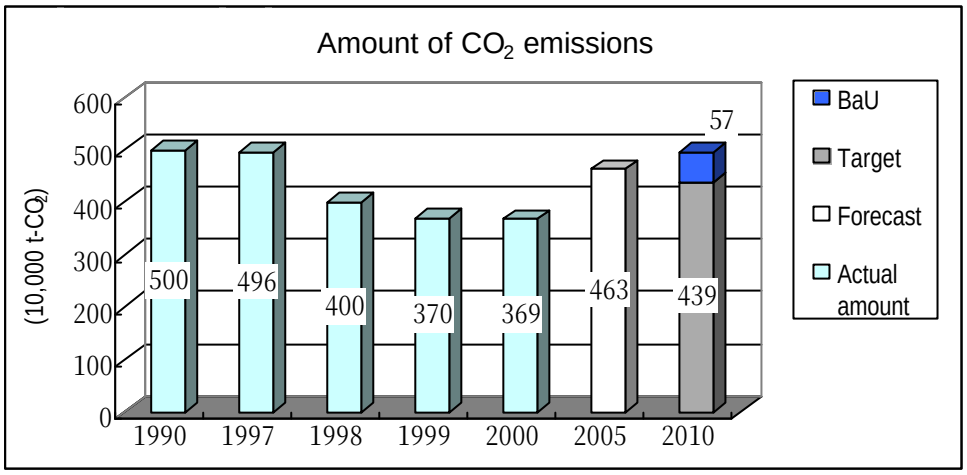
By obtaining ISO 14001 certification, the country's automobile manufacturers have been establishing systems that provide them with more effective means of dealing with the environment. In addition, the industry is carrying out surveys aimed at improving city environments in a number of Asian countries.

Note: The principal products of the industry are passenger cars and trucks, motorcycles, and KD components. The percentage of companies participating in this follow-up survey was 100% (13 companies), representing a coverage ratio for energy used of 100%. In its forecast for fiscal 2010, the industry assumes that production value in the target year would be the same as in fiscal 1990. The amount of CO_2 emissions forecast for fiscal 2010 was calculated by defining the CO_2 conversion coefficient for electricity as 0.104 kg-C/kWh (the fiscal 1990 value) and totaling the figures from the data of the 13 members' plants that manufacture 4-wheeled/2-wheeled vehicles and their parts.

Japan Federation of Construction Contractors;
Japan Civil Engineering Contractors' Association; Building Contractors Society

Target: With fiscal 1990 as the base year, to endeavor to reduce the CO_2 generated during construction work (on-site work) by 12% by fiscal 2010.

1. Degree of progress toward goal



The construction industry has emitted the following amounts of CO_2: 5.0 million t-CO_2 in fiscal 1990; 4.96 million tons t-CO_2 in fiscal 1997; 4.0 million t-CO_2 in fiscal 1998; 3.70 million tCO_2 in fiscal 1999; and 3.69 million tCO_2 in fiscal 2000. The industry finds that the fiscal 2000 decline in emissions was more the effect of a reduction of construction activity in the industry (resulting from lower private capital investment, cutbacks in public works spending and other factors), than it was the effect of the industry's efforts to reduce emissions. It is forecasting emissions of 4.63 million t-CO_2 in fiscal 2005, 7% less than in fiscal 1990. Its target for fiscal 2010 is 4.39 million t-CO_2, a 12% reduction compared to 1990. Were the voluntary action plan not executed, CO_2 emissions in fiscal 2010 would be 4.96 million t-CO_2 , or 1% less than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Turning engines off during idling.
  - Reducing the amount of rock and soil transported from construction sites.
  - Recycling rock and soil dug up at construction sites.
  - Reducing the amount of material and machinery transported to construction sites and reducing the amount of construction by-products generated.
  - Properly servicing heavy construction vehicles.
  - Reducing the by-products of construction activity.

- Turning lights off whenever they are not necessary.
- Promoting use of highly efficient construction-site electrical equipment.
- Reducing instances of excess cooling and heating.
- Promoting reasonable heating and cooling.
- Reasonable use of heaters etc. at construction sites.
- Training in fuel-efficient operation for drivers and machine operators

● Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made (selections from questionnaire responses)

Obayashi Corporation

- Construction-stage measures: Reduction of 57,000 t-CO_2 (compared to 1990)
- Design-stage measures
  - – Selection of materials: Reduction of 13,000 t-CO_2
  - – Operations-related measures: Reduction of 338,000 t-CO_2

Taisei Corporation

- Construction-stage measures: Reduction of 5,166 t-CO_2
- Design-stage measures: Reduction of 3,466 t-CO_2

(Estimated investment: ¥386 million

Takenaka Corporation

- Promotion of energy-conserving design: Reduction of 27,300 t-CO_2/year
- Promotion of ecologically minded purchase of blast furnace cement, electric furnace steel, etc.: Reduction of 16,500 t-CO_2 at the upstream industries
- Training in fuel-efficient operation of vehicles/machines in construction process
  Trucks: 25% improvement in fuel use, reduction of 5.5 t-CO_2/truck
  Heavy machinery: 18% improvement in fuel use, reduction of 8.6 t-$C0_2$/machine
- Reduction in dirt hauled and hauling distances; optimized servicing of heavy machinery; improvements in efficiency of temporary on-site equipment; turning off of lights at on-site offices; conversion of air conditioning equipment; and other construction-stage measures: Reduction of 3,825 t-CO_2
- Turning all lights off at certain times, and other office-related efforts: Reduction of 32.1 t-CO_2/year

The environmental reports of several other companies list various energy conservation measures and the resulting effect in reducing $C0_2$ emissions

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

In comparison to the benchmark year (fiscal 1990), CO_2 emissions per unit output were reduced by 9.92% in fiscal 2000. As the industry sees the amount of CO_2 emissions as being proportionate to the number of projects completed, the fiscal 2000 CO_2 emission amount has been calculated as 25.58% less than fiscal 1990. Although the number of projects completed was approximately 3% higher than in fiscal 1999, the overall amount of CO_2 emissions was lower because fiscal 2000 saw a decline in the proportion of civil engineering projects to building construction projects, the former being a major source of CO_2 emissions. The following is an analysis of the approximately 26% decrease in CO_2 emissions between fiscal 1990 and 2000.

Improvements in electric power use per unit output	0%
Efforts to reduce emissions by various segments of the industry	-10.71%
Economic expansion (changes in production output, etc.)	-14.87%
Total	-25.58%

6. Other efforts to deal with global warming

- Emissions from offices and internal distribution (selections from questionnaire responses)
  - Use of Web sites to offer diagnostic checks, planning assistance, and measures for energy conservation
  - Training in fuel-efficient operation of construction machinery and cargo trucks
  - Campaign to promote eco-friendly operation of construction machinery and cargo vehicles
  - Promotion of ecologically minded design, and formulation of energy conservation proposals
  - Development of eco-friendly housing
  - Energy conservation efforts in office operations

- Measures to deal with greenhouse gases other than CO_2
  - HFC: Proper recovery and disposal of HFC when tearing down buildings and performing repair projects
  - SF_6: Selection of transformers, breakers, etc. that do not use SF_6.

- Projects implemented with regard for the Kyoto mechanism (selections from questionnaire responses)
  - Provision of information for the transfer of environmental/energy-conservation technology to other countries (GEC, English-language environmental reports, Web sites, etc.)
  - Through the Live Cycle Assessment System for Customer Satisfaction,

evaluation of hypothetical benefits produced by CO_2 emissions trading, etc.

- Cooperation in the Environmental Project for Afforestation in China (Keidanren) by presiding over the executive committee

7. Environmental management; environmental conservation in overseas business activities

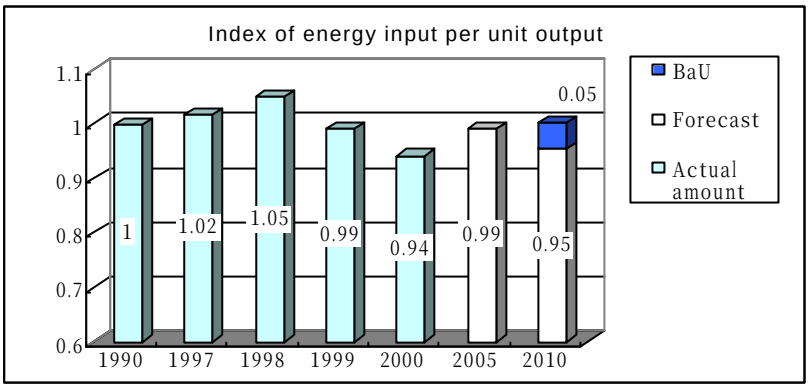
- Formation of environmental management systems (531 ISO 14001-certified operating centers as of July 2001)
- Creation of environmental-awareness reference: "Construction Industry Environmental Management System, Volume 7"
- Information dissemination: "Fiscal 2001 Compendium of Environmental Conservation Laws for the Construction Industry"
- Support and lectures for development of environmental management systems
- Other activities: Creation of "Environmental Accounting Guidelines for the Construction Industry" (interim summary), and "Green Procurement Guidelines" (interim report)

Note: The principal business of the industry is building and civil engineering construction. The participation rate in the current follow-up survey was 0.03% (180 companies out of 600,000 companies), representing 31% of total construction completed by the industry. For CO_2 emission amounts, the fiscal 1990 emissions per unit output value (as reckoned by the method used up to last year's report) was used as the base value, and the data collected for each reduction category (from the emission reduction activities that were conducted over the year in accordance with the CO_2 Emission Reduction Manual) was converted to CO_2 emissions per unit output using a set formula. These values were then deducted from the base value to arrive at each year's CO_2 emissions per unit value, which was multiplied by the year's volume of completed construction to generate an estimate for the amount of CO_2 emissions. The forecast for fiscal 2010 assumes that construction volume in the industry will remain unchanged from its level in fiscal 1996.

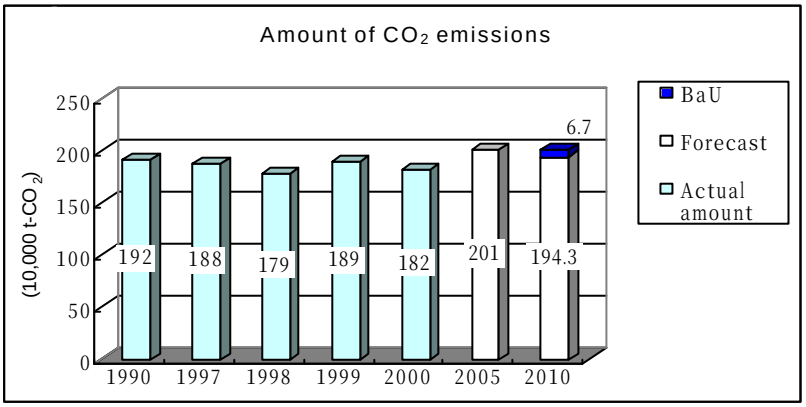
The Japan Rubber Manufacturers Association

Target: To maintain energy input per unit output and total CO_2 emissions at 1990 levels in 2010.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.



Assigning a value of 1 to energy consumption in fiscal 1990, the index of energy input per unit output stood at 1.02 in fiscal 1997, 1.05 in fiscal 1998, 0.99 in fiscal 1999, and 0.94 in fiscal 2000. The rubber industry is forecasting index values of 0.99 for fiscal 2005 and 0.95 for fiscal 2010.

The industry has emitted the following amounts of CO_2: 1.92 million t-CO_2 in fiscal 1990; 1.88 million tCO_2 in fiscal 1997; 1.79 million t-CO_2 in fiscal 1998; 1.89 million t-CO_2 in fiscal 1999; and 1.82 million in fiscal 2000. It is forecasting emissions of 2.01 million t-CO_2 for fiscal 2005, a 5% increase compared to fiscal 1990; and of 1.943 million t-CO_2 for fiscal 2010, a 1% increase compared to fiscal 1990. Were the voluntary action plan not executed, CO_2 emissions in fiscal 2010 would be 2.01 million t-CO_2, a 5% increase compared to fiscal 1990.

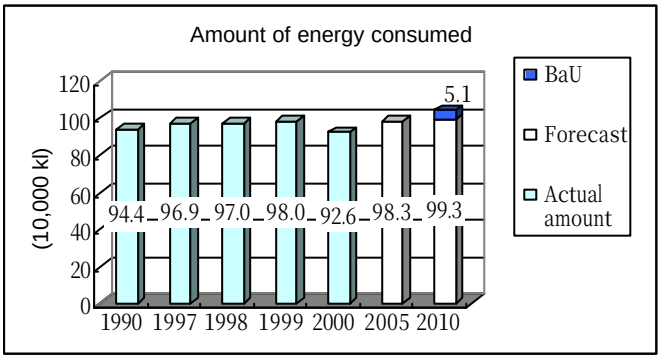
3. Measures undertaken to achieve goals

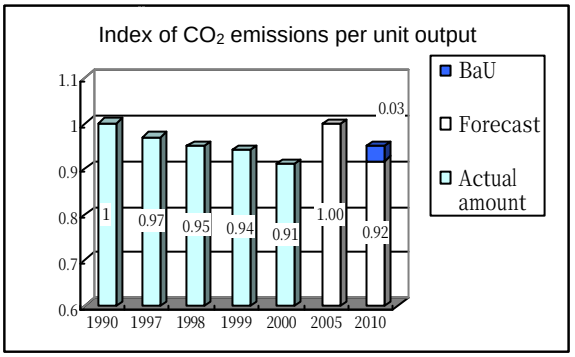
- Major undertakings
  - Control of revolutions in motors
  - Effective use of waste material
  - Recovery of waste heat
  - Introduction of cogeneration
  - Conversion to other fuels
  - Introduction of city gas

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The industry has been reducing its emissions of CO_2 through continued efforts at energy conservation, additions to installations of new cogeneration facilities, and adoption of highly efficient machinery, etc.

5. Reference data





Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

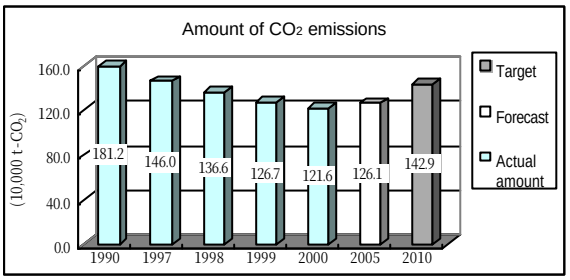
The industry has consumed the following amounts of energy (in terms of crude oil equivalents): 944,000 kl in fiscal 1990; 969,000 kl in fiscal 1997; 970,000 kl in fiscal 1998; 980,000 kl in fiscal 1999; and 926,000 kl in fiscal 2000. It is forecasting consumption of 983,000 kl in fiscal 2005 and 993,000 kl in fiscal 2010, 4% and 5% more, respectively, than in 1990. Assuming a value of 1 for emissions in fiscal 1990, the index of CO_2 emissions per unit of output stood at 0.97 in fiscal 1997, 0.95 in fiscal 1998, 0.94 in fiscal 1999, and 0.91 in fiscal 2000. The industry is forecasting index values of 1.00 for fiscal 2005 and 0.92 for fiscal 2010.

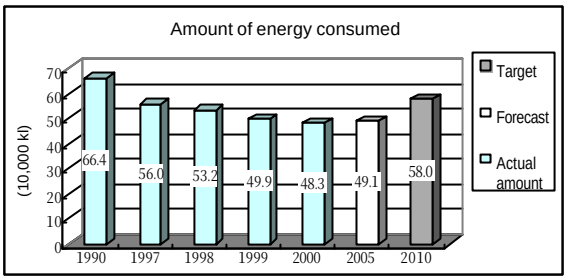
Note: The principal products in this industry are automobile tires, conveyor belts, rubber hoses, footwear, etc. The percentage of companies participating in this follow-up survey was 2.9% (23 out of 805 companies), representing a coverage rate of approximately 85% in terms of the consumption of new rubber. The forecast of production for fiscal 2010 (on the basis of consumption of new rubber) assumes an annual increase in production of 1% per year from a base year in fiscal 1998. Figures for energy consumption and for amounts of CO_2 emissions have been calculated by adding the data provided by the 23 member companies participating in the survey.

Japan Glass Bottle Association

Target: In relation to manufacturing processes, to reduce CO_2 emissions and energy consumption in 2010 by more than 10% compared to levels in 1990.

1. Degree of progress toward goal





Note: Emissions include CO_2 emitted from industrial processes.

The glass bottle industry has emitted the following amounts of CO_2: 1.812 million t-CO_2 in 1990; 1.460 million t-CO_2 in 1997; 1.366 million t-CO_2 in 1998; 1.267 million t-CO_2 in 1999; and 1.216 million t-CO_2 in 2000. The industry is forecasting emissions of 1.261 million t-CO_2 in 2005, a decrease of 30% compared to 1990, and has set a target of 1.429 million t-CO_2 for 2010, a decrease of 21% compared to 1990.

The industry has consumed the following amounts of energy (in terms of crude oil equivalents): 664,000 kl in 1990; 560,000 kl in 1997; 532,000 kl in 1998; 499,000 kl in 1999; and 483,000 kl in 2000. It is forecasting energy consumption of 491,000 kl in 2005, a decrease of 26% compared to 1990, and has set a target of 580,000 kl for 2010, a decrease of 13% compared to 1990.

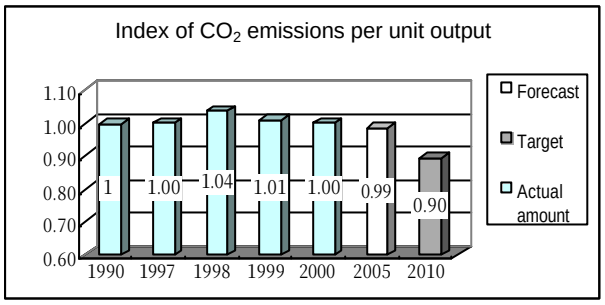
3. Measures undertaken to achieve goals

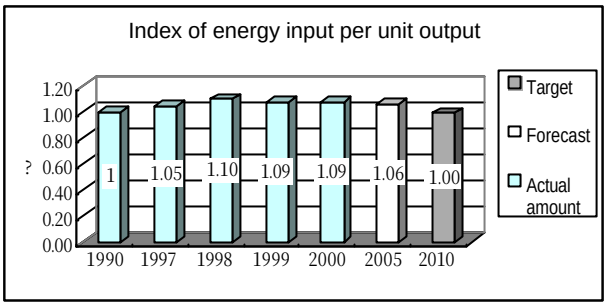
- Major undertakings
  - Increasing the rate of use of cullet
  - Promoting the production of eco-bottles
  - Encouraging a shift to lighter glass bottles
  - Improving yields of glass bottle production processes
  - Converting fuel gas in factories to LNG

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

CO_2 emissions dropped in response to a decline in production.

5. Reference data





(Note: The values in both graphs are based on production output as measured by weight of glass produced)

The index of CO_2 emissions per unit of output, based on a value of 1 for emissions in 1990, stood at: 1.00 in 1997; 1.04 in 1998; 1.01 in 1999; and 1.00 in 2000. The industry is forecasting an index value of 0.99 for 2005, and has set a target of 0.90 for 2010.

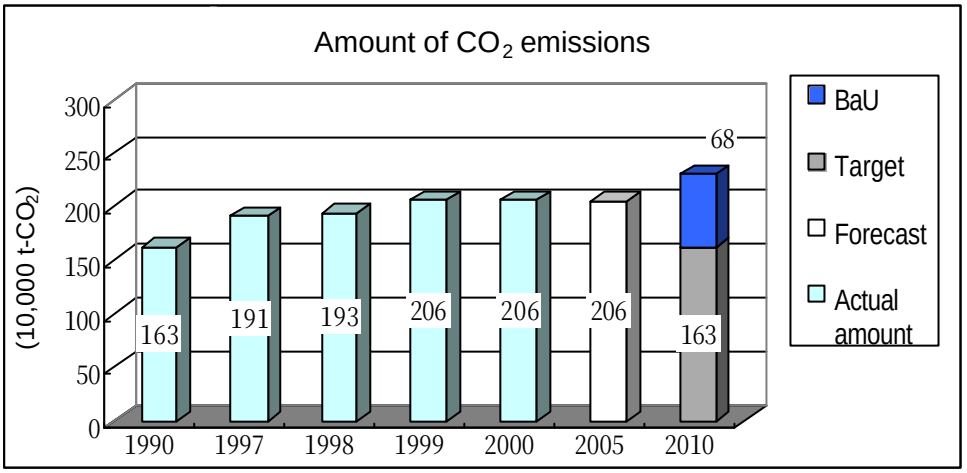
On the other hand, the index of energy input per unit of output, based on a value of 1 for energy consumption in 1990, stood at: 1.05 in 1997; 1.10 in 1998; and 1.09 in both 1999 and 2000. The industry is forecasting an index value of 1.06 for 2005, and has set a target of 1.00 for 2010.

Note: The principal product of the industry is glass bottles. Seven companies participated in the current follow-up survey (20% of the total of 35 companies), representing a coverage ratio in terms of production output of approximately 90%. CO_2 emission amounts were totaled from the data of the seven participating association members. The production forecast for 2010 assumes that production of glass bottles will increase by 1% per year after 1997.

Federation of Pharmaceutical Manufacturers' Association of Japan;
Japan Pharmaceutical Manufacturers Association

Target: To keep the amount of CO_2 emitted by pharmaceutical companies in fiscal 2010 at less than the level emitted in fiscal 1990.

1. Degree of progress toward goal



The industry has emitted the following amounts of CO_2: 1.63 million t-CO_2 in fiscal 1990; 1.91 million t-CO_2 in fiscal 1997; 1.93 million t-CO_2 in fiscal 1998; and 2.06 million t-CO_2 in both fiscal 1999 and 2000. Industry sales for fiscal 2000 rose 3% over the preceding year, but the companies reduced their energy consumption by 22,000 kl (crude oil equivalent), a 2.1% decrease compared to fiscal 1999, by installing energy-efficient equipment, improving operations, converting to other fuel sources, etc.

The industry is forecasting CO_2 emissions of 2.06 million t-CO_2 in fiscal 2005, a 27% increase compared to fiscal 1990, and is aiming to achieve an emissions target of 1.63 million t-CO_2 in fiscal 2010, the same level as in 1990. Were the voluntary action plan not executed, CO_2 emissions in fiscal 2010 would be 2.31 million t-CO_2, a 42% increase over fiscal 1990. However, the industry is endeavoring to keep emissions of CO_2 at less than the level emitted in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings

Because of government policies for cutting medical expenses and the lowering of the cost of pharmaceuticals, it is reasonable to predict that the industry's level of production will see only minute increases in the coming years. However, as the population continues to age, the energy needs of R&D in useful pharmaceuticals and of facility maintenance required for safe, high-quality pharmaceutical production are on the rise, meaning that drastic energy-saving measures are needed to attain the targeted emission level for 2010. In order to achieve the goal, the industry has adopted the following principal measures:

- Conversion to energy-conserving facilities and equipment.
- Introduction of cogeneration facilities (based on careful evaluation of the ability of each facility to conserve energy and reduce emissions of carbonic gas)
- Recovering waste heat, and strengthening the monitoring of energy-saving modes of operation.
- Promoting energy conservation through more effective implementation of environmental management systems.
- Evaluating potential improvements in how air conditioning systems and refrigeration and heating equipment are used, including starting, stopping, and hours of operation.
- Introducing small boilers, and conserving energy through restrictions of their number.
- Converting to fans, mixers, and lights that incorporate inverter technology.
- Installing lighting that is controlled by timers, and turning off lights when they are not required, by using devices that blink automatically.
- Reviewing methods for controlling energy-supply equipment, and adopting efficient methods of operation for such equipment.
- Recovering drained steam, and adopting measures to deal with radiated heat.

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

The industry invested ¥3.15 billion in measures for fiscal 2000, and achieved an energy reduction of 11,324 kl (crude oil equivalent) and a CO_2 emission cutback of 21,071 t-CO_2. The breakdown for major implementations is as follows.

Measure	Investment (million yen)	Energy Reduction (kl, crude oil equiv.)	CO_2 Reduction (t-CO_2)
Alternate energy RDF (Refills Dried Fuel), etc. (3 items)	619		3,960
Introduction of cogeneration	930	942	164
Use of small boilers in restricted numbers (11 items)	501	1,425	90
Conversion to inverter technology and energy-saving equipment (26 items)	262	668	765

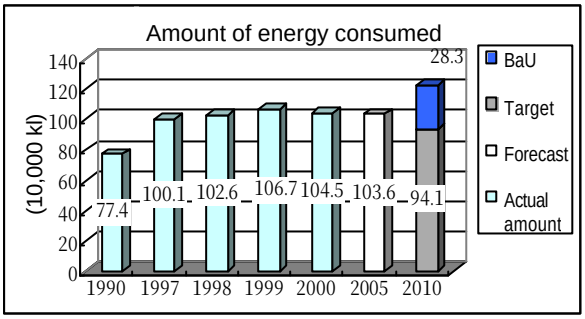
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

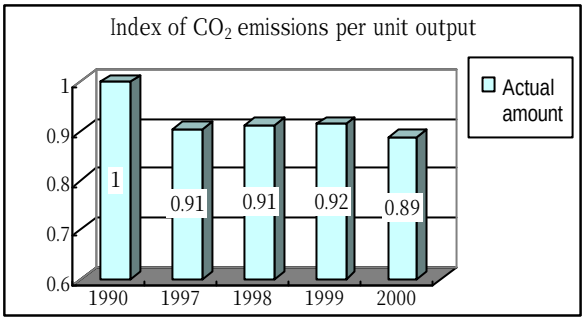
The measures implemented by the industry in fiscal 2000 achieved a reduction of approximately 20,000 t-CO_2, but because of increased production and other such factors, the level of emissions remained the same as fiscal 1999.

- Decreasing factors: The effect of fuel conversion and other measures against global warming, introduction of energy-conserving/anti-global-warming equipment, and operational improvements realized by education/training under ISO 14001, etc.
- Increasing factors: Greater production, establishment/expansion of research facilities, etc.

Improvements in electric power use per unit output	-92,000 t-CO_2	-5.7%
Efforts to reduce emissions by various segments of the industry	-156,000 t-CO_2	-9.6%
Economic expansion (change in quantities produced, etc.)	686,000 t-CO_2	42.2%
Total	438,000 t-CO_2	26.9%

5. Reference data





Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

The industry has consumed the following amounts of energy: 774,000 kl in fiscal 1990; 1.001 million kl in fiscal 1997; 1.026 million kl in fiscal 1998; 1.067 million kl in fiscal 1999; and 1.045 million kl in fiscal 2000. Although it is forecasting consumption of 1.036 million kl in 2005, a 34% increase vis-à-vis 1990, it is aiming to achieve consumption of 941,000 kl in 2010. The industry expects its consumption of energy to grow at a slower rate than its emissions of carbonic gas emissions hereafter, and expects the rate of growth in energy consumption to decline. It will continue to evaluate different types of fuels for use in cogeneration, and to endeavor to reduce emissions of carbonic gas.

Assuming a value of 1 for CO_2 emissions in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.91 in both fiscal 1997 and 1998, at 0.92 in fiscal 1999, and at 0.89 in fiscal 2000.

6. Other efforts to deal with global warming

- Emissions from offices and internal distribution
  - Carrying out joint delivery of products.
  - Reducing loads on the environment in each company's transportation division by adopting measures such as: turning off engines during stops; appropriate loading for delivery vehicles; and use of low-pollution vehicles.
  - Reducing environmental loads by adopting packaging-related measures such as: creating lighter product containers (bottles); using recycled paper; and shifting from plastic to paper.

- Measures to deal with greenhouse gases other than CO_2

By fiscal 2010, the industry plans to reduce its usage of HFC (used in medical aerosols) by 25% compared to the amount that would be used if no efforts were made. The measures for this purpose are:

- Reducing the quantity of leakage from manufacturing equipment
- Finding substitutes for HFC
- Limiting use of HFC
- Future measures
  {1} Use limitations: endeavoring to limit the development, manufacture, and sale of products that use HFC, other than when absolutely necessary for medical purposes.
  {2} Conversion: promoting conversion to products that do not use HFC, such as those that use DPI.
  {3} Recovery and decomposition of HFC: promoting the recovery and decomposition of HFC from inferior products and products that are taken back as returns.

7. Environmental management; environmental conservation in overseas business activities

As of August 2001, 27 companies, operating through 61 locations, had obtained ISO 14001 certifications. (based on companies belonging to the Japan Pharmaceutical Manufacturers Association).

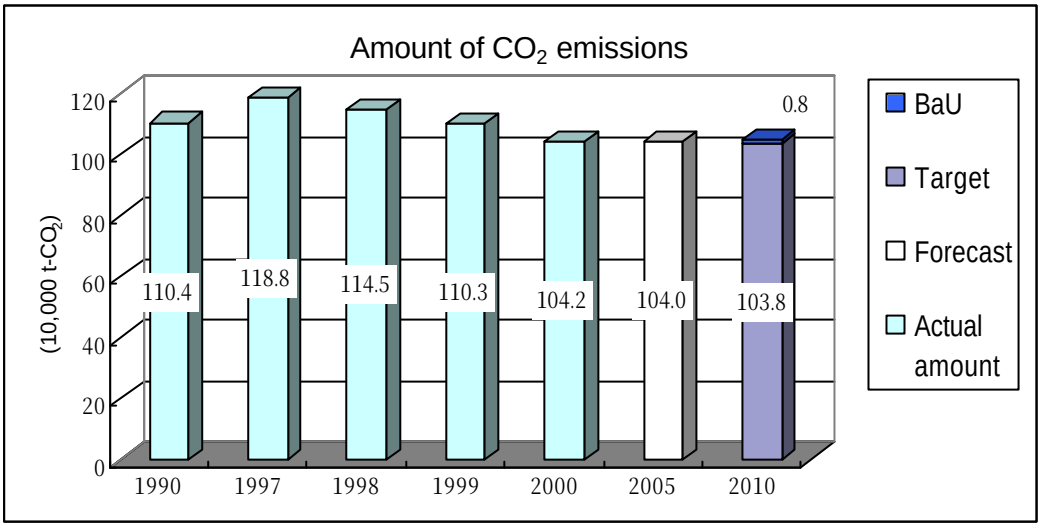
In their overseas operations, companies naturally endeavor to comply with the rules and regulations of countries in which they are investing. In addition, based on policies for voluntary actions established by the Japan Pharmaceutical Manufacturers Association, they endeavor to adopt a global perspective in their measures to protect the environment.

Note: The principal product of this industry is pharmaceuticals. The percentage of companies participating in the current follow-up survey was 5.1% (80 out of 1,562 companies), representing a coverage ratio in terms of revenues generated of 83.7%. CO_2 emission amounts were totaled from the figures provided by the 80 participating FPMAJ/JPMA members. Some companies responded that it was difficult for them to offer data regarding fiscal 2005 and later, so these companies' actual figures for fiscal 2000 were adjusted to calculate the future projections. Demand for pharmaceuticals is expected to increase in response to the aging of the population and other such factors, but concrete forecasts for production levels are based on the assumptions of each member company, with the industry not establishing any premises of its own.

Brewers Association of Japan

Target: To reduce CO_2 emissions from beer production at beer plants in fiscal 2010 to 94% of the level of fiscal 1990.

1. Degree of progress toward goal



The beer industry has emitted the following amounts of CO_2: 1.104 million t-CO_2 in fiscal 1990; 1.188 million t-CO_2 in fiscal 1997; 1.145 million t-CO_2 in fiscal 1998; 1.103 million t-CO_2 in fiscal 1999; and 1.042 million t-CO_2 in fiscal 2000. It is forecasting emissions of 1.040 million t-CO_2 for fiscal 2005, a decline of 6% compared to fiscal 1990, and has established a target value of 1.038 million t-CO_2 for fiscal 2010, 6% less than fiscal 1990. On a business as usual basis, the industry forecasts that CO_2 emissions would be 1.046 million t-CO_2 in fiscal 2010, 5% less than in fiscal 1990.

3. Measures undertaken to achieve goals

- Installed more efficient anaerobic waste-water processing equipment.
- Introduced cogeneration systems.
- Introduced fuel cells.
- Installed non-flon facilities.
- Installed more efficient facilities for capturing CO_2 produced through fermentation.
- Reduced fuel requirements through installation of new boilers.
- Converted to new fuels.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

(1) Improvements in energy consumption and CO_2 emissions per unit output through greater plant productivity (including closings and integrations).

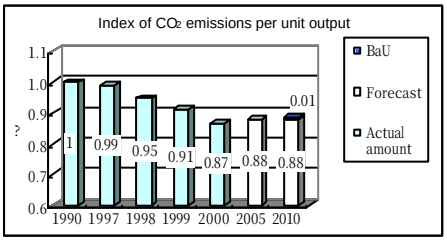
(2) Improvements in energy consumption and CO_2 emissions per unit output resulting from a higher ratio of canned products in overall product mix

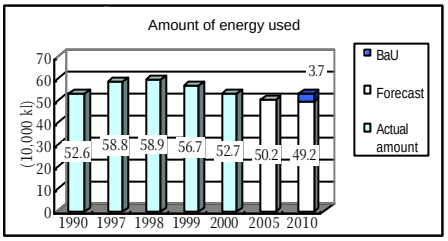
(3) Improvements in energy consumption and CO_2 emissions per unit output through installation of new equipment.

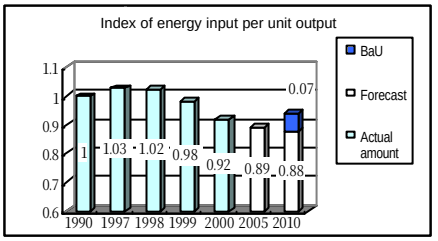
The following is an analysis of the approximately 6% reduction in CO_2 emissions between fiscal 1990 and fiscal 2000.

Improvements in electric power use per unit output	- 40,000 t-CO_2
Efforts to reduce emissions by various segments of the industry	-118,000 t-CO_2
Economic expansion (change in quantities produced etc.)	96,000 t-CO_2
Total	-62,000 t-CO_2

5.Reference data







Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

Assuming a value of 1 for CO_2 emissions per unit output in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.99 in fiscal 1997, 0.95 in fiscal 1998, 0.91 in fiscal 1999, and 0.87 in fiscal 2000. The industry is forecasting index values of 0.88 for both fiscal 2005 and fiscal 2010. Its record for energy consumption is as follows (in terms of crude oil equivalents): 526,000 kl in fiscal 1990; 588,000 kl in fiscal 1997; 589,000 kl in fiscal 1998; 567,000 kl in fiscal 1999; and 527,000 kl in fiscal 2000. The industry is forecasting energy consumption of 502,000 kl in fiscal 2005 and 492,000 kl in fiscal 2010, 5% and 7% less, respectively, than in fiscal 1990. Were a voluntary action plan not executed, the forecast for energy consumption in fiscal 2010 would be 529,000 kl, a 1% increase compared to fiscal 1990. Assuming a value of 1 for energy consumed per unit output in fiscal 1990, the index of energy input per unit output stood at 1.03 in fiscal 1997, 1.02 in fiscal 1998, 0.98 in fiscal 1999, and 0.92 in fiscal 2000. The industry is forecasting index values of 0.89 for fiscal 2005 and 0.88 for fiscal 2010.

6. Other efforts to deal with global warming

- Emissions from offices and internal distribution

  The industry has adopted the following measures aimed at reducing CO_2 in the transportation, offices and households sector.

  - Shift to lighter cans and bottles
  - Shift to lighter packaging materials of cardboard etc.
  - Promoting the idling-stop of truck engines
  - Reduction of CO_2 emissions through joint product deliveries
- Measures to deal with greenhouse gases other than CO_2
  - Installation of non-flon equipment
  - Strict implementation of measures to capture unused flon

7. Environmental management; environmental conservation in overseas business activities

- Obtaining and maintaining ISO 14001 certification at individual plants
- Disclosure of information through ongoing publication of environmental reports; continued application of environmental accounting

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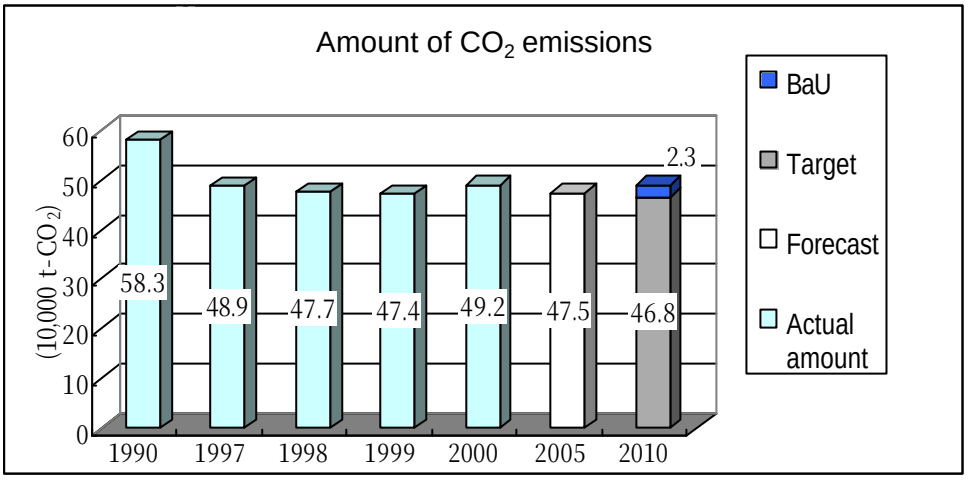
Note: The principal product of the industry is beer (including happoshu beer substitutes). The percentage of companies participating in this follow-up survey was 80% (4 out of 5 companies), representing a coverage ratio in terms of revenues of 99%. Figures on CO_2 emissions are summations of data provided by the four participating companies. For fiscal 2010, the industry is projecting a 6.9% increase in production compared to fiscal 1990. It is forecasting a decline in emissions per unit of output by then of 12% (through installation of anaerobic waste-water processing equipment, adoption of cogeneration, increases in the ratio of canned products to the total product mix, promotion of energy conservation measures, etc.)

Japan Sugar Refiners' Association

Target: To reduce industry emissions of CO_2 in 2010 by 20% compared to the level in fiscal 1990.

1. Degree of progress toward goal



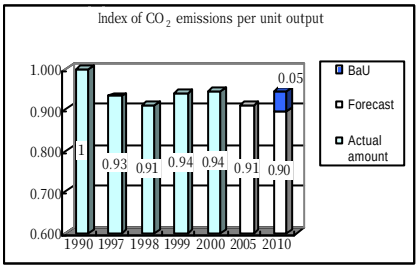
The sugar refining industry has recorded the following amounts of CO_2 emissions: 583,000 t-CO_2 in fiscal 1990; 489,000 t-CO_2 in fiscal 1997; 477,000 t-CO_2 in fiscal 1998; 474,000 t-CO_2 in fiscal 1999; and 492,000 t-CO_2 in fiscal 2000. It is forecasting emissions of 475,000 t-CO_2 in fiscal 2005, a 19% decline compared to 1990, and has set as its target emissions of 468,000 t-CO_2 in fiscal 2010, a 20% reduction compared to 1990. If the voluntary action plan were not executed, emissions would be 491,000 t-CO_2 in 2010, or 16% less than in 1990.

3. Measures undertaken to achieve goals

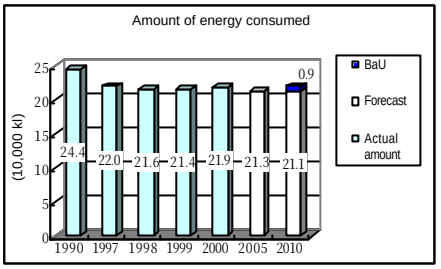
- Major undertakings

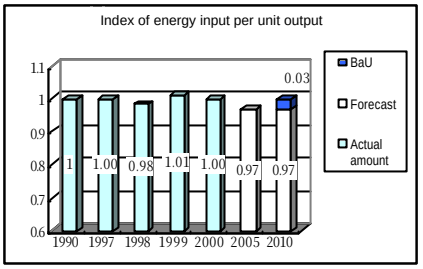
The industry will adopt the following major measures for achieving these targets: change of fuels; installation of individual steam recompression-type concentrators; installation of vacuum pan with attached agitators; introduction of automatic boiling in conjunction with vacuum pan; introduction of cogeneration facilities; introduction of steam accumulators; control of revolutions in motors using inverters; recovery of waste heat from boilers; adding turbochargers to compressors; change to energy-saving transformers; installation of absorption-type air-conditioning equipment; introduction of vacuum breaking devices; preservation of heat in steam pipes; etc.

5. Reference data



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.





Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

Assuming a value of 1 for the CO_2 emissions in fiscal 1990, the index of CO_2 emissions per unit of output stood at 0.93 in fiscal 1997, 0.91 in fiscal 1998, 0.94 in fiscal 1999, and 0.94 in fiscal 2000. The industry is forecasting index values of 0.91 for fiscal 2005 and 0.90 for fiscal 2010.

The industry has recorded the following amounts of energy consumption: 244,000 kl in fiscal 1990; 220,000 kl in fiscal 1997; 216,000 kl in fiscal 1998; 214,000 kl in fiscal 1999; and 219,000 kl in fiscal 2000. It is forecasting consumption of 213,000 kl in fiscal 2005 and 211,000 kl in fiscal 2010.

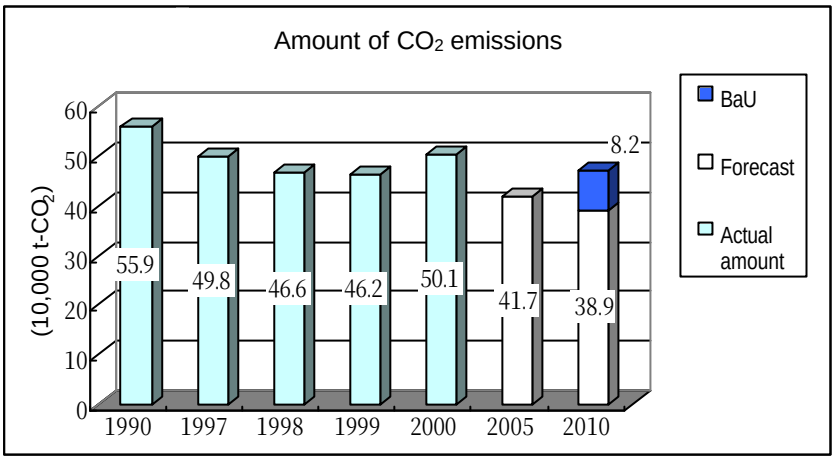
Assuming a value of 1 for energy consumption in fiscal 1990, the index of energy input per unit output stood at 1.00 in fiscal 1997, 0.98 in fiscal 1998, 1.01 in fiscal 1999, and 1.00 in fiscal 2000. The industry is forecasting index values of 0.97 for both fiscal 2005 and 2010.

Note: The principal product for this industry is sugar. The percentage of companies participating in this follow-up survey was 90.5% (19 out of 21 companies), representing a coverage ratio for energy consumed by the industry of 98.6%. In calculating its forecasts for fiscal 2010, the industry assumed that sugar consumption would remain stable through fiscal 2010, with perhaps a slightly upward bias, and that production and energy efficiency would improve.

Japan Auto-body Industries Association, Inc.

Target: By fiscal 2010, reduce the amount of CO_2 emissions by 10% compared to fiscal 1990.

1. Degree of progress toward goal



The auto-body industry has emitted the following amounts of CO_2: 559,000 t-CO_2 in fiscal 1990; 498,000 t-CO_2 in fiscal 1997; 466,000 t-CO_2 in fiscal 1998; 462,000 t-CO_2 in fiscal 1999, and 501,000 tCO_2 in fiscal 2000. It is forecasting emissions of 417,000 t-CO_2 in fiscal 2005, and 389,000 t-CO_2 in fiscal 2010 (with assumption that production volume will be 20% lower in fiscal 2010), representing declines of 25% and 30%, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, the industry would emit 471,000 t-CO_2 in fiscal 2010, a 16% decrease over fiscal 1990.

3. Measures undertaken to achieve goals

- Specific anti-global warming measures carried out in 2000; estimated investment and impact made
  (1) Conversion from liquefied petroleum gas to municipal gas for fuel
  (2) Installation of gas turbine cogeneration equipment
  (3) Installation of energy-conserving inverters
  (4) Integration of production facilities

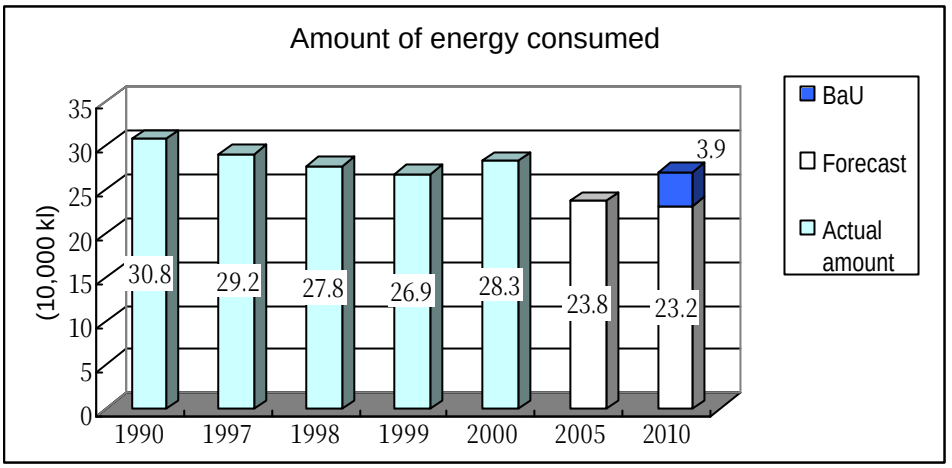
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

Overall, CO_2 emissions declined in comparison to fiscal 1990.

- Increasing factors: Changes to operational format (from 1 shift to 2 shifts), improvements to working environment (installation of air conditioners and heaters)
- Decreasing factors: Improvements in productivity and operational efficiency,

reduction in range of parts used, introduction of energy-efficient equipment

5. Reference data



The industry has recorded the following amounts of energy consumption: 308,000 kl in fiscal 1990; 292,000 kl in fiscal 1997; 278,000 kl in fiscal 1998; 269,000 kl in fiscal 1999, and 283,000 kl in fiscal 2000. It is forecasting consumption of 238,000 kl for fiscal 2005 and 232,000 kl for fiscal 2010, representing 23% and 25% decreases, respectively, compared to fiscal 1990. Were the voluntary action plan not executed, industry would consume 271,000 kl of energy in fiscal 2010, 12% less than in fiscal 1990.

6. Other efforts to deal with global warming

- Measures to deal with greenhouse gases other than CO_2

Auto-body plants use materials containing other greenhouse gases (e.g., HFC, PFC, and SF6), but the association has not yet surveyed the state of measures against these gases.

7. Environmental management; environmental conservation in overseas business activities

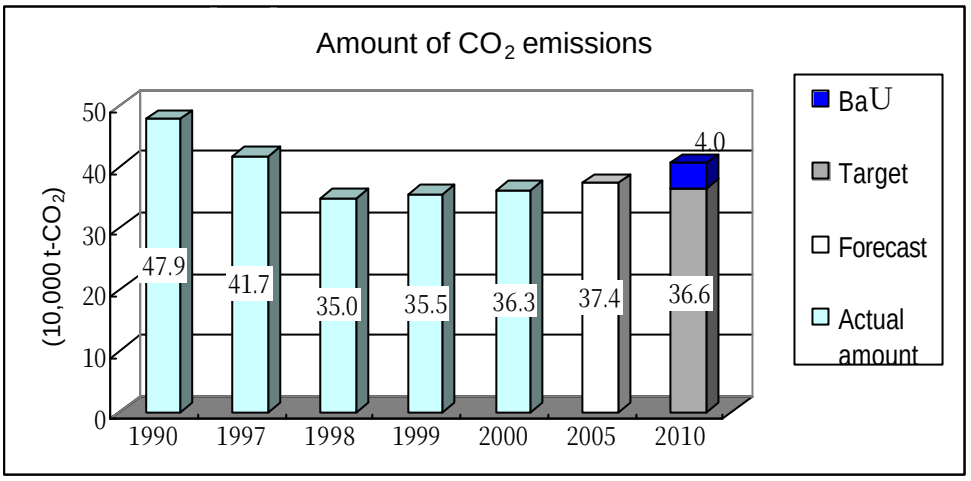
As the majority of its members are small- and medium-sized businesses, the association plans to work on building its members' awareness of the need to thoroughly implement environmental management activities.

Note: The principal products of this industry are bodies and equipment for trucks, vans, buses, trailers, specially outfitted vehicles, special vehicles, and compact vehicles. The percentage of companies participating in this follow-up survey was 30% (58 out of 194 companies), representing a coverage ratio of 90.1% in terms of overall production volume. CO_2 emission amounts were totaled from the data provided by the 58 participating companies, including incomplete data from 34 of these companies. The forecast for fiscal 2010 assumes that production volume will see a decrease of slightly under 20% compared to fiscal 1990.

Japan Sanitary Equipment Industry Association

Target: By fiscal 2010, reduce the CO_2 emissions of production plants by 20% or more compared to fiscal 1990.

1. Degree of progress toward goal



The industry has emitted the following amounts of CO_2: 479,000 t-CO_2 in fiscal 1990; 417,000 t-CO_2 in fiscal 1997; 350,000 t-CO_2 in fiscal 1998; 355,000 t-CO_2 in fiscal 1999; and 363,000 t-CO_2 in fiscal 2000. It is forecasting emissions of 374,000 t-CO_2 in fiscal 2005, a 22% decrease compared to fiscal 1990. Its target for fiscal 2010 is 366,000 t-CO_2, which represents a 24% reduction over fiscal 1990. Were a voluntary action plan not executed, the industry would emit 406,000 t-CO_2 in fiscal 2010, a 15% decrease over fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings

Below are some of the principal implementations undertaken by the industry to achieve its target.

(1) Ongoing undertakings

(a) Introduction of co-generation technology

(b) Promotion of fuel conversion

(c) Improvement of operational efficiency of equipment

(d) Installation of high-efficiency equipment

(e) Promotion and reinforcement of individual employee's efforts to reduce use of energy and resources

- Total prevention of compressed air leakage
- Thorough management of air conditioner temperatures

- Meticulous efforts to turn off unnecessary lighting
- Other efforts that can be done by individuals

(2) New undertakings planned

(a) Promotion of use of new forms of energy and forms heretofore not used

(b) Promoting purchases of environmentally friendly equipment and supplies

(c) Integration/closing of production lines to improve efficiency

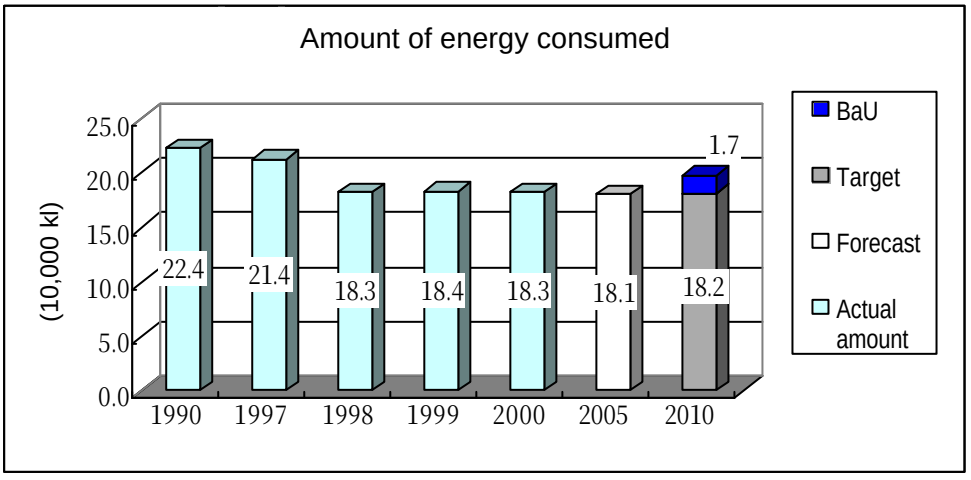
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

Production volume dropped by 5% compared to fiscal 1990, and CO_2 emissions decreased as well. Every company made efforts to improve energy efficiency and operational performance by converting to other fuels and high-efficiency equipment, achieving reductions of 24% in CO_2 emissions and 18% in energy consumption compared to fiscal 1990 (calculations include decreases due to changes in carbon emission coefficient of electrical power, energy conversion coefficient, and heat value conversion coefficient of fuel).

The following is an analysis of the approximately 24% reduction in CO_2 emissions between fiscal 1990 and fiscal 2000.

Improvements in electric power use per unit output	-14,183 t-CO_2	-3.0%
Efforts to reduce emissions by various segments of the industry	-79,040 t-CO_2	-16.5%
Economic expansion (change in quantities produced, etc.)	-23,253 t-CO_2	-4.9%
Total	-116,476 t-CO_2	-24.3%

5. Reference data



The industry has recorded the following amounts of energy consumption (in terms of crude oil): 224,000 kl in fiscal 1990; 214,000 kl in fiscal 1997; 183,000 kl in fiscal 1998; 184,000 kl in fiscal 1999, and 183,000 kl in fiscal 2000. It is forecasting consumption of 181,000 kl for fiscal 2005, and its goal for fiscal 2010 is 182,000 kl,

representing 19.2% and 18.8% decreases, respectively, compared to fiscal 1990. Were the voluntary action plan not executed, the industry would consume 199,000 kl of energy in fiscal 2010, 11% less than in fiscal 1990.

6. Other efforts to deal with global warming

● Contributions to the transportation, offices and households sector (effect of products and services, etc.)

One company reduced its transportation fuel consumption by 5% through a campaign to encourage environmentally friendly driving.

7. Environmental management; environmental conservation in overseas business activities

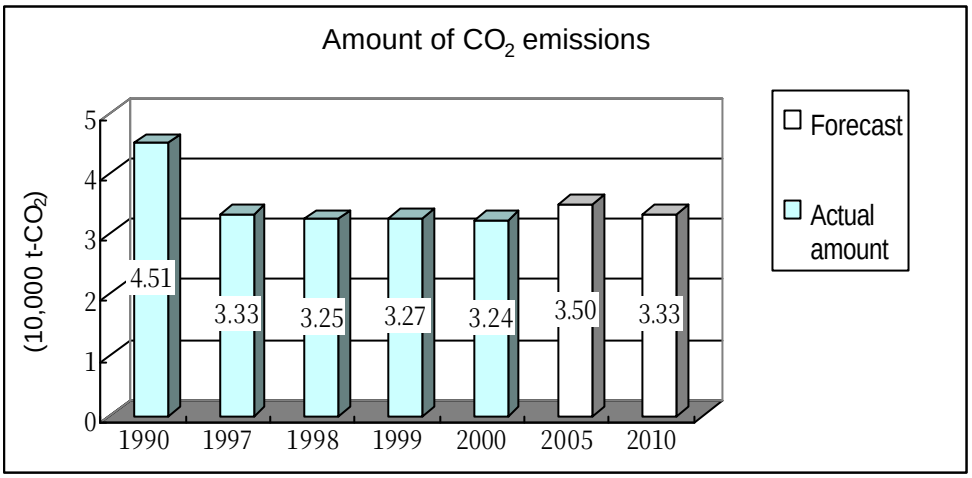
- ISO 14001 certification has been acquired by 41 operating centers (including manufacturing group companies), and 3 companies have operating centers that are preparing for certification or will acquire certification within one to three years.
- One company requires its overseas plants to install the same environment-conserving equipment that is used in the company's plants in Japan.

Note: The principal products of this industry are ceramic sanitary equipment, metal faucets, toilet seats equipped with warm-water bidet, bathtubs, and bathroom modules (some companies also produce tile). The percentage of companies participating in this follow-up survey was 100% (8 out of 8 companies). Energy consumption amounts and CO_2 emission amounts were totaled from the data provided by the 8 companies, which operate production plants that manufacture the above products. The forecasts for fiscal 2010 are based on the following assumptions: (1) production volume will continue to increase at an average annual rate of 2% of the fiscal 2000 production amount, and (2) both energy input per unit output and CO_2 emissions per unit output will improve at an average annual rate of 2% after fiscal 2000 due to the effect of voluntary energy-conserving efforts.

Japan Association of the Rolling Stock Industry

Target: To reduce CO_2 emissions in fiscal 2010 by 10% compared to fiscal 1990.

1. Degree of progress toward goal



The rolling stock industry has emitted the following amounts of CO_2: 45,100 t-CO_2 in fiscal 1990; 33,300 t-CO_2 in fiscal 1997; 32,500 t-CO_2 in fiscal 1998; 32,700 t-CO_2 in fiscal 1999; and 32,400 t-CO_2 in fiscal 2000. It is forecasting emissions of 35,000 t-CO_2 for fiscal 2005 and 33,300 t-CO_2 for fiscal 2010, 22% and 26% less, respectively, than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Conversion of production equipment and machinery
  - Preventing leakage of air and steam; control of temperatures in heating and air conditioning systems
  - Conversion of fuels used in heating facilities
  - Selection of highly energy-efficient equipment for new installations and replacements
  - Conversion to municipal gas for the fueling of boilers
  - Appropriate utilization of existing facilities

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

The following endeavors are continuing from the last fiscal year.

(1) Concentration of facilities for painting and remodeling of drying furnaces for burning.

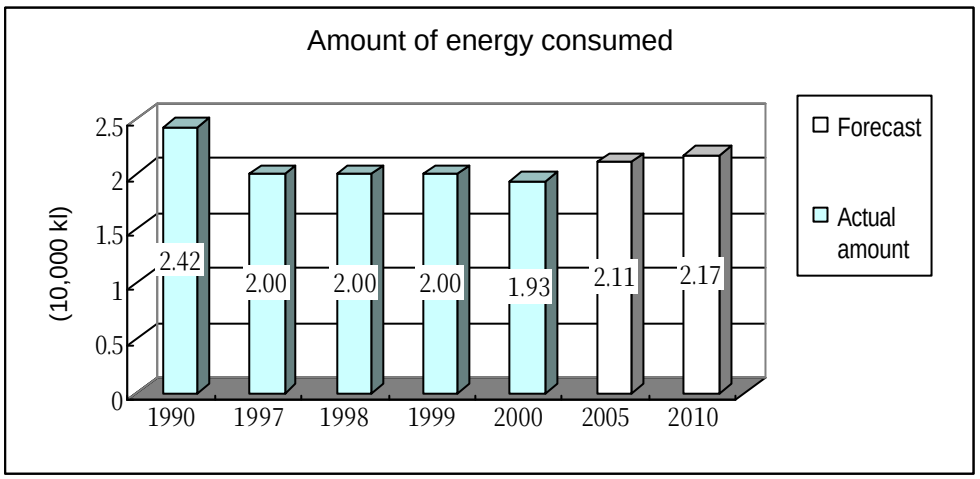
(2) Promotion of optimization of air conditioning and lighting.
(3) Detailed improvement work to save energy (such as the improvement of ceiling lighting).

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The following are the reasons that industry succeeded in reducing CO_2 emissions by approximately 28% from 45,100 t-CO_2 in 1990 to 32,400 t-CO_2 in 2000.

(1) Reduction in the consumption of kerosene due to energy-saving programs.
(2) Conversion of some heating facilities to use municipal gas which led to a reduction in LPG consumption and an increase in LNG consumption.
(3) Systematic reduction in electricity consumption on the basis that the cost of electricity represents the major part of the cost of energy.

5. Reference data



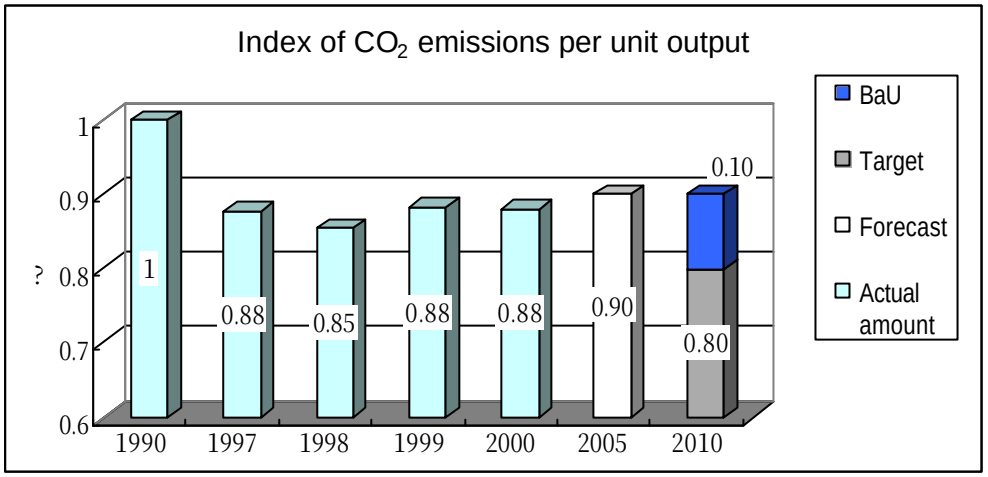
The rolling stock industry has recorded the following amounts of energy consumption: 24,200 kl in fiscal 1990; 20,000 kl for fiscal 1997, 1998 and 1999; and 19,300 kl in fiscal 2000. It is forecasting emissions of 21,100 kl for fiscal 2005 and 21,700 kl for fiscal 2010, 13% and 10% less, respectively, than in fiscal 1990.

Note: The principal product of this industry is rolling stock. The rate of participation in this follow-up survey was 17% (7 out of 42 companies), representing a coverage rate in terms of revenue of approximately 60%. In its forecast of production in fiscal 2010, the industry assumed slightly higher production for both the domestic and export markets. CO_2 emissions were calculated using forecasts of participating companies and enlarging estimates for participating companies that did not have forecasts.

Federation of Electric Power Companies

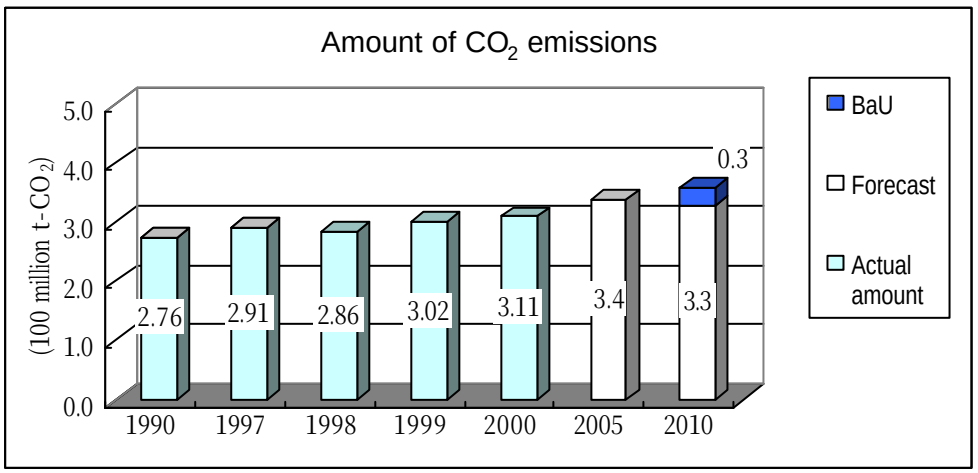
Target: By 2010, we aim to further reduce CO_2 emissions intensity (emissions per unit of end-use electricity) by approximately 20% from the 1990 level, to about 0.3kg-CO_2/kWh.

1. Degree of progress toward goal



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990(and uses emissions per unit output on a end-use electricity basis)

2. Amount of CO_2 emissions



The electric power industry has emitted the following amounts of CO_2 per unit of output: 0.419 kg-CO_2/kWh in fiscal 1990; 0.368 kg-CO_2/kWh in fiscal 1997; 0.358 kg-CO_2/kWh in fiscal 1998; 0.370 kg-CO_2/kWh in fiscal 1999; and 0.371 kg-CO_2/kWh in fiscal 2000. It is forecasting emissions of 0.380 kg-CO_2/kWh for fiscal 2005, and is aiming

to reduce emissions by around 20% of the 1990 level in fiscal 2010 (to around 0.3 kg-CO_2/kWh). The level of CO_2 emissions per unit of output in fiscal 2000 showed no significant change over the preceding year, as the percentage of total electric power generated from thermal power generation only minutely increased, while the usage of nuclear power plants rose from 80.1% in fiscal 1999 to 81.7%. The primary reason for the higher CO_2 emissions per unit of output in fiscal 2005 compared to fiscal 2000 is that the ratio of thermal power generation from coal is expected to rise.

The electric power industry has emitted the following amounts of CO_2: 276 million t-CO_2 in fiscal 1990; 291 million t-CO_2 in fiscal 1997; 286 million t-CO_2 in fiscal 1998; 302 million t-CO_2 in fiscal 1999; and 311 million t-CO_2 in fiscal 2000. It attributes the increase in CO_2 emissions in fiscal 2000 to a 2.6% year-on-year increase in demand for electric power. It is forecasting emissions of 340 million t-CO_2 in fiscal 2005 and 330 million t-CO_2 in fiscal 2010, approximately 23% and 20% more, respectively, than in fiscal 1990. With fiscal 1990 as the base year, it is forecasting that while electric power output will increase by about 1.5 times in fiscal 2010, it will be possible to hold CO_2 emissions down to about 1.2 times increase in that year.

3. Measures undertaken to achieve goals

- Major undertakings
  - Expanded use of non-fossil energy (increased utilization of nuclear and LNG thermal power generation, and the development and dissemination of renewable natural sources of energy)
  - Improved efficiency of power generation facilities (improving efficiency of thermal power plants, reducing loss rates from electricity transmission)

The industry is also committed on a medium-term basis to the task of developing new technologies for the recovery, disposal, fixing, and effective use of CO_2.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The amount of CO_2 emissions increased by roughly 2.9% in fiscal 2000 compared to the preceding year (from 302 million t-CO_2 to 311 million t-CO_2).

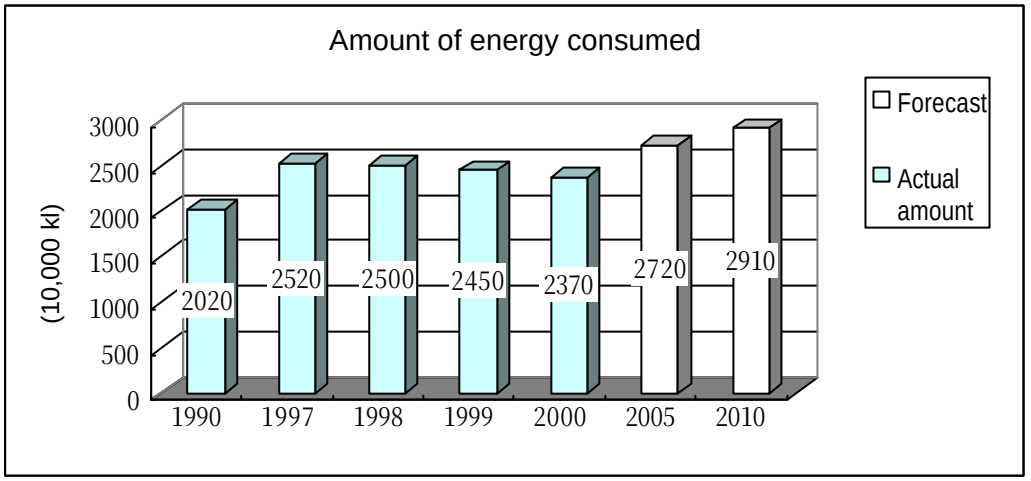
- Effect of increase in power usage:
  2.1 billion kWh x {(0.371+0.370) / 2} = 7,700,000 t-CO_2 (approx. 2.7%)
- Effect of increase in emissions per unit output:
  0.001 x {(8170+8380) / 2} = 800,000 t-CO_2 (approx. 0.2%)

Adding the above effects (approx. 2.7% + approx. 0.2%) gives 2.9% as the degree of the increase.

The following is an analysis of the 13% increase in CO_2 emissions between fiscal 1990 and 2000.

Improvements in electric power use per unit output (efforts by power companies)	-40 million t-CO_2	-14%
Economic expansion (change in quantities produced etc.)	75 million t-CO_2	27%
Total	35 million t-CO_2	13%

5. Reference data



Note: In calculating the above figures, the federation defined in-house power, and power lost in transmission/distribution as electrical power consumed by the industry. The forecasts for fiscal 2005 and 2010 are based on supply plans, and do not have a direct relationship with the existence of conservation measures.

6. Other efforts to deal with global warming

- Emissions from offices and internal distribution

In fiscal 2000, the amount of CO_2 emissions from office usage (offices and households sector) was approximately 410,000 t-CO_2, and the amount from internal distribution (transportation sector) was nearly 80,000 t-CO_2.

In order to reduce office-related emissions, the industry has implemented such measures as efficient operation of air conditioning, turning off of lights during lunchtime and other times when not needed, and reduced use of elevators. Measures for decreasing CO_2 emissions in internal distribution include promotion of fuel-efficient driving practices for operators of company vehicles, introduction and preferred usage of fuel-efficient vehicles, and maintenance of proper air pressure in tires.

- Measures to deal with greenhouse gases other than CO_2

The industry will take every possible step to reduce emissions of greenhouse gases other than CO_2, focusing on implementation of recovery and reutilization measures such as those indicated below (total emissions from the electric power industry of the five gases in question amount to roughly 1/200th of the amount of CO_2 emissions generated by the industry).

- SF_6: Suppressing emissions during equipment servicing and disposal through the establishment of recovery and reutilization systems (by fiscal 2005, reducing the percentage of emissions to around 3% during servicing, and to around 1% during disposal).
- HFC: Suppressing emissions by cooperating in efforts to prevent leakage when facilities are being installed or repaired, and to recover and reuse gases that escape.
- PFC: Although the industry uses liquid PFC as a coolant and insulator in some of its transformers, the chemical is easy to collect and reutilize. PFC thus does not escape into the atmosphere when machinery is being scrapped, nor, of course, during normal operations.
- N_2O: Every attempt is being made to suppress emissions through improvements in thermal efficiency (the industry assumes that emissions of N_2O from fuel combustion at thermal power plants account for approximately 2% of total emissions in Japan).
- CH_4: The concentration of CH_4 in gas emitted from thermal power plants is less than the concentration of CH_4 in the atmosphere, so the industry is not generating any real emissions.

- Projects implemented with regard for the Kyoto mechanism

The industry's involvement in Activities Implemented Jointly includes projects in Indonesia (equipping solar power plants and building small hydraulic power stations); it is also involved in an afforestation project (Australia), and participates the World Bank's Prototype Carbon Fund and the carbon fund of the European Bank for Reconstruction and Development.

7. Environmental management; environmental conservation in overseas business activities

- Besides establishing internal environmental management systems, companies are publicizing their respective activities on environmental conservation through publications such as the "Environmental Action Report."
- Based on the policies formulated by each company, the industry is aggressively pursuing voluntary efforts to enhance its internal environmental management formations and systems founded on the standards of the ISO 14000 series, and to

increase the number of operation centers with ISO 14000 certification.

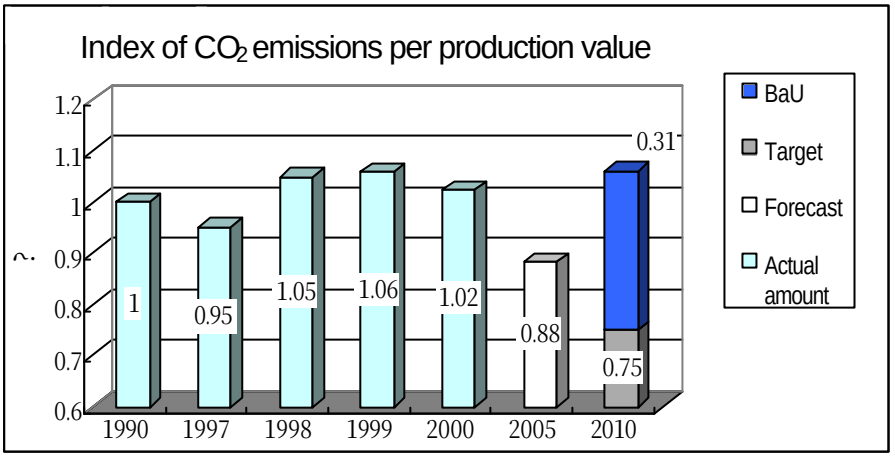
- In its overseas projects to date, the industry has always adopted measures to conserve the environment; it will continue to fully heed the needs of the environment in its future overseas business activities.

Note: The principal product of the industry is electricity. The percentage of companies participating in this follow-up survey was 100% (12 companies), representing a coverage ratio for energy consumed of 100%. CO_2 emission amounts were calculated by totaling the amounts of fuel used by each company to produce the electricity it sells (including electricity purchased from cooperative thermal power companies, independent power producers, etc. and then resold; but excluding electricity from power producers and suppliers), multiplying the totals for each fuel type by the appropriate CO_2 emission coefficient, and then adding up all the results. The electric power demand assumed for fiscal 2010 was estimated as approximately 964 billion kWh. It was also assumed that the industry would achieve its voluntary goal of reducing CO_2 emissions per unit of end-use electricity by around 20% of the level of fiscal 1990.

Communications Industry Association of Japan;
Japan Electronics and Information Technology Industries Association

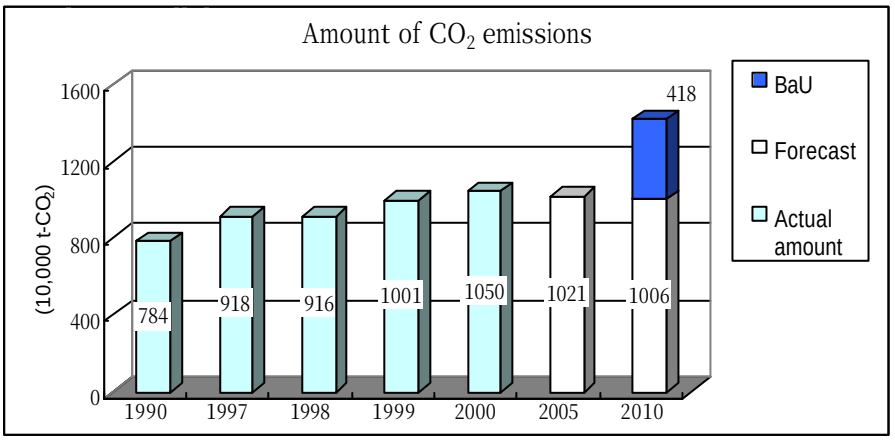
Target: To improve CO_2 emissions per production value by over 25% of the fiscal 1990 level by 2010.

1. Degree of progress toward goal



Note:The index of input per prodiction value of output assigns a value of 1 to the level of emissions in fiscal 1990.

2. CO_2 emissions



Assuming a value of 1 for CO_2 emissions in fiscal 1990, the index of CO_2 emissions per production value stood at 0.95 in fiscal 1997, 1.05 in fiscal 1998, 1.06 in fiscal 1999, and 1.02 in fiscal 2000. The industries are forecasting an index value of 0.88 for fiscal 2005, and are aiming for a target value of 0.75 for fiscal 2010. The industries have emitted the following amounts of CO_2: 7.84 million t-CO_2 in fiscal 1990; 9.18 million

t-CO_2 in fiscal 1997; 9.16 million t-CO_2 in fiscal 1998; 10.01 million t-CO_2 in fiscal 1999; and 10.50 million tCO_2 in fiscal 2000. They are forecasting total emissions of 10.21 million t-CO_2 in fiscal 2005 and 10.06 million t-CO_2 in fiscal 2010, 30% and 28% increases, respectively, compared to fiscal 1990. Were the voluntary action plan not executed, CO_2 emissions would be 14.24 million t-CO_2 in fiscal 2010, 82% higher than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Promoting the employment of highly efficient devices.
  - Improving production and manufacturing processes.
  - Promoting control of air conditioning system.
  - Promoting the use of new and unused forms of energy.
  - Strengthening energy managerial control.

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

There were 1,049 energy conservation measures reported as carried out in fiscal 2000. A total of ¥20.16 billion was invested in these measures, and the reduction in energy consumption achieved by them was 136,040 kl in crude oil equivalents.

*Totals drawn from follow-up survey on voluntary action plan for fiscal 2000
(Sampling survey results: 1,049 samples)

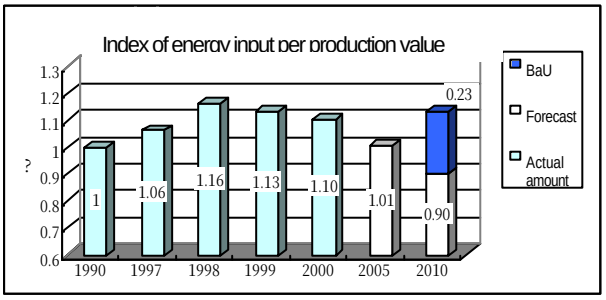
Measure	Investment (¥ million)	Energy Reduction (kl, crude oil equiv.)
Adoption of new forms and previously unused forms of energy	515.8	4,086.3
Introduction of high-efficiency equipment	8,516.5	23,327.5
Improved management of energy, etc.	284.0	31,405.0
Promoting control of air conditioning system	893.4	22,439.1
Improvement of machine control (automated control)	325.7	4,738.3
Use of waste heat	148.1	2,150.9
Improvement of production/manufacturing processes	2,826.3	15,039.4
Prevention of heat loss (insulation and retention)	558.3	2,888.0
Conversion to other fuels	407.7	719.4
Suppression of number of machines/devices used	294.8	2,463.3
Other measures	3,406.4	25,798.7

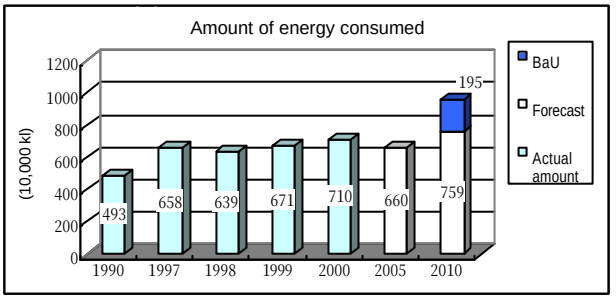
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

- CO_2 emissions in fiscal 2000 increased by 34% over fiscal 1990 as a result of a rise in production.
- Although the actual amount of fiscal 2000 emissions was higher than the fiscal 1999 level due to increased production, the amount of emissions per production value was improved by approximately 3.7% over fiscal 1999 as a result of energy-conserving efforts by the industry.
- In this sector, the decline in unit selling prices is a factor that has a heavy worsening effect on the value of CO_2 emissions per production value.

Improvements of CO_2 emissions per electric power generation output	-1,960,557 t- CO_2	-25.0%
Efforts to reduce emissions by above various segments of the industry	1,289,480 t- CO_2	16.4%
Economic expansion (increase in quantities produced etc.)	2,603,798 t- CO_2	33.2%
Total	1,932,720 t- CO_2	24.7%

5. Reference data





Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per production value stood at 1.06 in fiscal 1997, 1.16 in fiscal 1998, 1.13 in fiscal 1999 and 1.10 in fiscal 2000. The industries are forecasting an index value of 1.01 in fiscal 2005 and one of 0.90 in fiscal 2010. They have recorded the following amounts of energy consumption: 4.93 million kl in fiscal 1990; 6.58 million kl in fiscal 1997; 6.39 million kl in fiscal 1998; 6.71 million kl in fiscal 1999 ; and 7.10 million kl in fiscal 2000. Their forecasts for consumption for fiscal 2005 and 2010 are 6.60 million and 7.59 million, respectively.

6. Other efforts to deal with global warming

- Measures to deal with greenhouse effect gases other than CO_2

In regard to greenhouse effect gases other than CO_2, the industries have taken steps to reduce emissions of PFCs and SF_6. Their goal with respect to liquid PFC, which is used to wash electronic components, is to reduce total emissions in fiscal 2010 by in excess of 60% of the amount emitted in fiscal 1995 by substituting other substances for PFC and taking steps to increase collect rates. The industries are also working to reduce the amounts of PFC and SF_6 gas used in the manufacture of semiconductors and liquid crystal displays by improving the efficiency of gas utilization, substituting other gases, and installing gas destruction devices. In the area of semiconductors, the industries have adjusted their targets for emissions reductions to make them consistent with the international objectives agreed upon at the World Semiconductor Conference. Thereupon, they have restated their goals for reduction of these gases to figures expressed in terms of total amount of emissions (GWP conversion), replacing goals expressed as standard inputs per production value prior to the adjustments, and are now aiming to reduce emissions on actual emission basis by 10% or more in fiscal 2010 compared to fiscal 1995. As for measures related to liquid crystal displays, the industries have stepped up their efforts to curb emissions by elevating their reduction targets (as emission per unit size of production output) to 20% for existing manufacturing facilities and 90% for new manufacturing facilities.

7. Environmental management; environmental conservation in overseas business activities

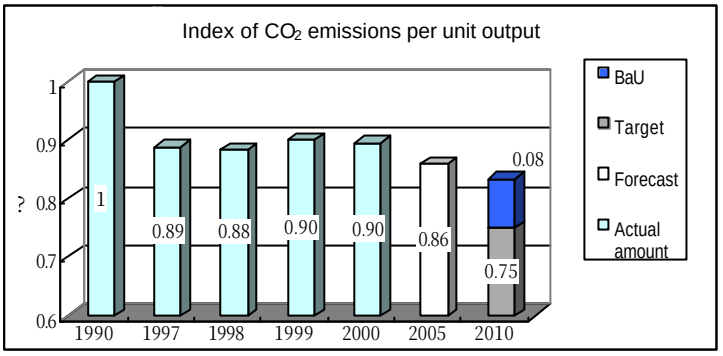
In Japan, 6,786 production facilities received ISO-14001 certification (as of July 2001) and 19.3% of them are in the field of electrical machinery industry.

Note: The principal products of these industries are electronic devices for consumer use, electronic equipment for industrial use, electronic components, and electronic devices (telephones, facsimiles, televisions, VCRs, electronic components, semiconductors, liquid crystal displays, computers, etc.). The percentage of companies in the industry participating in this follow-up survey jointly conducted by four electronics industry organizations was approximately 61% (349 of 575 companies; total of the four organizations), representing a coverage ratio for energy consumed between 70-80%. The forecasts for fiscal 2010 assume that production value will grow by an annual rate of 2.72%.

Japan Electrical Manufacturers' Association

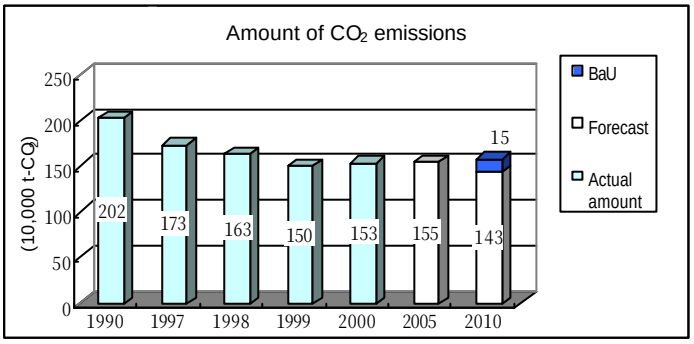
Target: By 2010, energy conservation in production will be improved to 25% below the 1990 level in terms of CO_2 emissions per unit of production value.

1. Degree of progress toward goal



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

2. Amount of CO_2 emissions



Assuming a value of 1 for CO_2 emitted in fiscal 1990, the index of CO_2 emissions per unit output at factories (plants and other operational sites) stood at 0.89 in fiscal 1997, 0.88 in fiscal 1998, and at 0.90 in both fiscal 1999 and 2000. The industry is forecasting an index value of 0.86 for fiscal 2005, and is aiming for a target value of 0.75 for fiscal 2010.

Projecting from trends in the above index of CO_2 emissions per unit output at factories, the electrical manufacturing industry has emitted the following amounts of CO_2: 2.02 million t-CO_2 in fiscal 1990; 1.73 million t-$C0_2$ in fiscal 1997; 1.63 million t-$C0_2$ in fiscal 1998; 1.50 million t-CO_2 in fiscal 1999; and 1.53 million t-CO_2 in fiscal 2000. The industry is forecasting emissions of 1.55 million t-CO_2 in fiscal 2005 and of 1.43 million t-CO_2 in fiscal 2010, representing 24% and 29% declines, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, emissions would be 1.58 million t-CO_2 in fiscal 2010, or 22% less than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Introduction of highly efficient instruments and equipment (methodically introduced at time of equipment replacement)
  - Introduction of instruments and equipment that use new forms of energy or previously unused forms of energy (introductions will accelerate as a result of improvements to social infrastructure)
  - Conversion to other sources of energy; improving methods of monitoring energy consumption
  - Building highly efficient production systems (conversion to manufacturing lines designed for high productivity)
  - Energy conservation measures for offices

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

The survey sampled 307 reports of implementations as energy conservation measures carried out in fiscal 2000. A total of ¥2.8 billion was invested in these measures, and the reduction in energy consumption achieved by them was 11,140 kl in crude oil equivalents.

*Totals drawn from follow-up survey on voluntary action plan for fiscal 2000
(Sampling survey results: 307 samples)

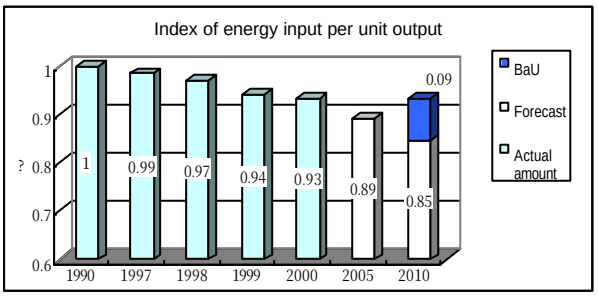
Measure	Investment (¥ million)	Energy Reduction (kl, crude oil equiv.)
Adoption of new forms and previously unused forms of energy	0	0
Introduction of high-efficiency equipment	1,204.8	1,360.0
Improved management of energy, etc.	124.4	2,014.5
Regulation of machine speeds	233.2	426.5
Improvement of machine control (automated control)	58.7	707.8
Use of waste heat	35.2	56.4
Improvement of production/manufacturing processes	542.7	3,877.0
Prevention of heat loss (insulation and retention)	54.2	186.2
Conversion to other fuels	139.3	222.1
Suppression of number of machines/devices used	54.1	441.5
Other measures	348.4	1,844.7

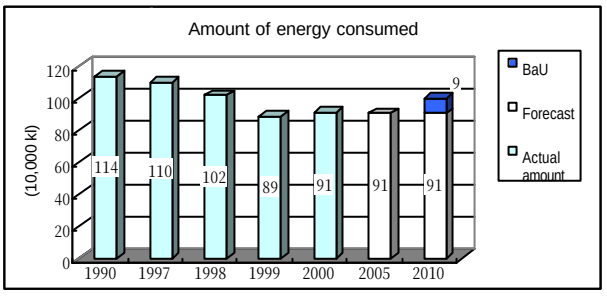
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

- CO_2 emissions in fiscal 2000 were 24% less than the level of fiscal 1990, partially because of a decline in production. In some instances, this reduction in emissions was more the effect of the energy conservation and emission control efforts of the companies than the decline in production, and the industry succeeded in reducing CO_2 emissions per unit of output (the factor targeted by the industry) by 11%.
- On the other hand, comparing fiscal 2000 to fiscal 1999, the amount of CO_2 emissions did rise along with a climb in production, but because of the energy conservation efforts of all the companies, there was no significant change in the CO_2 emissions per unit of output.
- In this sector, the drop in selling prices and changes to the structure of the industry are factors that have a heavy worsening effect on the value of CO_2 emissions per unit of output.

Improvements in electric power use per unit output	-119,900 t- CO_2	-5.9%
Efforts to reduce emissions by various segments of the industry	-60,300 t- CO_2	-3.0%
Economic expansion (change in quantities produced etc.)	-307,000 t- CO_2	-15.2%
Total	-487,000 t- CO_2	-24.1%

5. Reference data





Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit output was 0.99 in fiscal 1997, 0.97 in fiscal 1998, 0.94 in fiscal 1999, and 0.93 in fiscal 2000. The industry is forecasting index values of 0.89 and 0.85 for, respectively, fiscal 2005 and 2010.

The industry has consumed the following amounts of energy (in crude oil equivalents): 1,140,000 kl in fiscal 1990; 1,100,000 kl in fiscal 1997; 1,020,000 kl in fiscal 1998; 890,000 kl in fiscal 1999; and 910,000 kl in fiscal 2000. The industry is forecasting consumption of 910,000 kl in both fiscal 2005 and 2010, a decline of 20% compared to

fiscal 1990. Were the voluntary action plan not executed, consumption would be 1,000,000 kl in fiscal 2010, 12% less than in fiscal 1990.

6. Other efforts to deal with global warming

- Contributions to the transportation, offices and households sector (effect of products and services)

Development and promotion of energy-conserving household appliances

- With new standards for efficiency of energy consumption ("top runner" standards) under the revised energy conservation law now applying to household refrigerators (models designed to meet restrictions on designated chlorofluorocarbons), companies are taking steps to achieve these new standards.
- As a voluntary effort to reduce the amount of energy consumed by appliances when they are not in actual use, the association has established a target of lowering at-rest energy consumption to a level below one watt by the end of fiscal 2003 for those appliances that require electricity even when at rest, and all manufacturers are now working towards this goal.

Use of non-fossil fuels; developing and providing a stable supply of high-efficiency generators and equipment (including also high-efficiency instruments and equipment for industrial use)

- Nuclear power generating systems
- Highly efficient thermal power plants, including combined cycle plants.
- Power generation systems fueled by new energy sources (sunlight, fuel cells, wind power, etc.).
- Highly efficient devices for industrial use (industrial use motors, transformers, engine speed control devices, etc.).

With respect to the above, the industry is carrying out R & D on implementation of new technologies; it is also promoting improvements in efficiency and sophistication of existing technologies and taking steps to assure a stable supply of such improved existing technologies.

- Measures to deal with greenhouse gases other than CO_2

Controlling emissions of HFC from household refrigerators

- Reducing leakage during manufacturing to less than 0.5% of amount used by 2000.
- Establishing the capability to dispose of 100% of the used household refrigerators that are turned in to manufacturers under the Household Appliance Recycling Law (went into effect in 2001).

Controlling emissions of SF_6 insulation

- In relation to leakage prevention during manufacturing, reducing emissions to less than 3% of net purchased amounts by fiscal 2005 (a 30% emissions rate in

1995, which was improved to a 15% emissions rate in 2000)

- Recovering and reusing gas through strengthening and renovating facilities, and through carefully reviewing production procedures, etc.

7. Environmental management; environmental conservation in overseas business activities

The ratio of plants and other operational sites that have received ISO 14001 certification in the domestic electrical machinery industry is slightly over 19.3% of a total of 6,786 sites in operation (as of July 2001), representing the highest number compared to other sectors. This same ratio in terms of Japanese-related firms operating in Asia (which account for approximately 70% of firms doing business abroad in the industry) is now slightly over 30%. In addition, approximately 48% of the firms are undertaking preparations for certification. The firms that have been certified are taking steps to reduce loads on the environment in a methodical and systematic fashion. (Source: "Japanese-Capital Companies in Asia: The State of the Environment, and Environmental Issues," Japan Machinery Exporters' Association, September 2000)

Note 1: The primary products of this industry are industrial class 301 heavy electrical equipment (machines and equipment for power generation/transmission/distribution and industrial purposes) and industrial class 302 domestic electrical equipment (household appliances). The ratio of participation in this follow-up survey by companies of the four electrical machinery/electronics organizations that jointly conducted the survey was roughly 61% (349 of 575 companies, total of all four organizations). The coverage of the survey, in terms of energy consumed by the industry, was approximately 80% of the total consumption for both industrial classes 301 and 302 as listed in the calendar 1990 Statistical Survey of Consumption of Petroleum and Other Fuels (note that the production value and energy consumption coverage ratio figures do not always mesh, due to differences in the way that operating centers [plants] are classified, the scope of the calculations, and other such factors). The figures for amount of energy consumption and amount of CO_2 emissions were totaled from the data of 80 companies with plants that manufacture the products mentioned above.

Note 2: Due to the revision of the heat values assigned to each type of fuel, some minor changes have occurred to the figures that were reported last year for amount of CO_2 emissions and CO_2 emissions per unit output.

Note 3. The calculation of the various indices takes into consideration actual emissions in fiscal 2000; assumptions regarding value of production (i.e., that this value will increase by 1% per year starting in fiscal 2001); an average annual 1% improvement (i.e., achievement of non-binding targets under the Energy Conservation Law) in energy per unit of production value, beginning in fiscal 2001; and improvements in the end use-electricity coefficient for CO_2 emissions per unit of input of electric power. Moreover, we have fixed the electrification ratio (= CO_2 emissions from purchased electricity/total CO_2 emissions) for fiscal 2005 and 2010 at the actual rate for fiscal 1990.

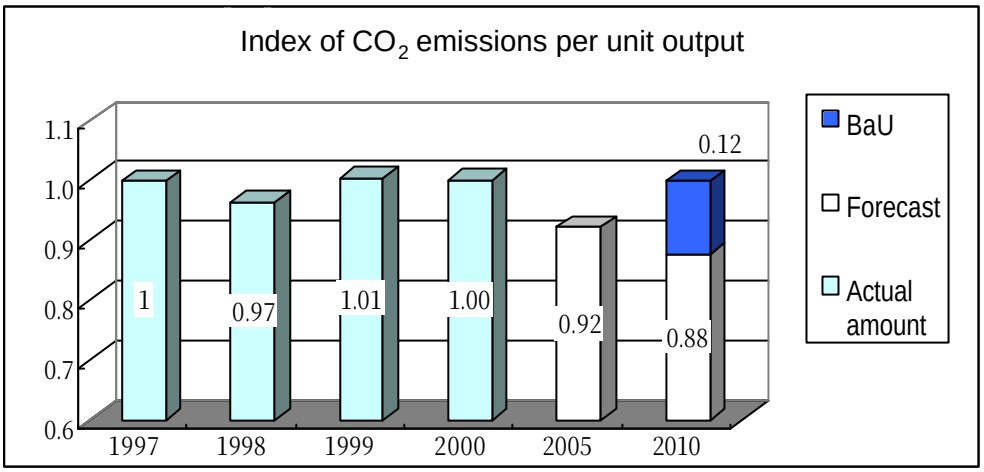
Note 4. The BaU amount indicates the hypothetical case where the average annual 1% improvement in energy per unit of production value in fiscal 2001 and subsequent years (i.e., achievement of non-binding targets under the Energy Conservation Law) cannot be attained, and the fiscal 2000 energy value remains unchanged.

Note 5. Increases in fuel expended by plants as a result of adoption of co-generation systems have been added to amounts of energy consumed for purposes of calculating energy input per unit of output and CO_2 emissions. Therefore, when using average CO_2 emissions per unit of production on an all power-sources basis, the incorporation of co-generation systems results, ironically, in an increase in CO_2 emissions. Because methods of assessing CO_2 emissions relating to the introduction of co-generation systems are not yet established at this point, we have provided the data without revision to calculate our estimates.

Japan Society of Industrial Machinery Manufacturers

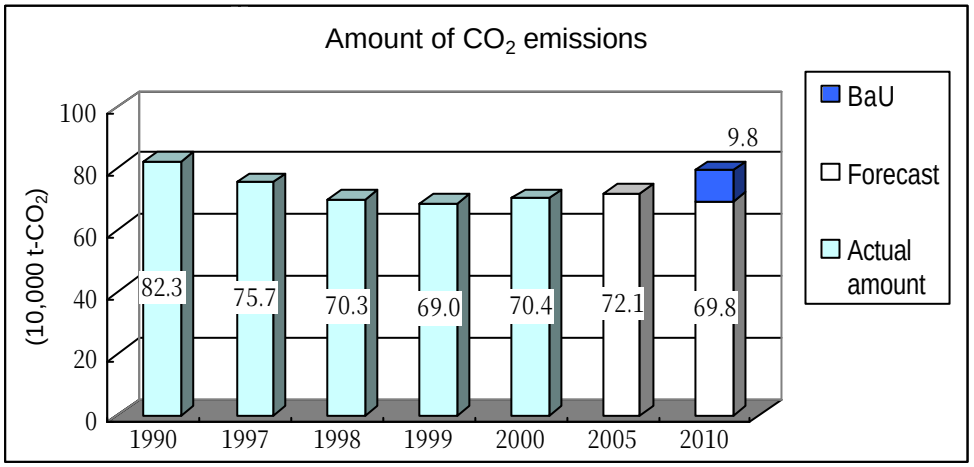
Target: To endeavor to reduce CO_2 emissions from production processes by over 1% a year on a per unit of output basis.

1. Degree of progress toward goal



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1997. Forecasts for CO_2 emissions per unit of output were calculated on the assumption that the per unit of output value would decrease by 1% a year.

2. Amount of CO_2 emissions



Note: The fiscal 2005 value, 721,000 t-CO_2, represents the median value of the range 699,000–742,000 t-CO_2.
Likewise, the value 698,000 t-CO_2 for fiscal 2010 is the median of 664,000–731,000 t-CO_2.
The fiscal 2010 forecast for the case that the voluntary action plan were not executed is 795,000 t-CO_2, the median of 757,000–833,000 t-CO_2.

Assuming a value of 1 for CO_2 emissions in fiscal 1997, the index of CO_2 emissions per unit output stood at 0.97 in fiscal 1998, 1.01 in fiscal 1999, and 1.00 in

fiscal 2000. The industry is forecasting index values of 0.92 for fiscal 2005 and 0.88 for fiscal 2010.

The industry has emitted the following amounts of CO_2: 823,000 t-CO_2 in fiscal 1990; 757,000 t-CO_2 in fiscal 1997; 703,000 t-CO_2 in fiscal 1998; 690,000 t-CO_2 in fiscal 1999; and 704,000 t-CO_2 in fiscal 2000. It is forecasting emissions of between 699,000–742,000 t-CO_2 for fiscal 2005 and between 664,000–731,000 t-CO_2 for fiscal 2010. Were the voluntary action plan not executed, emissions in fiscal 2010 would be between 757,000–833,000 t-CO_2. (Note from secretariat: the fiscal 2005/2010 forecasts in the graph are the median values of these ranges.)

3. Measures undertaken to achieve goals

- Major undertakings
  - Product-related measures (development and propagation of high efficiency boilers; development and propagation of high efficiency combustion systems for waste disposal plants; the incorporation of energy conservation requirements into the development and design of plant and equipment).
  - Adoption of cogeneration systems.
  - Converting to equipment that incorporates inverter technology.
  - Placing limits on the number of compressors in use; operating compressors efficiently through centralized control.

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

The 225 measures implemented in fiscal 2000 involved the following areas: environmental management, improvement of processes, operational management, energy conservation measures, operational management of cooling equipment, operational management of pumps and fans, operational management of compressors and related equipment, management of furnace combustion, management of operational efficiency of furnaces, thermal insulation and thermal radiation prevention for furnaces, management of electrical receptors, management of electrical transformers, management of capacity and operation of electrical motors, operational management of lighting fixtures, and modulated service contracts for electrical power.

The total investment for the fiscal 2000 implementations is estimated to be ¥73.4 billion. The resulting reduction in CO_2 emissions is calculated at 4,515 t-CO_2.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The actual amount of CO_2 emissions decreased in comparison to the benchmark year, fiscal 1997.

- Factors for decrease in amount of CO_2 emissions: More efficient use of energy, improvement of operational efficiency of equipment, conversion to other fuels, etc.

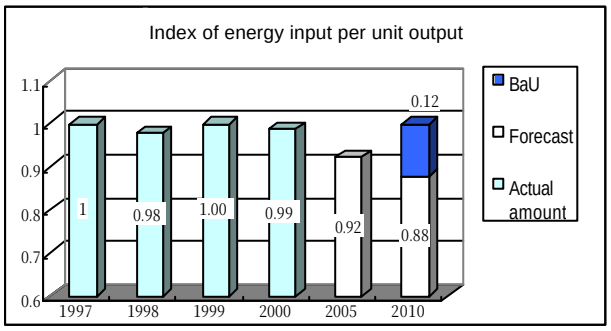
- Factors for rise in CO_2 emissions per unit output: Steep decline in production volume (production value), increase in product testing facilities (experimental testing of boiler combustion, etc.)

Although the amount of CO_2 emissions in fiscal 2000 increased in comparison to fiscal 1999, the value of emissions per unit output improved. This was because energy consumption rose as a result of increased production, while at the same time production per unit input increased.

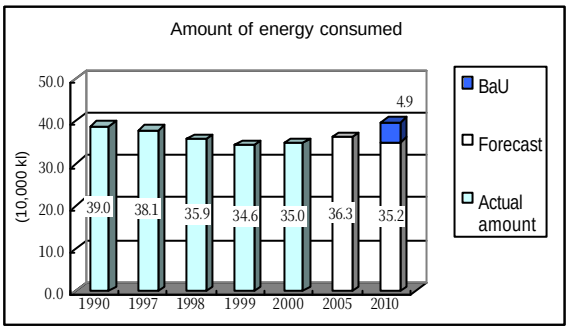
The following is an analysis of the approximately 15% reduction in CO_2 emissions between fiscal 1990 and fiscal 2000.

Improvements in electric power use per unit output	-44,000 t- CO_2	-5.3%
Efforts to reduce emissions by various segments of the industry	-5,000 t- CO_2	-0.6%
Economic expansion (changes in production output, etc.)	-70,000 t- CO_2	-8.5%
Total	-119,000 t- CO_2	-14.5%

5. Reference data



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1997.



Notes: Note: Estimated from units of heat.
The fiscal 2005 value, 363,000 kl, represents the median value of the range 352,000–374,000 kl.
Likewise, the value 352,000 kl for fiscal 2010 is the median of 335,000–368,000 kl.
The fiscal 2010 forecast for the case that the voluntary action plan were not executed is 401,000 kl, the median of 381,000–420,000 kl.

Assuming a value of 1 for energy consumed in fiscal 1997, the index of energy input per unit output stood at 0.98 in fiscal 1998, 1.00 in fiscal 1999, and 0.99 in fiscal 2000. The industry is forecasting index values of 0.92 for fiscal 2005 and 0.88 for fiscal 2010. It has recorded the following amounts of energy consumption: 390,000 kl in fiscal 1990; 381,000 kl in fiscal 1997; 359,000 kl in fiscal 1998; 346,000 kl in fiscal 1999; and 350,000 kl in fiscal 2000. It is forecasting consumption between 352,000–374,00 kl in fiscal 2005 and between 335,000–368,000 kl in fiscal 2010. Were a voluntary action plan not executed, consumption of energy would be between 381,000–420,000 kl in fiscal 2010.

(Note from secretariat: the fiscal 2005/2010 forecasts in the graph are the median values of these ranges.)

7. Environmental management; environmental conservation in overseas business activities

The number of companies that have acquired ISO 14001 certification has been steadily increasing.

Nearly 60% of the 70 companies that provided useful responses for the environmental management questions in this survey have appointed an environmental affairs officer and have established an environmental management department. Approximately 20% issue an environmental report and just over 10% include environment as an accounting item.

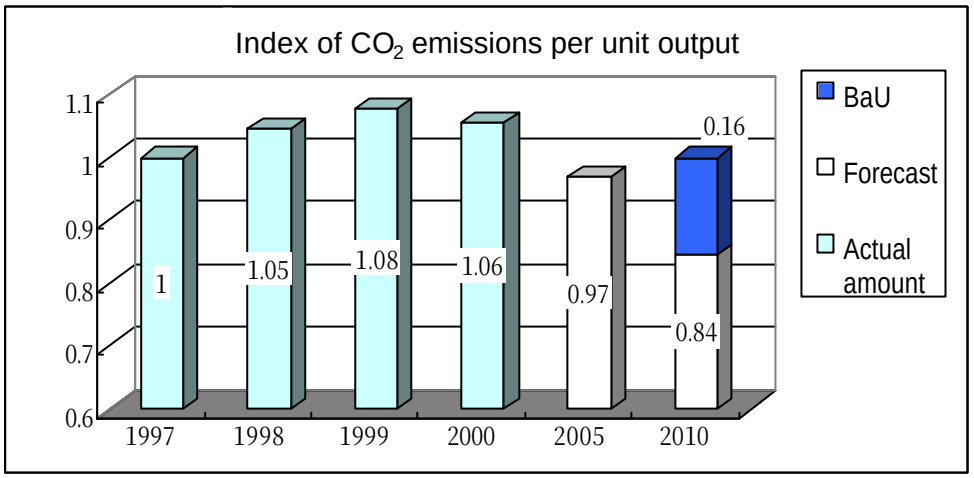
Very few of the companies in this industry have established operations overseas. However, those that maintain such operations do so in strict compliance with Keidanren's ten environmental precepts for overseas business activities.

Note: The principal products in this industry are: boilers; engines; mining machinery; chemical machinery; environmental devices; tanks; plastic manufacturing equipment; wind and waterpower equipment (pumps, compressors, ventilators); transportation equipment; power transmission devices; steel-making equipment; and industrial washing machines (also included is engineering related to industrial machinery). The results of the current follow-up survey are based on responses from 211 companies; 131 companies participated in the survey (excluding companies specializing in engineering). The coverage of the industry in this follow-up is 90.9% in terms of fiscal 2000 production value. The forecasts of production in value terms in fiscal 2010 assumed that production would vary between a range of unchanged and + 10% vis-à-vis the fiscal 1997 level. Energy consumption amounts were calculated by applying the appropriate heat value coefficient to each energy category and totaling the results. The forecasts of CO_2 emissions per unit output were calculated by assuming an annual improvement of 1% over the value of the benchmark year (fiscal 1997). The CO_2 emission amounts were figured by multiplying the pre-calculated forecasts of CO_2 emissions per unit output with the production value.

Japan Bearing Industrial Association

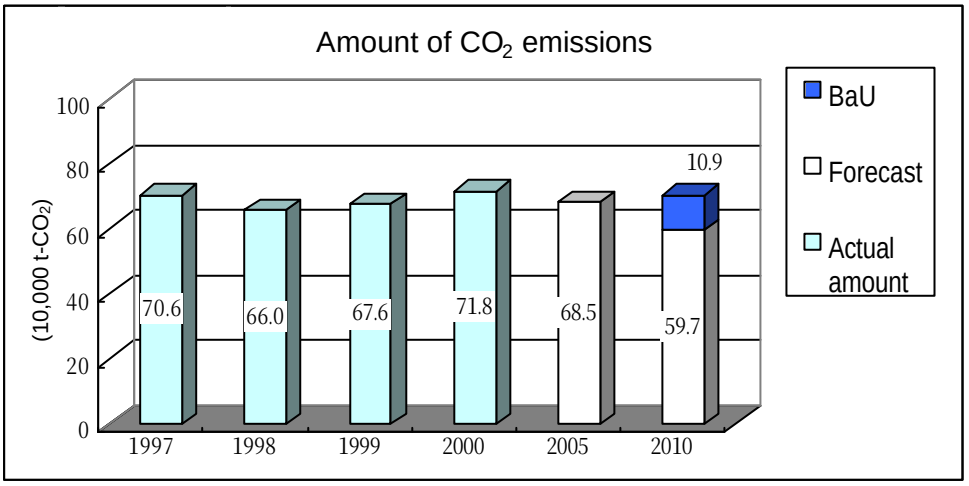
Target: By fiscal 2010, to endeavor to reduce the index of CO_2 input per unit of output by 13% compared to fiscal 1997.

1. Degree of progress toward goal



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1997.

2. Amount of CO_2 emissions



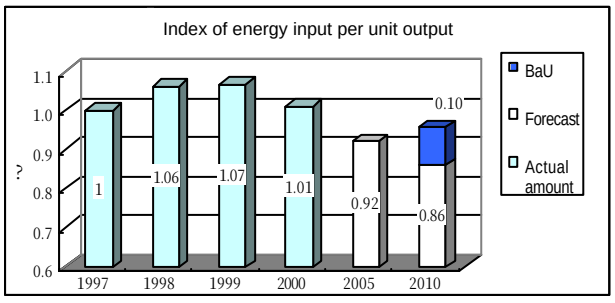
Assuming a value of 1 for CO_2 emissions in fiscal 1997, the index of CO_2 emissions per unit of output stood at 1.05 in fiscal 1998, 1.08 in fiscal 1999, and 1.06 in fiscal 2000. In fiscal 2000, emissions per unit of output improved by 2.1% in comparison to fiscal 1999. The industry is forecasting an index value of 0.97 for fiscal 2005 and 0.84 for fiscal 2010.

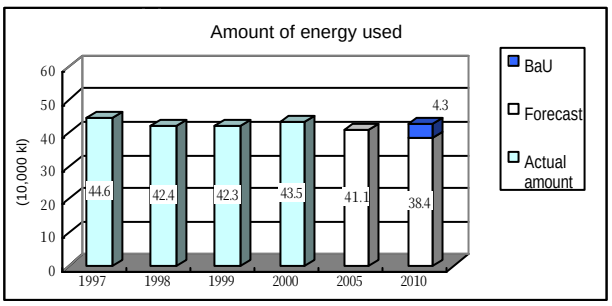
The industry has emitted the following amounts of CO_2: 706,000 t-CO_2 in fiscal 1997; 660,000 t-CO_2 in fiscal 1998; 676,000 t-CO_2 in fiscal 1999; and 718,000 t-CO_2 in fiscal 2000. In fiscal 2000, output increased by 8.5% year-on-year. The industry is forecasting emissions of 685,000 t-CO_2 in fiscal 2005 and 597,000 t-CO_2 in fiscal 2010, 3% and 15.4% less, respectively, than in fiscal 1997. Were a voluntary action plan not executed, CO_2 emissions in fiscal 2010 would be 706,000 t-CO_2, or unchanged from fiscal the level of 1997.

3. Measures undertaken to achieve goals

- Major undertakings
  - Took steps to prevent leaks and to reduce air pressure in compressors
  - Converted fuels used in heat treatment facilities, and used waste heat emitted by such facilities
  - Installed ice thermal storage air conditioning systems and GHP
  - Installed highly efficient lighting equipment
  - Adopted turn-off-lights policy
  - Used more efficient motors, and continued to convert to inverter technology
- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impacts made
  - Air-conditioning-related (conversion to heat pumps, ice thermal storage, and other energy-conserving technologies; strict implementation of temperature controls, etc.)
  - Compressor-related (shift to integrated operations of equipment, air pressure-reduction measures, etc.)
  - Lighting-related (replacement of existing lighting with energy-conserving models; strict enforcement of turn-off policy when lights are unnecessary, etc.)
  - Motor and power source-related (inverter controls, etc.)
  - Heat treatment-related (conversion of fuels used in heat treatment facilities; changing the conditions of operation, etc.)
  - Electricity generation-related (installation of in-house generating equipment)
  - Others (reduction of cycle times for manufacturing machinery, etc.)

5. Reference data





Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1997

Assuming a value of 1 for energy consumed in fiscal 1997, the index of energy input per unit output was 1.06 in fiscal 1998, 1.07 in fiscal 1999, and 1.01 in fiscal 2000. The industry is forecasting index values of 0.92 and 0.86 for fiscal 2005 and 2010, respectively. It has consumed the following amounts of energy (in terms of crude oil equivalents): 446,000 kl in fiscal 1997; 424,000 kl in fiscal 1998; and 423,000 kl in fiscal 1999; and 435,000 kl in fiscal 2000. It is forecasting energy consumption of 411,000 kl in fiscal 2005 and 384,000 kl in fiscal 2010, 7.8% and 13.9% less, respectively, than in fiscal 1997. Were a voluntary action plan not executed, consumption would be 427,000 kl in fiscal 2010, or 4.3% less than in fiscal 1997.

6. Other efforts to deal with global warming

- Contributions to the transportation, offices and households sector (effect of products and services)

Bearings are used in all the revolving parts of automobiles, general machinery, electrical machinery, etc.; thus bearings per se contribute significantly to energy conservation at the point at which they are used.

7. Environmental management; environmental conservation in overseas business activities

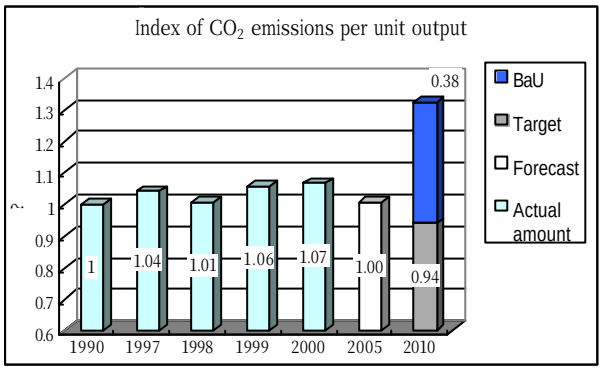
With respect to ISO 14001 certification, member companies as of June 2001 had obtained certification at 42 plants and operational sites domestically (11 companies) and at 34 sites overseas (6 companies).

Note: The principal product of this industry is bearings. The percentage of companies participating in this follow-up was 91.7% (33 out of 36 companies), representing a coverage ratio in terms of value of production of 99.8%. Figures on CO_2 emissions are summations of data provided by 33 member companies of the Japan Bearing Industrial Association. Forecasts for fiscal 2010 assume that production output will remain roughly unchanged from their levels of fiscal 1997.

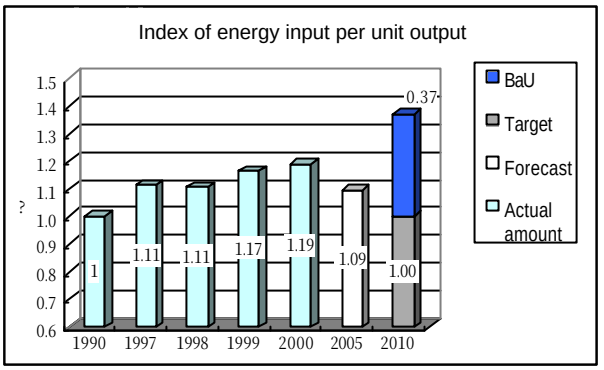
The Japan Soft Drinks Association

Targets: To reduce CO_2 emissions per unit output in 2010 by 6% compared to 1990, and to keep energy input per unit output in 2010 at the same level as in 1990.

1. Degree of progress toward goal

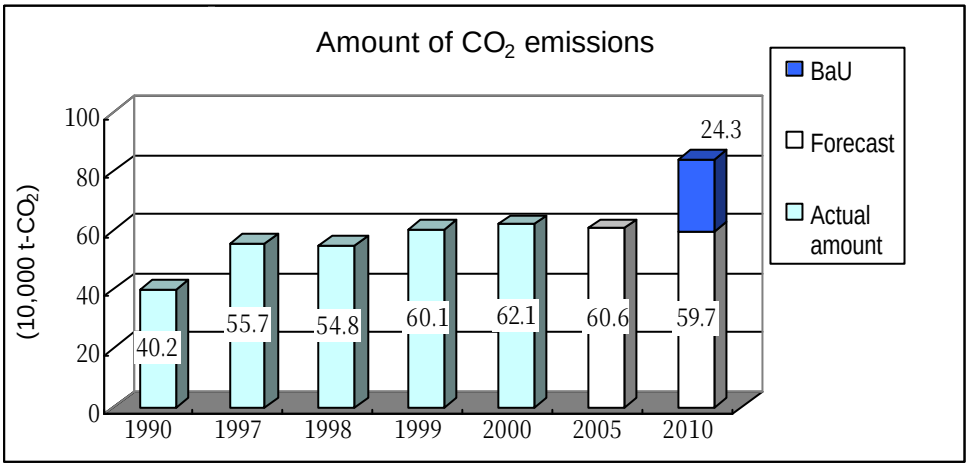


Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Assuming a value of 1 for CO_2 emitted in fiscal 1990, the index of CO_2 emissions per unit output stood at 1.04 in fiscal 1997, 1.01 in fiscal 1998, 1.06 in fiscal 1999 and 1.07 in fiscal 2000. The industry is forecasting an index value of 1.00 for fiscal 2005, and is aiming for a target value of 0.94 in fiscal 2010. Again, assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit output stood at 1.11 in fiscal 1997, 1.11 in fiscal 1998, 1.17 in fiscal 1999 and 1.19 in fiscal 2000. The industry is forecasting an index value of 1.09 in fiscal 2005, and is aiming for a target value of 1.00 in fiscal 2010.

The industry has emitted the following amounts of CO_2: 402,000 t-CO_2 in fiscal 1990; 557,000 t-CO_2 in fiscal 1997; 548,000 t-CO_2 in fiscal 1998; 601,000 t-CO_2 in fiscal 1999; and 621,000 t-CO_2 in fiscal 2000. The industry is forecasting emissions of 606,000 t-CO_2 in fiscal 2005 and 597,000 t-CO_2 in fiscal 2010, increases of 51% and 48%, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, emissions of CO_2 would be 839,000 t-CO_2 in fiscal 2010 which is 109% more than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Use of co-generation
  - Reutilization of water
  - Use of heat-transfer equipment
  - Recovery and utilization of methane gas
  - Use of high efficiency boilers
  - Use of waste heat from steam
  - Use of new energy sources (fuel cells, etc.)
  - Promotion of technologies that recover heat
  - Development and installation of energy-conserving vending machines
  - Conversion to new fuels
  - Improvement of lighting and air conditioning systems
  - Improvement of freezer and chilling equipment
  - Improvement of water disposal systems
  - Use of solar and wind energy

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

CO_2 emissions are tending to increase slightly for the following reasons.

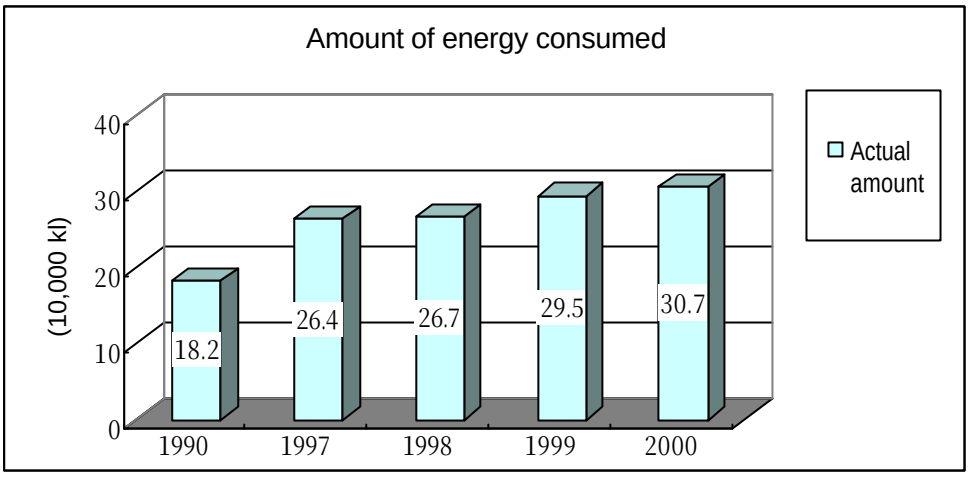
(1) The proportion of tea and coffee that require heat treatment in products increased.

(2) PET bottle products increased as did the number of PET bottles produced by soft drink manufacturers*.

(3) Soft drink manufacturers responded to HACCP requirements (improvements in ventilation and air conditioning facilities)

(* Previously, soft drink manufacturers purchased PET bottles from bottle manufacturers, but now they make and fill the bottles themselves.)

5. Reference data



The industry has consumed the following amounts of energy: 182,000 kl in fiscal 1990; 264,000 kl in fiscal 1997; 267,000 kl in fiscal 1998; 295,000 kl in fiscal 1999; and 307,000 kl in fiscal 2000.

7. Environmental management; environmental conservation in overseas business activities

Status of acquisition of ISO14001 according to number of workplaces (number of workplaces surveyed: 38)

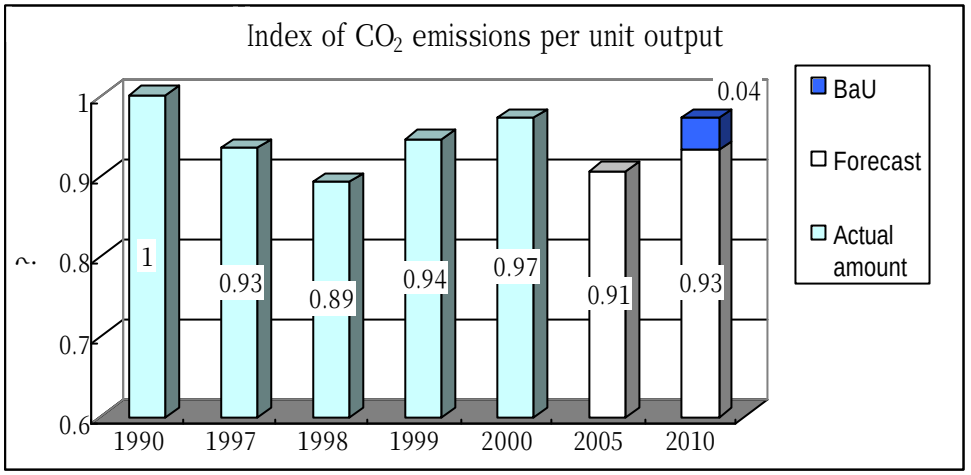
Already acquired	28
Planning to acquire in 2001	8
Planning to acquire in 2002	2
Total	38

Note: The principal product of the industry is soft drinks. Number of companies participating in this follow-up survey was 29 which represented a coverage ration of 43% in terms of production output. The CO_2 emissions are calculated by aggregating data of the 29 companies that are the members of the Japan Soft Drink Association. The industry's forecasts for fiscal 2010 assumes an annual increase in production of 1.0%.

Japan Camera Industry Association

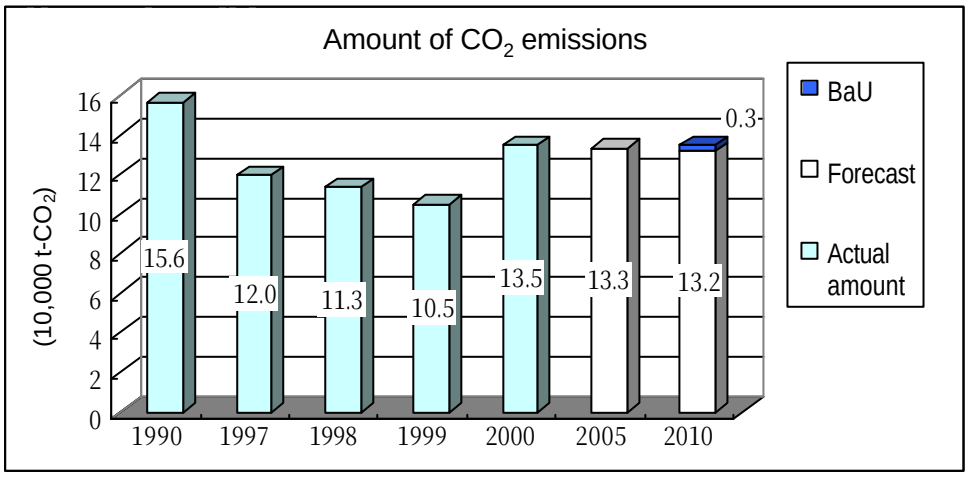
Target: To reduce the index of CO_2 emissions per unit of output (based on fiscal 1990 price levels) in fiscal 2010 by 10% compared to fiscal 1990.

1. Degree of progress toward goal



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

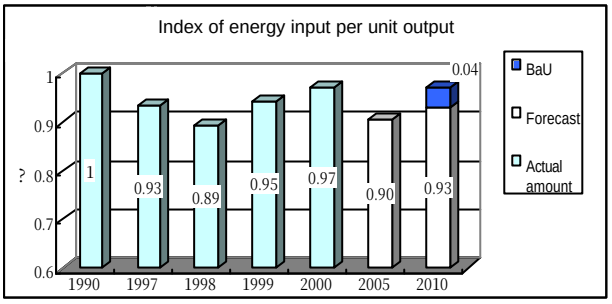
2. Amount of CO_2 emissions

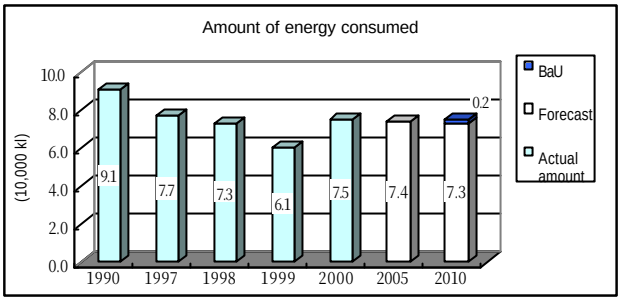


Assuming a value of 1 for amounts emitted in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.93 in fiscal 1997, 0.89 in fiscal 1998, 0.94 in fiscal 1999, and 0.97 in fiscal 2000. The camera industry is forecasting index values of 0.91 in fiscal 2005 and 0.93 in fiscal 2010. It has emitted the following amounts of CO_2: 156,000 t-CO_2 in fiscal 1990; 120,000 t-CO_2 in fiscal 1997; 113,000 t-CO_2 in fiscal 1998; 105,000 t-CO_2 in fiscal 1999, and 135,000 t-CO_2 in fiscal 2000. It is forecasting emissions of

133,000 t-CO_2 in fiscal 2005 and 132,000 t-CO_2 in fiscal 2010, 14.7% and 15.4% less, respectively, than in fiscal 1990. Were a voluntary action plan not executed, emissions would be 135,000 t-CO_2 in fiscal 2010, a 13.5% decrease vis-à-vis fiscal 1990.

5. Reference data





Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

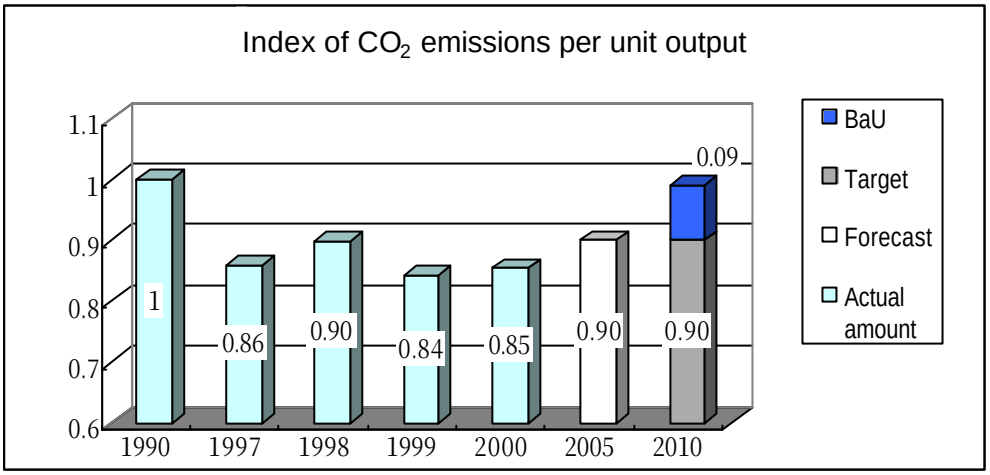
Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit output stood at 0.93 in fiscal 1997, 0.89 in fiscal 1998, 0.95 in fiscal 1999, and 0.97 in fiscal 2000. The industry is forecasting index values of 0.90 for fiscal 2005 and 0.93 for fiscal 2010. It has consumed the following amounts of energy: 91,000 kl in fiscal 1990, 77,000 kl is fiscal 1997, 73,000 kl in fiscal 1998, 61,000 kl in fiscal 1999, and 75,000 kl in fiscal 2000. It is forecasting energy consumption of 74,000 kl in fiscal 2005 and 73,000 kl in fiscal 2010, 19% and 20%, respectively, less than in fiscal 1990. Were a voluntary action plan not executed, energy consumption in fiscal 2010 would be 75,000 kl, a 18% reduction compared to fiscal 1990.

Note: The principal products of the Japan Camera Industry Association are cameras and replacement lenses.

Japan Shipowners' Association

Target: To reduce CO_2 emissions in 2010 on a per unit transported basis by approximately 10% compared to 1990.

1. Degree of progress toward goal



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990. Input per unit output is expressed in terms of CO_2 emissions per amount of freight transported.

Assuming a value of 1 for CO_2 emissions in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.86 in fiscal 1997, 0.90 in fiscal 1998, 0.84 in fiscal 1999, and 0.85 in fiscal 2000. The industry is forecasting an index value of 0.90 for fiscal 2005, and is aiming for a target value of 0.90 for fiscal 2010. The fiscal 2000 revision of the Calorific Value Table by Energy Source raised CO_2 emissions by 1.5%. (The index of CO_2 emissions per unit output for fiscal 2000 will be 0.84 if the previous coefficients are used.)

3. Measures undertaken to achieve goals

- Major undertakings
  - Conversion to new ships with greater energy efficiency, adoption of energy-saving equipment, etc.
  - Research into/adoption of voyage support systems that enable the planning of optimum routes etc.
  - Research into/implementation of energy-saving navigation technologies on board ship, and encouraging strict compliance to energy-saving measures
  - Endeavors in research and development to introduce effective ways of using wasted energy in order to increase propulsion efficiency and to improve fuel efficiency.

- Optimally designed ships that increase the efficiency of transportation
- Energy conservation measures for offices on shore, including adjustments to the temperatures set for air conditioning and heating, adjustments of the duration of their use, and the installation of energy conserving OA equipment.

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made
  - Measures to improve the propulsion efficiency such as regular cleaning and painting of ships and grinding of propellers.
  - Measures to improve the combustion efficiency of main engines such as thorough maintenance of fuel valves and air release valves.
  - The selection of optimum routes to reduce the increase in fuel consumption by sailing disturbance. Reduction in speed to reduce energy consumption when there is time to spare in the schedule.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

Although CO_2 emissions have increased over the last ten years due to an increase in freight volume, the efforts described above have reduced the target of energy per unit output. Despite the fact that the freight volume increased 44% since fiscal 1990, the increase in CO_2 emissions in the same period was just 23.1%.

6. Other efforts to deal with global warming

- Emissions from offices and internal distribution

  Energy conservation measures for offices on shore, including adjustments to the temperatures set for air conditioning and heating, adjustments of the duration of their use, and the installation of energy conserving OA equipment will be introduced on a continuous basis.

- Measures to deal with greenhouse gases other than CO_2
  - Regarding chlorofluorocarbon substitutes for the HFC etc. used in air conditioning equipment, food warehouses, and reefer containers, the industry will monitor the development of refrigerants that have a minimal impact on global warming, and endeavor to adopt HFC substitutes hereafter. It will also endeavor to prevent the gases in question from escaping into the atmosphere during the servicing or repair of such facilities.

7. Environmental management; environmental conservation in overseas business activities

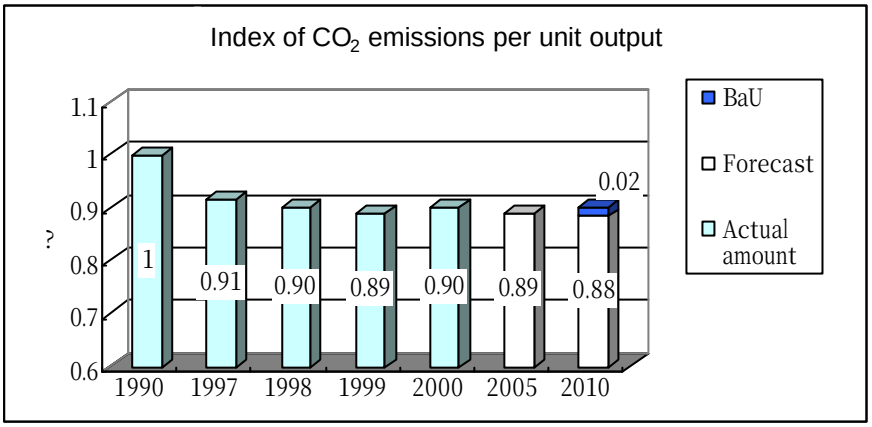
- Environmental management system: Continuous endeavors will be made for the conservation of the environment and environmental management systems will be improved, taking into consideration ISO14000 (environmental management standards).

Note: While the industry is involved in ocean shipping generally, the goals contained in this report apply only to overseas shipping. The number of participating companies in this follow-up survey was 40, representing coverage of 859.93 million tons of freight in fiscal 2000. Volume of CO_2 emissions in the past was calculated by aggregating figures of 40 com panies that conduct transportation using ocean liners. In calculating its forecast for annual shipping volume in fiscal 2010, the industry generated estimates based on trends in freight volumes carried by Japanese merchant fleets (source: Ministry of Land, Infrastructure and Transport) over the most recent five year period. In addition, although CO_2 emissions are affected by the distances that freight is transported, CO_2 emissions per unit output were calculated using only freight volumes in this survey.

The Scheduled Airlines Association of Japan

Target: By fiscal 2010, to reduce CO_2 emissions that have been generated through the use of aviation fuel by 10% per unit of output (passenger seat-distance provided) compared to the level of fiscal 1990.

1. Degree of progress toward goal



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

Assuming a value of 1 for CO_2 emissions in fiscal 1990, the index of CO_2 emissions per unit output in terms of passenger seat-distance provided stood at 0.91 in fiscal 1997, 0.90 in fiscal 1998, 0.89 in fiscal 1999, and 0.90 in fiscal 2000. The airline industry is forecasting an index value of 0.89 for fiscal 2005, and has established a target value of 0.88 for fiscal 2010.

3. Measures undertaken to achieve goals

- Major undertakings
  - Promoted a shift toward new aircraft that offer improved rates of fuel consumption (put 19 new aircraft into service in fiscal 2000)
  - Shortened routes and flight times, and improved the precision of routes taken, through the introduction of future air navigation systems etc.
  - Selected optimum flight altitudes and speeds, and the shortest possible flight routes, in everyday service.
  - Fueled planes with optimum amounts of fuel; lightened the material loaded on to planes; reduced use of supplementary power devices; reduced actual flight training and evaluation time through the use of simulators; shortened the amount of time used to test engines.

- Specific anti-global warming measure carried out in fiscal 2000; estimated investment and impacts made

In fiscal 2000, the industry took 15 older planes out of service, replacing them with 19 new aircraft with improved fuel efficiency at a cost of 176 billion yen.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

Volume of transportation expanded in recent ten years, leading to increased emissions of CO_2. As a result of the above-mentioned undertakings, CO_2 emissions per unit output (target index) were reduced, which is shown in the fact that the passenger seat-distance increased by 88% in the period while CO_2 emissions expanded only by 63%.

6. Other anti-global warming measures

- Emissions from offices and in-house distribution

At each of its operational locations, the industry has taken steps to conserve energy, by assuring that air conditioning equipment is being operated at appropriate settings and by considering the periods and times in which heat or air conditioning is provided; it has also endeavored to save electricity and water. It will take further steps in this regard hereafter. In relation to facilities and equipment, the industry currently uses only the most energy-efficient models available at the time of installation, and it will continue this policy hereafter.

- Measures to deal with greenhouse gases other than CO_2

By preventing leakage during the servicing and maintenance of equipment that uses substitute chlorofluorocarbons, and through collection and reutilization of such gases, the industry is contributing to the control of such emissions (its use of advanced gas recovery equipment has enabled it to achieve a collection rate of virtually 100%).

7. Environmental management; environmental conservation in overseas business activities

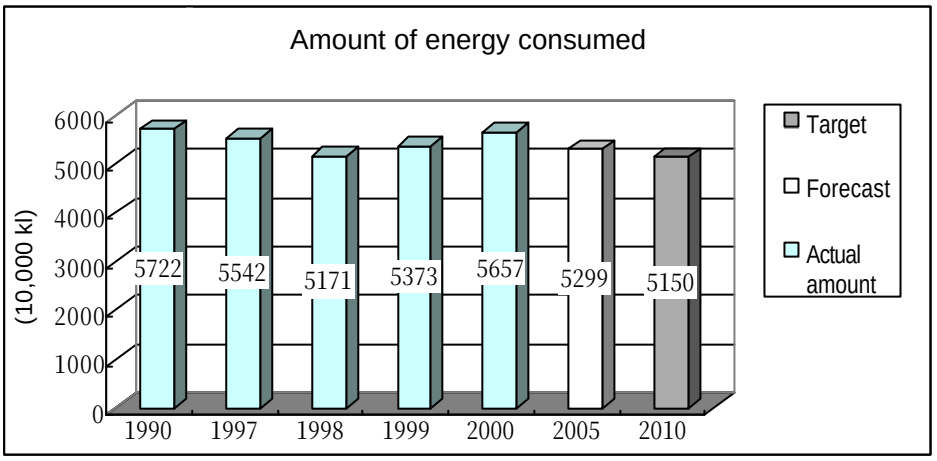
- Airlines are either promoting efforts to obtain ISO 14001 certification or establishing environmental management systems that are modeled on ISO 14001 requirements. Previously certified companies are endeavoring to make further improvements.
- Airlines abide by the rules and regulations of overseas airports, and make allowances for environmental measures required by each airport.

Note: The principal business of The Scheduled Airlines Association is providing regularly scheduled air transportation service over domestic and international routes. The percentage of companies participating in this follow-up survey was 100%--all 12 of the industry's companies.

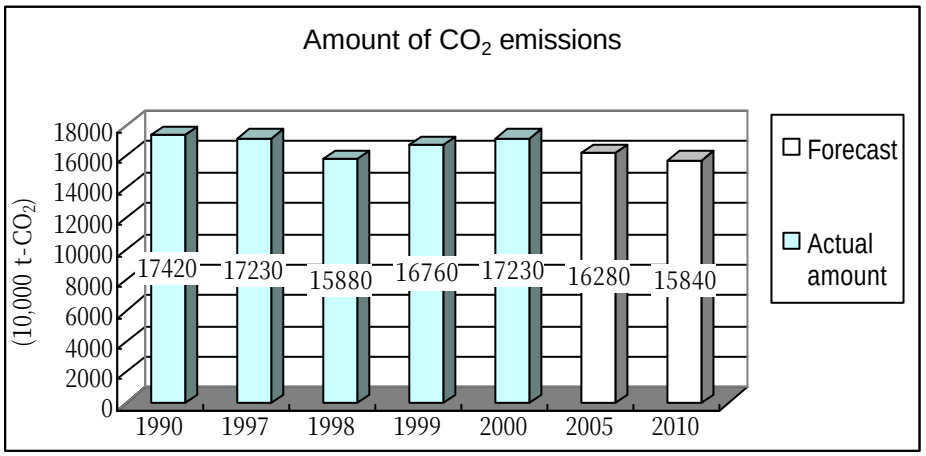
The Japan Iron and Steel Federation

Targets: With fiscal 1990 as the base year, to reduce the amount of energy consumed by 10% in fiscal 2010. As an additional endeavor, the industry will take steps to utilize waste plastics recycling system in blast furnace, etc., which will be utilized roughly 1.5% of the amount of energy consumption for the production processes in fiscal 1990 (assuming the development of a proper collection system) by fiscal 2010.

1. Degree of progress toward goal



2. Amount of CO_2 emissions



Note: Emissions do not include CO2 emitted from industrial processes.

The steel industry has recorded the following amounts of energy consumption (in terms of crude oil): 57.22 million kl in fiscal 1990; 55.42 million kl in fiscal 1997; 51.71 million kl in fiscal 1998; 53.73 million kl in fiscal 1999; and 56.57 million kl in fiscal 2000. It is forecasting consumption of 52.99 million kl for fiscal 2005, and is aiming to achieve the goal of 51.50 million kl in fiscal 2010. Assuming the completion

of the waste collection system that the industry undertakes additional efforts involving the use of waste plastics as reducing agent for coke into blast furnace etc., the target for fiscal 2010 would be 50.60 million kl.

The steel industry has recorded the following amounts of CO_2 emissions (excluding amounts emitted through industrial processes): 174.2 million t-CO_2 in fiscal 1990; 172.3 million t-CO_2 in fiscal 1997; 158.8 million t-CO_2 in fiscal 1998; 167.6 million t-CO_2 in fiscal 1999; and 172.3 million t-CO_2 in fiscal 2000. It is forecasting CO_2 emissions of 162.8 million t-CO_2 in fiscal 2005 and 158.4 million t-CO_2 in fiscal 2010, 7% and 9% declines, respectively, compared to fiscal 1990.

Moreover CO_2 emissions from limestone and dolomite, two non-energy sources of CO_2, are as follows: 11.6 million t-CO_2 in fiscal 1990; 10.5 million t-CO_2 in fiscal 1997; 9.6 million t-CO_2 in fiscal 1998; 9.9 million t-CO_2 in fiscal 1999; and 10.3 million t-CO_2 in fiscal 2000.

3. Measures undertaken to achieve goals

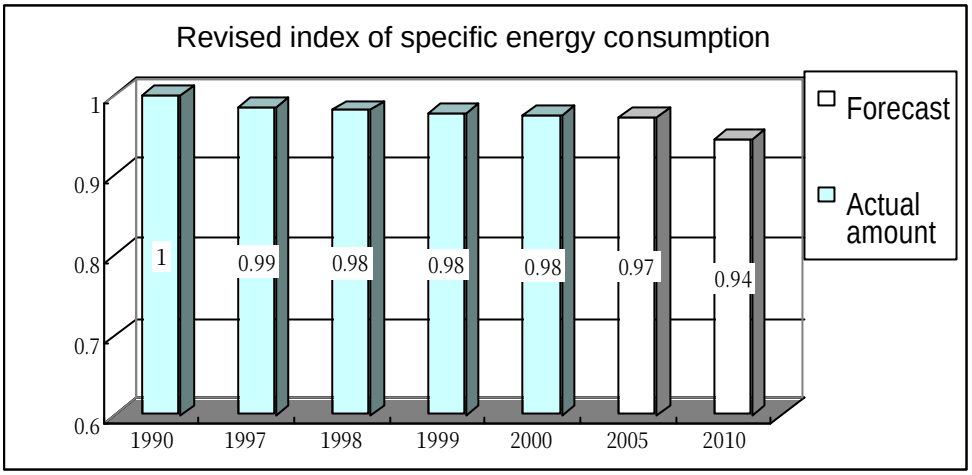
- Major undertakings
  - Engaging in efforts to conserve energy during production processes (increasing dissemination of waste-energy recovery systems; promoting greater efficiency in production facilities; promoting the introduction of next-generation iron and steel-making technology, etc.)
  - Effective utilization of waste plastics
  - Utilization of unused energy in the local community
  - Contributing to energy conservation in society through products and by-products
  - Contributing to energy conservation through international technical cooperation (JI, CDM, etc.)

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

The following are the major measures implemented in fiscal 2000.

- Measures to improve the efficiency of reheating furnaces (such as utilization of regenerating burners).
- Enhanced utilization of facilities to recover waste energy by CDQ, TRT and sintering machine, etc.
- Improvement in the efficiency of private generating station.
- Highly efficient blowers for blast furnaces.
- Improvement in the revolution speed control of dust collectors, etc.
- Concentration of facilities.
- Improvement in the hot charge rate.
- Waste plastics recycling into blast furnaces, etc.

5. Reference data



Note: This index assigns a value of 1 to the amounts of energy consumed in fiscal 1990.
(Production conditions have been adjusted to the conditions existing in fiscal 1995)

Assuming a value of 1 for specific energy consumption in fiscal 1990, the revised index of the specific consumption stood at 0.99 in fiscal 1997, 0.98 in fiscal 1998, 0.98 in fiscal 1999, and 0.98 in fiscal 2000. The industry is forecasting index values of 0.97 in fiscal 2005 and 0.94 in fiscal 2010.

6. Other efforts to deal with global warming

? Contributions to the transportation, offices and households sector (effect of products and services etc.)

The industry has been moving vigorously to develop high-performance products that exploit steel's special attributes, such as high-strength steel sheet for automobiles, magnetic steel sheet for transformers, and ultra-thin steel cans. Each of these products is making a significant contribution to energy conservation when actually used in society.

? Projects implemented with regard for the Kyoto mechanism

- Since 1995, the industry has completed work on seven "Green Aid Plan" energy conservation model projects in China and Thailand, and is currently pursuing four other projects in these countries. Four of these model projects (two projects in China and two in Thailand) have been approved as Activities Implemented Jointly with the respective countries. Hence the industry's projects are recognized by the governments of the countries. (The estimated energy saving effect achieved by the completed model projects is 69,625 kl/year in terms of crude oil.)
- To investigate the possibility of participation in future JI, CDM, etc., the industry has evaluated a number of national projects (NEDO) since fiscal 1998 (basic surveys on the promotion of AIJ etc.), undertaking seven project

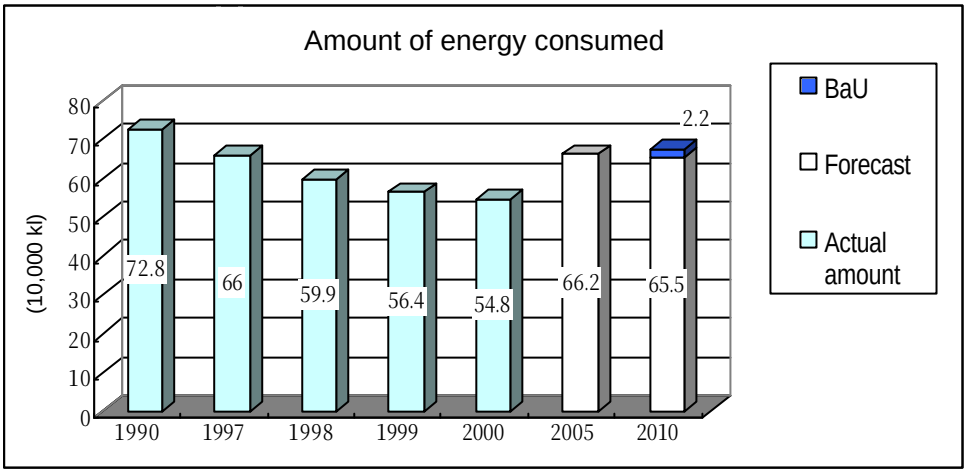
development studies in fiscal 1998, fifteen project development studies in fiscal 1999 and four project development studies in fiscal 2000. (The estimated CO_2 reduction effect by the basic surveys on the promotion of AIJ, etc. is 2.94 million t-C in fiscal year 1998 and 1.261 million t-C in fiscal year 1999.)

Note: For CO_2 emissions per unit of output from electricity in fiscal 2010, the industry uses 0.102 kg C/kWh, which was the actual value in fiscal 1990. Amount of CO_2 emissions was estimated using designated statistics of energy consumption by steel industry prepared by the government (Dynamic Statistics of Consumption of Petroleum and Other Fuels). It assumes crude steel production of approximately 100 million tons in fiscal 2010.

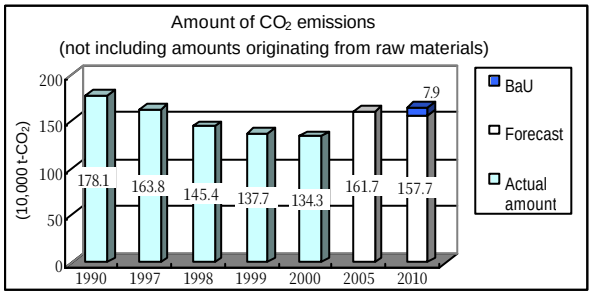
Flat Glass Association of Japan

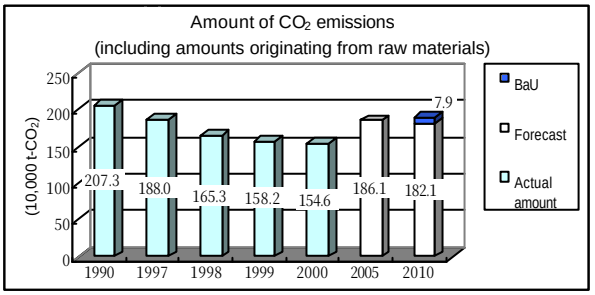
Target: To reduce the amount of energy used in the production process by 9% of the amount consumed in fiscal 1990 by fiscal 2005, and by 10% of the amount consumed in fiscal 1990 by fiscal 2010.

1. Degree of progress toward goal



2. Amount of CO_2 emissions





The flat glass industry has consumed the following amounts of energy (in terms of crude oil equivalents): 728,000 kl in fiscal 1990; 660,000 kl in fiscal 1997; 599,000 kl in fiscal 1998; 564,000 kl in fiscal 1999; and 548,000 kl in fiscal 2000. It is forecasting consumption of 662,000 kl in fiscal 2005 and 655,000 kl in fiscal 2010, 9% and 10% declines, respectively, compared to 1990. Were the voluntary action plan not executed, energy consumption would be 677,000 kl in fiscal 2010, a 7% reduction vis-à-vis fiscal 1990.

Excluding emissions that originate in raw materials, the industry has emitted the following amounts of CO_2: 1.781 million t-CO_2 in fiscal 1990; 1.638 million t-CO_2 in fiscal 1997; 1.454 million tCO_2 in fiscal 1998; 1.377 million tCO_2 in fiscal 1999; and

1.343 million t-CO_2 in fiscal 2000. It attributes the reduction of emissions in fiscal 2000 to reduced production and more efficient use of energy. It is forecasting CO_2 emissions of 1.617 million t-CO_2 in fiscal 2005 and 1.577 million t-CO_2 in fiscal 2010, 9% and 12% less, respectively, than in fiscal 1990. Were a voluntary action plan not executed, emissions in fiscal 2010 would be 1.656 million t-CO_2, 7% less than in fiscal 1990.

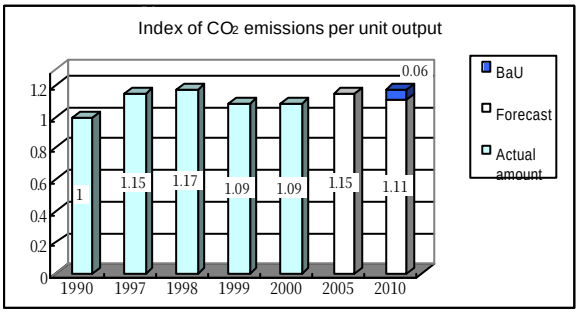
3. Measures undertaken to achieve goals

- Major undertakings
  - Improvements in energy efficiency through periodic repairs of melting kilns and greater concentration of production facilities.
  - Technological development aimed at reducing CO_2 in the production process, and development of technologies for energy conversion.
  - Promoting the propagation of multiplex glass.

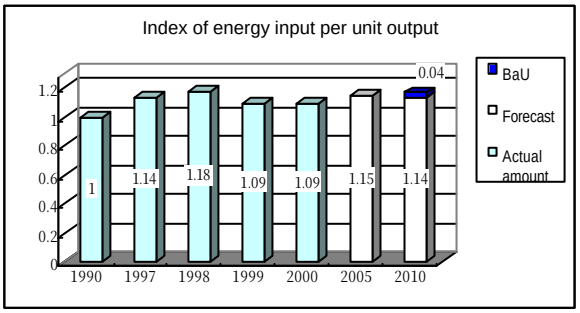
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

In terms of reaching its goal of decreasing the amount of energy consumed in the production process, the industry used 24.6% less energy in fiscal 2000 compared to fiscal 1990, but the largest factor accounting for this change was the 31.1% drop in production in fiscal 2000, vis-à-vis fiscal 1990 production. Because of the decline in production levels, the overall amount of CO_2 emissions also decreased, but the amount of CO_2 emissions per unit output slightly worsened.

5. Reference data



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

Assuming a value of 1 for CO_2 emitted in fiscal 1990, the index of CO_2 emissions per unit output stood at 1.15 in fiscal 1997, 1.17 in fiscal 1998, and 1.09 for both fiscal 1999 and 2000. The industry is forecasting index values of 1.15 and 1.11, respectively, for fiscal 2005 and 2010.

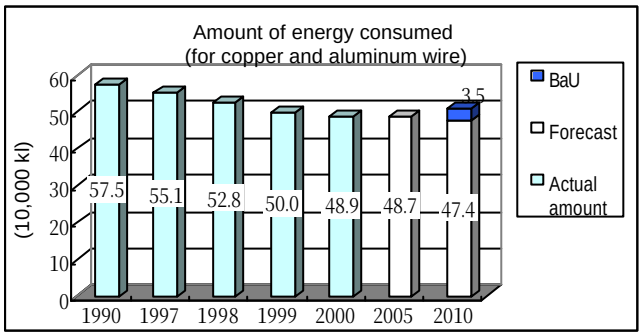
Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy consumed per unit output stood at 1.14 in fiscal 1997, 1.18 in fiscal 1998, and 1.09 for both fiscal 1999 and 2000. The industry is forecasting index values of 1.15 and 1.14, respectively, for fiscal 2005 and 2010.

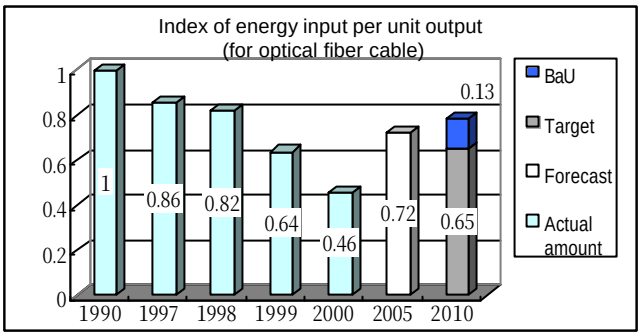
Note: The principal product of this industry is flat glass. The percentage of companies participating in this follow-up survey was 100% (3 out of 3 companies), representing a coverage rate for energy consumed by the industry of 100% (considering the production process only). The amounts of CO_2 emissions were calculated by totaling the various fuel consumption values listed in the annual statistics reports on the kiln industry and construction materials, converting the totals into heat values (MJ), and then multiplying them by the appropriate carbon conversion coefficient. The forecast of production output in fiscal 2010 assumes that production will remain at about the same level as in 1995, the data for which became available to the industry just prior to its preparation of voluntary plans.

Japan Electric Wire and Cable Makers' Association

Targets: In fiscal 2010, to keep the amount of energy consumed in production plants for copper and aluminum wire at the level consumed in fiscal 1990. Furthermore, in fiscal 2010, to reduce the amount of energy consumed per unit in production plants for optical fiber cable by 35% compared to fiscal 1990.

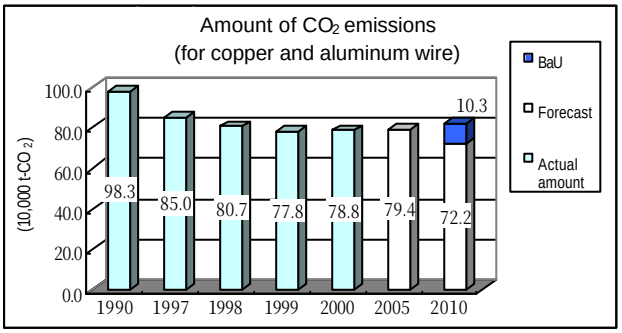
1. Degree of progress toward goal

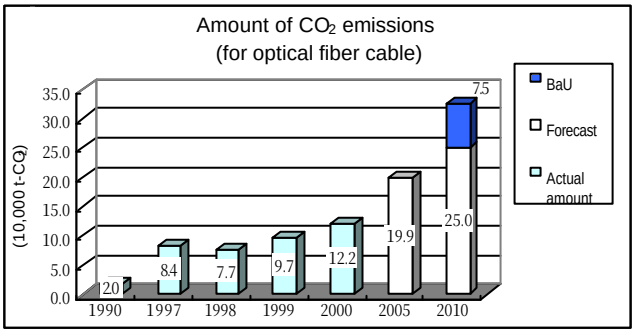




Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions





In production plants for copper and aluminum wire, the wire and cable manufacturing industry has consumed the following amounts of energy: 575,000 kl in fiscal 1990; 551,000 kl in fiscal 1997; 528,000 kl in fiscal 1998; 500,000 kl in fiscal 1999; and 489,000 kl in fiscal 2000. It attributes the decline in consumption in fiscal 2000 to a decline in production volume. The industry is forecasting consumption of 487,000 kl in fiscal 2005 and 474,000 kl in fiscal 2010, 15% and 18% declines, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, the forecast for consumption in fiscal 2010 would be 509,000 kl, 12% less than in fiscal 1990.

On the other hand, assuming a value of 1 for energy consumed in the production of optical fiber in fiscal 1990, the index for of energy consumed per unit output stood at 0.86 in fiscal 1997, 0.82 in fiscal 1998, 0.64 in fiscal 1999, and 0.46 in fiscal 2000. The industry is forecasting an index value of 0.72 for fiscal 2005 and is aiming for a target value of 0.65 for fiscal 2010.

In producing copper and aluminum wire, the industry has emitted the following amounts of CO_2: 983,000 t-CO_2 in fiscal 1990; 850,000 t-CO_2 in fiscal 1997; 807,000 t-CO_2 in fiscal 1998; 778,000 tCO_2 in fiscal 1999; and 788,000 tCO_2 in fiscal 2000. It is forecasting emissions of 794,000 t-CO_2 for fiscal 2005 and 722,000 t-CO_2 for fiscal 2010, representing 19% and 27% reductions, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, CO_2 emissions in fiscal 2010 would be 825,000 t-CO_2, a 16% decline compared to fiscal 1990.

CO_2 emissions from optical fiber production were: 20,000 tCO_2 in fiscal 1990; 84,000 t-CO_2 in fiscal 1997; 77,000 t-CO_2 in fiscal 1998; 97,000 t-CO_2 in fiscal 1999; and 122,000 t-CO_2 in fiscal 2000. The emission forecasts are 199,000 t-CO_2 for fiscal 2005 and 250,000 tCO_2 for fiscal 2010, representing 895% and 1150% increases, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, CO_2 emissions in fiscal 2010 would be 325,000 t-CO_2, a 1525% increase compared to fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Measures to increase energy efficiency (renewing existing equipment to new and superior energy-efficient models)
  - Measures to reduce energy losses
  - Measures to conserve energy through improvements in wire manufacturing processes
  - Energy-saving measures for optical fiber cable production

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

The association checks the state of energy consumption every three months as part of its effort to promote action against global warming by member companies.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

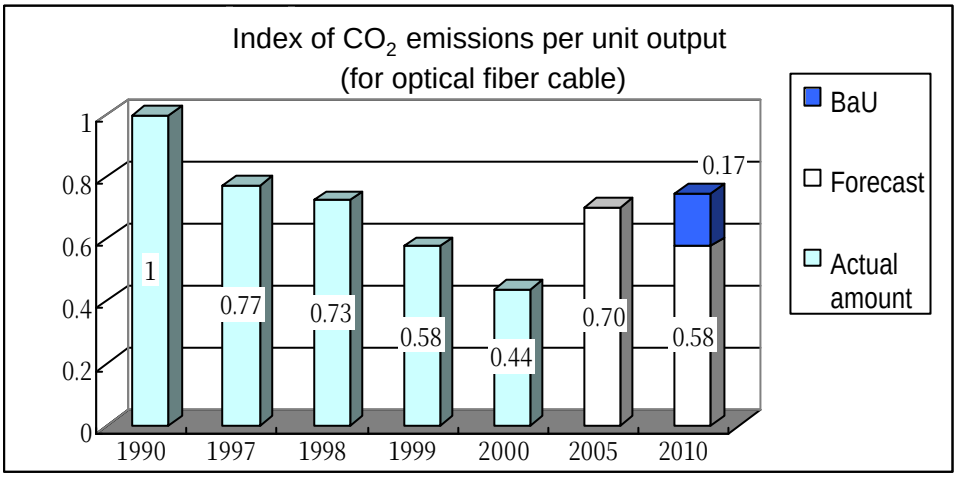
- Copper/aluminum wire production: CO_2 emissions dropped in fiscal 2000 because of reduced production and implementations that improved energy efficiency.
- Optical fiber production: Improvements were made in energy efficiency and the

operational efficiency of facilities, but the massive increase in production in fiscal 2000 resulted in a rise in CO_2 emissions.

The following is an analysis of the factors behind the changes in CO_2 emission amounts from fiscal 1990 to fiscal 2000.

	Copper/Aluminum	Optical Fiber
Improvements in electric power use per unit output	-72,895 t-CO_2	-14,867 t-CO_2
Efforts to reduce emissions by various segments of the industry	114,544 t-CO_2	-142,852 t-CO_2
Economic expansion (change in quantities produced etc.)	-236,126 t-CO_2	259,137 t-CO_2
Total	-194,477 t-CO_2	101,419 t-CO_2

5. Reference data



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

Assuming a value of 1 for emissions in fiscal 1990, the index of CO_2 emissions per unit output for optical fiber cable stood at 0.77 in fiscal 1997, 0.73 in fiscal 1998, 0.58 in fiscal 1999, and 0.44 in fiscal 2000. The industry is forecasting index values of 0.70 in fiscal 2005 and 0.58 in fiscal 2010.

6. Other efforts to deal with global warming

- Emissions from offices and internal distribution

Energy consumption associated with internal distribution was 49,000 kl for fiscal 1996; 44,000 kl for fiscal 1997; 39,000 kl for fiscal 1998; 37,000 kl for fiscal 1999; and 38,000 kl for fiscal 2000. The goal for fiscal 2010 is 36,000 kl.

- Measures dealing with greenhouse gases other than CO_2

With respect to SF_6 and HFC, the industry is taking steps to prevent leakage during servicing and repair, and to collect and reuse gases.

7. Environmental management; environmental conservation in overseas business activities

As a means of ensuring their commitment to voluntary efforts and to continual improvements with respect to the environmental problem, companies are endeavoring to introduce and/or build environmental management systems. As of August 2001, out of the 150 member companies of the association, 39 companies, operating through 81 business locations, had obtained ISO 14001 certification.

Companies, of course, are endeavoring to comply with local environmental standards in their overseas business activities, while also abiding by the section on "environmental concerns in relation to overseas business development" that is incorporated into the Keidanren "Global Environmental Charter." They also refer to Japanese environmental standards and other standards as guidelines in their efforts to do all that is possible to protect the environment.

Note: The principal products of this industry are copper, aluminum and optical fiber cable. The percentage of companies participating in this follow-up survey was 91% (137 out of 150 companies). The industry's forecast for fiscal 2010 assumes that annual quantities of copper and aluminum cable produced will remain unchanged after fiscal 1998, and that energy consumption will be reduced by 1.0% per year up to fiscal 2000, and by 0.5% per year thereafter. In addition, the forecast assumes that production amounts of optical fiber cable will increase by 10% per year through fiscal 2010, and that energy consumption per unit output in this activity will be 35% less in fiscal 2010 than in fiscal 1990. The figures for energy consumption and CO_2 emissions are based on the statistics of association members.

The Petroleum Association of Japan

Targets: [Production and distribution stages]

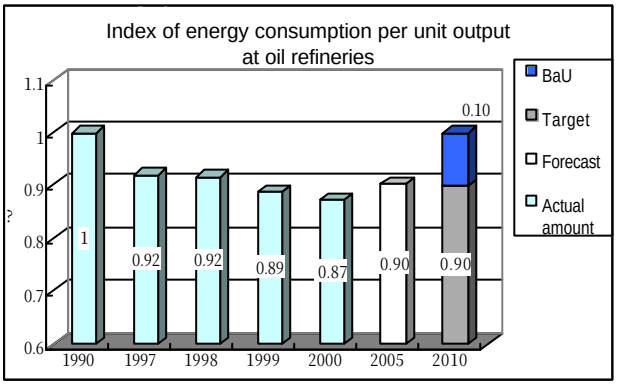
The industry is targeting the following goals for energy conservation in fiscal 2010 compared to fiscal 1990.

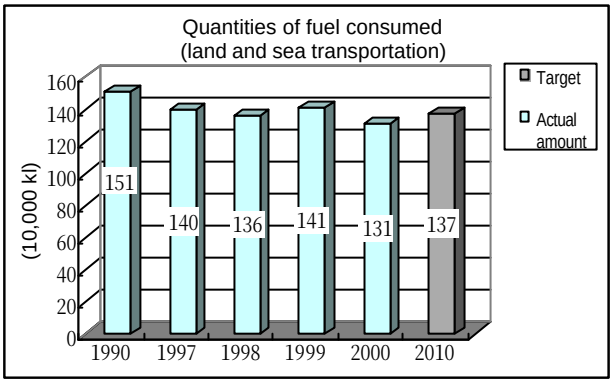
- A 10% reduction of energy input per unit of output at oil refineries.
- A 9% reduction in fuel used to transport oil products.

[Consumption sector]

- Achieving an annual reduction of 1.4 million kl in oil consumed through greater use of co-generation.

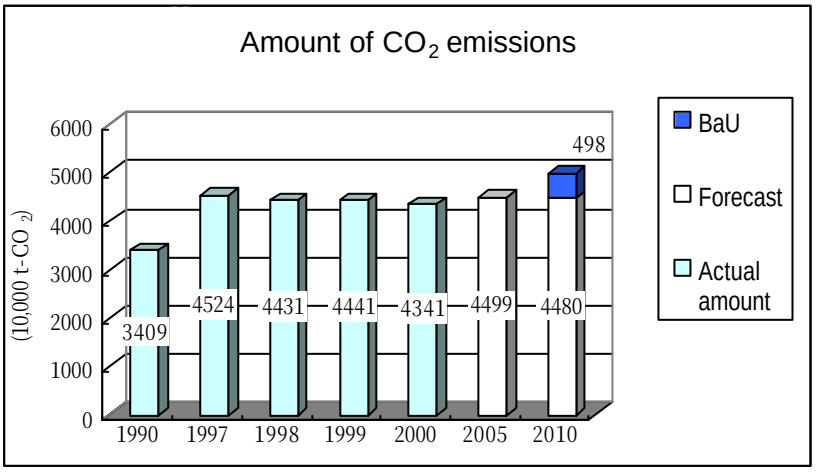
1. Degree of progress toward goal





Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Note: Emissions do not include CO_2 emitted from industrial processes.

Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy consumption per unit output at oil refineries stood at 0.92 in fiscal 1997, 0.92 in fiscal 1998, 0.89 in fiscal 1999 and 0.87 in fiscal 2000. The industry is forecasting an index

value of 0.90 for fiscal 2005 and is aiming for a target value of 0.90 for fiscal 2010. In terms of both land and sea transportation, the industry has consumed the following amounts of energy: 1.51 million kl in fiscal 1990; 1.40 million kl in fiscal 1997; 1.36 million kl in fiscal 1998; 1.41 million kl in fiscal 1999; and 1.31 million kl in fiscal 2000. It is aiming for consumption of 1.37 million kl in fiscal 2010, a 9.0% reduction compared to fiscal 1990.

Oil refineries have emitted the following amounts of CO_2: 34.09 million t-CO_2 in fiscal 1990; 45.24 million t-CO_2 in fiscal 1997; 44.31 million t-CO_2 in fiscal 1998; 44.41 million t-CO_2 in fiscal 1999; and 43.41 million t-CO_2 in fiscal 2000. It attributes the increase in emissions in fiscal 1999 to increased unit production and an increase in energy consumed through secondary processing equipment because of a demand shift towards light gas oil and the need to incorporate environmental quality measures into production. However, CO_2 emissions dropped in fiscal 2000 due to efforts to conserve energy and the integration and closure of oil refineries. It is forecasting emission of 44.99 million t-CO_2 in fiscal 2005 and 44.80 million t-CO_2 in fiscal 2010 which are increases of 32% and 31%, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, CO_2 emissions in fiscal 2010 would be 49.78 million t-CO_2, a 46% increase compared to fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Energy conservation at oil refineries (advanced energy conservation management; reduction of steam; recovery of waste heat; development and introduction of new technologies)
  - Increased efficiency of land transportation (increasing the size of tankers; improving fuel efficiency; increasing loads per vehicle)
  - Increased efficiency of sea transportation (reducing amounts transported; increasing the size of ships; reducing transportation distances)
  - Conservation in the consumption sector (promoting the dissemination of petroleum cogeneration)

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

  Energy consumption per unit output at oil refineries improved 0.17 points on the previous year due to implementation of comprehensive energy conservation measures including the following.
  - Advanced energy conservation management (optimizing machinery operation using highly advanced computerized control).
  - Reduction of steam (volume to be used, more precise control of pressure and increasing steam generation, etc.)

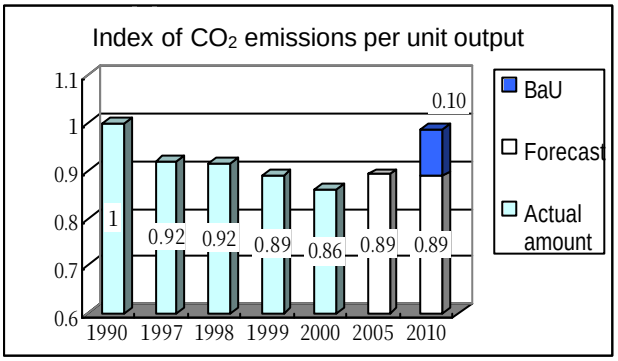
- Recovery of waste heat.

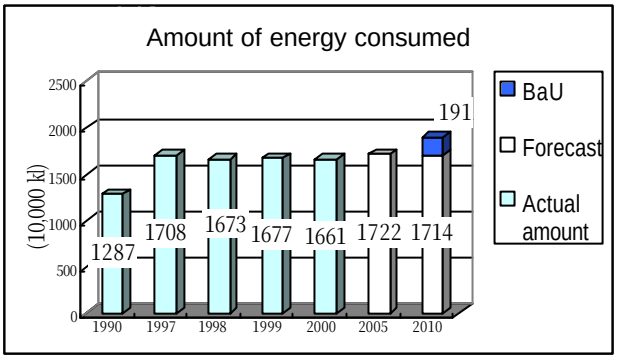
* There is no information about the effect of the items or the amounts invested.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

Improvements in electric power use per unit output	- 68,000 t-CO_2	-0.2%
Efforts to reduce emissions by various segments of the industry	-6,301,000 t-CO_2	-18.5%
Economic expansion (change in quantities produced etc.)	15,697,000 t-CO_2	46.0%
Total	9,328,000 t-CO_2	27.4%

5. Reference data





Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

Assuming a value of 1 for CO_2 emitted in fiscal 1990, the index of CO_2 emissions per unit of output stood at 0.92 in fiscal 1997, 0.92 in fiscal 1998, 0.89 in fiscal 1999 and 0.86 in fiscal 2000. The industry is forecasting an index value of 0.89 for both fiscal 2005 and fiscal 2010, and a "business-as-usual" value of 0.99 for fiscal 2010. It has recorded the following amounts of energy consumption (in terms of crude oil equivalents): 12.87 million kl in fiscal 1990; 17.08 million kl in fiscal 1997; 16.73 million kl in fiscal 1998; 16.77 million kl in fiscal 1999; and 16.61 million kl in fiscal 2000. The industry is forecasting energy consumption of 17.22 million kl in fiscal 2005 and 17.14 million kl in fiscal 2010 which are increases of 34% and 33%, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, consumption would be 19.05 million kl in 2010, 48% more than in fiscal 1990.

6. Other efforts to deal with global warming

- Contributions to the transportation, offices and households sector (effect of products and services)

  By promoting the spread of petroleum co-generation, the industry expects to achieve energy conservation of 1.4 million kl (in terms of fueloil equivalents)/year each year through fiscal 2010.

- Measures to deal with greenhouse gases other than CO_2
  - No record of use of HFC or PFC.
  - SF_6 is used in breakers that are found in power receiving equipment. When the gas is let out, the procedure is carried out in a closed environment and the gas is recaptured.
  - Approximately 7t of CH_4 is emitted annually by evaporation from tanks, etc.
  - 496t of N_2O is emitted annually from oil refining equipment.

- Projects implemented with regard for the Kyoto mechanism
  Conclusion of options contracts for the right of CO_2 emissions in Australia

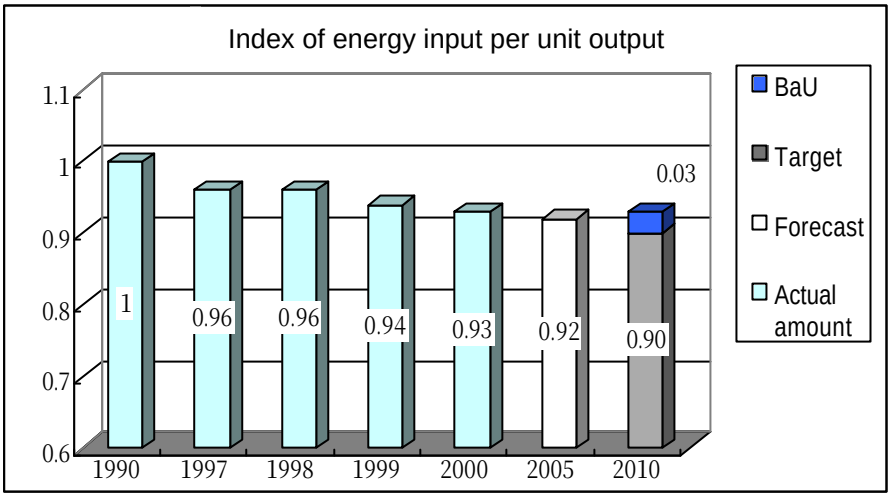
7. Environmental management; environmental conservation in overseas business activities
  - As of the end of March 2001, the number of plants and other operational sites that had obtained either ISO 14001 certification or recognition for an equivalent environmental management system had reached 67.
  - Through the Petroleum Energy Center, NEDO, JICA and other organizations, the industry is engaged in solar electricity development, training in energy conservation, and other overseas projects.

Note: The industry's principal products are gasoline, gas oil, LPG, jet fuel, naphtha, kerosene, fuel oil, and asphalt. All of the companies in the industry, including non-members of the association, participated in this survey (22 out of 22 companies). The coverage ratio of oil refining (except for lubrication oil manufacturing) was 100%. CO_2 emissions and energy consumption were calculated by aggregating the consumption of fuel by fuel type, the energy consumption per unit output at oil refineries and the volume of production of oil refineries (35 refineries) which are obliged to make regular reports by the Law concerning the Rational Use of Energy. With regard to targets and forecasts for fiscal 2010, energy consumption per unit output at oil refineries is used as a targeting figure for forecasts after implementation of measures, and the same energy consumption per unit output at oil refineries of fiscal 1990 is used to calculate the BAU. The quantity of processed crude oil, production volume and the proportion of purchased electricity in consumed energy are the actual figures for the last fiscal year.
Regarding energy consumption per unit of output at oil refineries: Depending on the type of crude oil and the composition of demand for products, oil refineries operate desulfurization and cracking devices at different device utilization rates. In order to compare energy inputs per units of output, it is necessary to adjust these figures so that they are based on identical rates of operation. The resulting revised values are known as energy consumption per unit of output at oil refineries.

Japan Chemical Industry Association

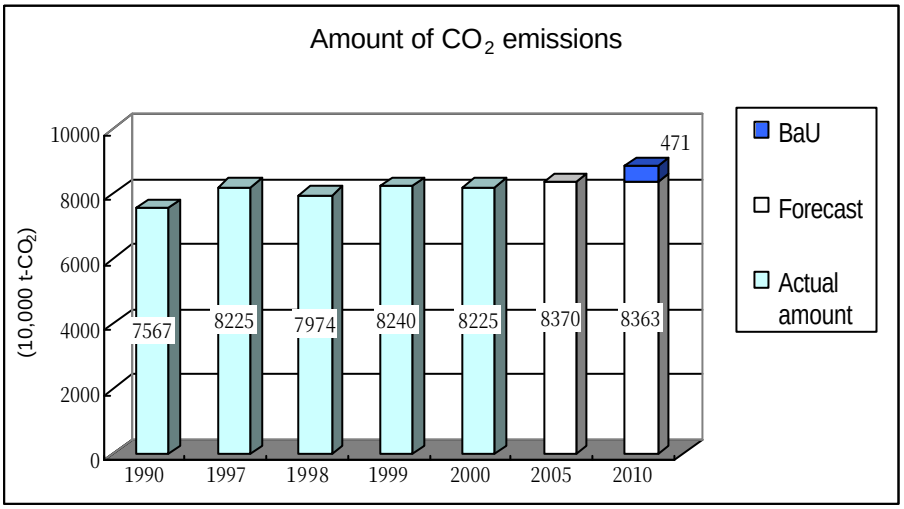
Target: To endeavor to reduce energy input per unit of output to 90% of the 1990 level by 2010.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Based on a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit output stood at 0.96 in both fiscal 1997 and 1998, and at 0.94 in fiscal 1999 and 0.93 in fiscal 2000. The chemical industry is forecasting an index value of 0.92 for fiscal 2005, and has established a target value of 0.90 for fiscal 2010. The industry believes that the goal for fiscal 2010 will be achievable through measures such as

introducing energy-conserving processes and equipment, increasing the efficiency of operating methods, and collecting waste heat.

The chemical industry has emitted the following amounts of CO_2: 75.67 million t-CO_2 in fiscal 1990; 82.25 million t-CO_2 in fiscal 1997; 79.74 million t-CO_2 in fiscal 1998; 82.40 million t-CO_2 in fiscal 1999; and 82.25 million t-CO_2 in fiscal 2000. It is forecasting emissions of 83.70 million t-CO_2 in fiscal 2005, and 83.63 million t-CO_2 in fiscal 2010, 11% more in both instances than in fiscal 1990. Despite the 28% increase in production that is being forecast for fiscal 2010, emissions of CO_2 in that year will be held to an 11% increase compared to fiscal 1990 as a result of a significant improvement in energy input per unit of output. Were a voluntary action plan not executed, emissions in fiscal 2010 would be 88.34 million t-CO_2, or 17% higher than in fiscal 1990.

3. Measures undertaken to achieve goals

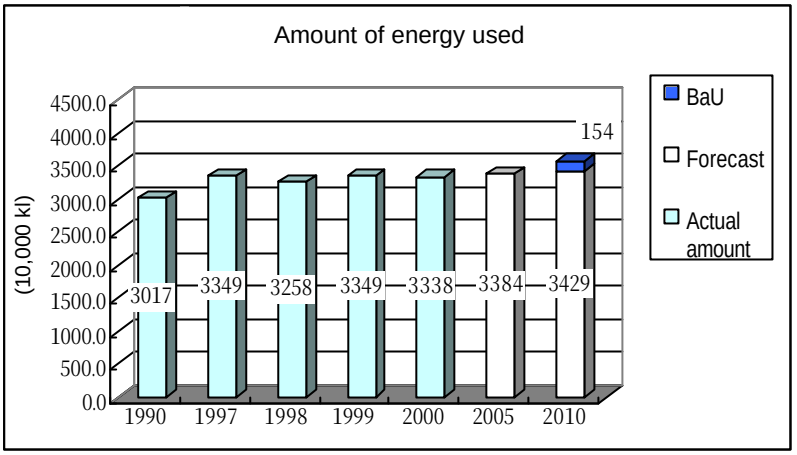
- Major undertakings
  - Increased the efficiency of facilities and equipment by improving the performance of equipment, installing highly efficient facilities, etc.
  - Improved operating methods by adopting reutilization and recycling, and by making changes in operational settings such as pressures, temperatures, and flows.
  - Recovered discharged energy by using warm and cool discharged heat, etc.
  - Rationalized processes; improved processes through changes in manufacturing methods, etc.
- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made
  - The industry reported 774 separate measures designed to deal with global warming, costing 21.2 billion. The impact of these measures in terms of energy saved was 323,000 kl on a crude-oil conversion basis.
  - Broken down by type of action, 36% of this reduction was accounted for by improvements made to the efficiency of facilities and equipment, and another 35% by improvements in operational methods.

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The following is an analysis of the approximately 9% increase in CO_2 emissions between fiscal 1990 and 2000.

Reduction through efforts by individual companies (reductions through energy-conservation measures, etc.)	-8.2%
Improvements in CO_2 per unit of output for purchased electric power	-2.1%
Amount attributed to increased production	19.0%
Total	8.7%

5. Reference data



The industry has recorded the following amounts of energy consumption: 30.17 million kl in fiscal 1990; 33.49 million kl in fiscal 1997; 32.58 million kl in fiscal 1998; 33.49 million kl in fiscal 1999; and 33.38 million kl in fiscal 2000. It is forecasting consumption of 33.84 million kl in fiscal 2005 and 34.29 million kl in fiscal 2010, 12% and 14% increases, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, emissions would be 35.83 million kl in 2010, or 19% higher than in fiscal 1990.

6. Other efforts to deal with global warming

- Emissions from offices and internal distribution

The industry is endeavoring to reduce CO_2 emissions through measures such as the following: use of large trucks; integrated ship and rail transportation; joint delivery with other companies; conversion of automobiles used in sales activities to reduced-pollution vehicles; reducing the weight of packages and containers.

- Contributions to the transportation, offices and households sector (effect of products and services)

(1) Building materials

- Reducing energy consumption by 5,600 kl/year on a crude-oil conversion basis through the spread of photovoltaic systems in 7,000 homes (embedded in roof tiles or in other roofing material)
- Resin-framed sashes, with their powerful heat-insulating qualities, have contributed to a 620,000-ton reduction in CO_2 emissions (actual results through 1996, based on use in 560,000 homes)
- Possible to conserve 10,000 kl/year worth of energy on a crude-oil conversion basis through heat-insulating material for residential use

(2) Automobiles

- Development of coupling material and carbon black for use in green tires; development of synthetic rubber for use in lightweight and green tires (compared

to ordinary tires, green tires contribute to a 4% improvement in fuel consumption; if used in all vehicles on the road, it would result in a 1.72 million ton reduction in CO_2 emissions)

- Development of energy-conserving additives to lubricating oil
- Development of catalysts for exhaust systems used with diesel engines, which emit relatively small amounts of CO_2
- Research into materials to be used in fuel cells for hybrid automobiles

(3) Information appliances

- Development of material for use in LCDs, and of toner for use in energy-conserving copiers
- Development of sealing material for printed substrates that do not require heating processes

- Measures to deal with greenhouse gases other than CO_2

The industry is adopting the following measures to suppress emissions of HFC and other greenhouse gases.

- Sealing off plant and equipment; carrying out stricter equipment servicing practices; engaging in preventative maintenance; and recovering gases that escape from leaks.
- Establishing exclusive container filling lines; increasing container size; developing optimum filling schedules.
- Using check-valves to prevent backward flows; recovering leftover gas in gas cylinders; increasing amounts filled; adopting exclusive-use containers.
- In conjunction with user industries, reutilizing recovered gas and developing technologies for decomposing or disposing gases that cannot be reused.
- Developing substitutes for HFC etc., and developing gases with minimal greenhouse impact.

The results of the follow-up survey of manufacturers of PFC and SF_6 for fiscal 2000 are as follows:

PFC: Emissions per unit of output: -11% (cf. 1995) (goal for 2010: -30%)
SF_6: Emissions per unit of output: -72% (cf. 1995) (goal for 2010: -75%)

7. Environmental management; environmental conservation in overseas business activities

- Of the 293 companies participating in the voluntary action plan, 61 companies release information to the public via environmental reports、home pages or other means on amounts of energy used, energy inputs per unit of output, CO_2 emissions, etc.
- The number of companies that have acquired certification for excellence in environmental management (ISO 14001) has reached 519, or 8.5% of all

companies in the industry.

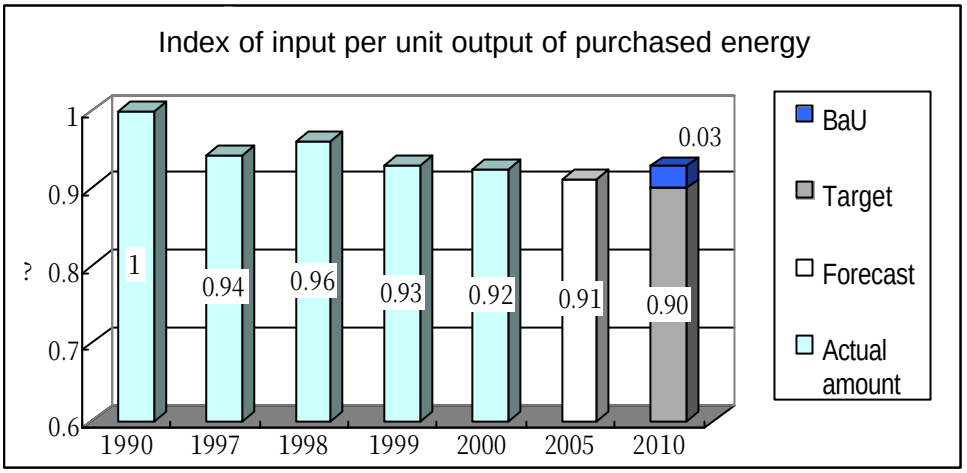
- Through promotion of "responsible care" activities, companies are developing voluntary plans for environmental protection, and are becoming actively involved in preserving the global environment and in assuring the safety and health of mankind.
- When developing business overseas, the industry abides strictly by the laws and standards of the other country, while endeavoring to transfer the latest energy-conservation technologies to such countries.

Note: The principal products of this industry are: chemical fertilizers; industrial inorganic chemicals (industrial soda products, inorganic chemicals, inorganic pigments, high-pressure gas); industrial organic chemicals (olefin, synthetic dyes, organic chemicals, petrochemical-based fragrances, synthetic resins, synthetic rubber); fats and processed products; paints; printing inks; cosmetics; photosensitive material for photography; synthetic fibers; and lime. The latest follow-up survey covered 293 companies, representing an energy-coverage ratio of approximately 90%. The figures on energy use (actual and forecasted) are summations of amounts consumed by each company in the survey. The index of energy per unit of output was derived by calculating weighted averages of amounts of energy used by each company, and of indices of input per unit output (actual, estimated) for the respective companies, CO_2 emissions from consumption of electric power were calculated on the basis of the emissions coefficient for production-use electricity. The factors contributing to increases or decreases in CO_2 emissions were calculated using production indices rather than production amounts.

Japan Paper Association

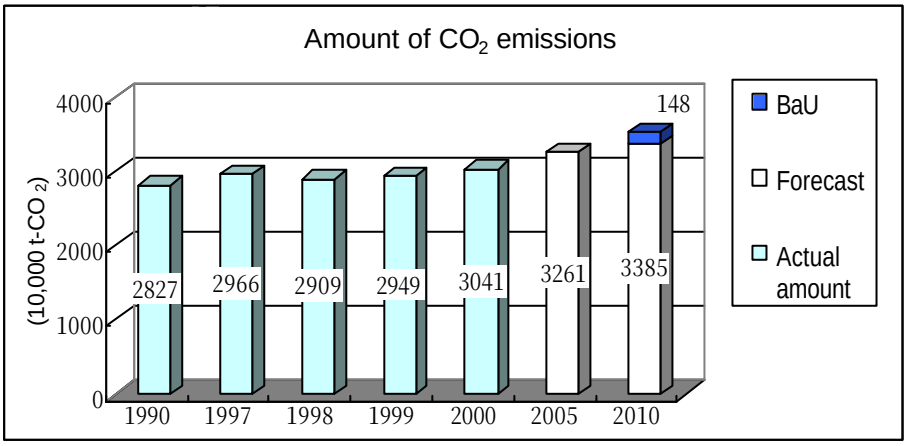
Target: To reduce purchased energy input per unit output for each product by 10% of the 1990 level by 2010.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Assuming a value of 1 for amount of energy purchased in fiscal 1990, the index of input per unit output of purchased energy stood at 0.94 in fiscal 1997, 0.96 in fiscal 1998, 0.93 in fiscal 1999, and 0.92 in fiscal 2000. The paper industry is forecasting an index value of 0.91 for fiscal 2005, and is aiming to achieve an index value of 0.90 in fiscal 2010. As measures against global warming, the industry is endeavoring to promote afforestation projects in Japan and other countries, while aiming to expand the amount of forests that it owns or controls by 550,000 hectares by 2010. From the standpoint of reducing waste and of conserving forestry resources and saving energy, it is taking steps

to promote the recovery and use of waste paper. The reduction of waste is especially promising as a means of reducing methane gas and CO_2, the former generated by landfills and having a high global-warming coefficient. The industry is aiming to utilize recycled paper for 60% of its production up to fiscal 2005, and achieved a rate of 57.3% for fiscal 2000.

The industry has emitted the following amounts of CO_2: 28.27 million t-CO_2 in fiscal 1990; 29.66 million tCO_2 in fiscal 1997; 29.09 million t-CO_2 in fiscal 1998; 29.49 million tCO_2 in fiscal 1999, and 30.41 million t-CO_2 in fiscal 2000. It is forecasting emissions of 32.61 million t-CO_2 in fiscal 2005 and 33.85 million t-CO_2 in fiscal 2010, 15% and 20% more, respectively, than in fiscal 1990. Were a voluntary action plan not executed, the industry would emit 35.33 million t-CO_2 in fiscal 2010, a 25% increase over fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Utilization of pulp runoff
  - Active introduction of co-generation
  - Prevention of heat loss, and recovery and utilization of waste heat
  - Conservation of electricity consumed by pumps, fan agitators, etc.
  - Energy efficient production facilities
  - Rationalization of fuel and use of alternate energy
  - Measures relating to raw materials, chemicals, etc.

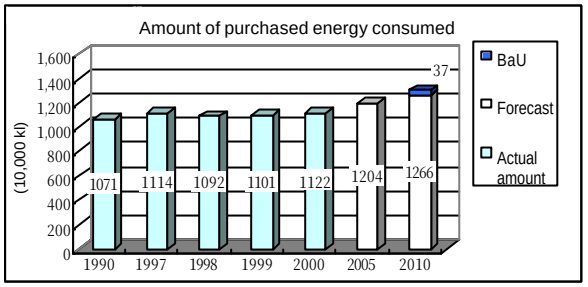
- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made
  - According the responses of 29 member companies, 355 projects (construction, etc.) were implemented in fiscal 2000, at an investment of ¥23 billion. Energy savings amounted to 176,000 kl in crude oil equivalents.
  - There were 103 separate investments of over ¥10 million, 20 investments exceeding ¥100 million, and 4 investments exceeding ¥1 billion.
  - There were 67 cases of energy savings that exceeded 500 kl/year (crude oil equivalents), 20 cases with savings over 1,000 kl/year, and 2 cases with savings over 10,000 kl/year.
  - Sixty percent of the implementations involved operational process reform or installation of high-efficiency equipment.

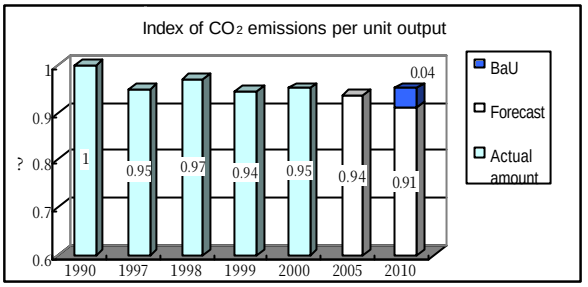
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The following is an analysis of the 8% increase in CO_2 emissions between fiscal 1990 and 2000.

Improvements in electric power use per unit output	-374,437 t- CO_2	-1.3%
Efforts to reduce emissions by various segments of the industry	-1,183,460 t- CO_2	-4.2%
Economic expansion (change in quantities produced etc.)	3,694,959 t- CO_2	13.1%
Total	2,137,062 t- CO_2	7.6%

5. Reference data





Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

The paper industry has recorded the following amounts of purchased energy consumption (in terms of crude oil): 10.71 million kl in fiscal 1990; 11.14 million kl in fiscal 1997; 10.92 million kl in fiscal 1998; 11.01 million kl in fiscal 1999, and 11.22 million kl in fiscal 2000. It is forecasting consumption of 12.04 million kl for fiscal 2005 and 12.66 million kl for fiscal 2010, representing 12% and 18% increases, respectively, compared to fiscal 1990. Were the voluntary action plan not executed, industry would consume 13.06 million kl of purchased energy in fiscal 2010, 22% more than in fiscal 1990.

Assuming a value of 1 for amounts emitted in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.95 in fiscal 1997, 0.97 in fiscal 1998, 0.94 in fiscal 1999, and 0.95 in fiscal 2000. The industry is forecasting an index value of 0.94 for fiscal 2005, and a value of 0.91 for fiscal 2010.

If the traditional heat value coefficient is used for calculating the data of fiscal 2000, the index of input per unit output of purchased energy is 0.91, the amount of CO_2 emissions is 29.98 million t-CO_2, the energy consumption amount is 11.22 million kl, and the index of CO_2 emissions per unit output is 0.94.

6. Other efforts to deal with global warming

- Emissions from offices and internal distribution

CO_2 emissions associated with office usage were 400 t-CO_2 for fiscal 1990, 1,300 t-CO_2 for fiscal 1997, 1,600 t-CO_2 for fiscal 1998, 6,600 t-CO_2 for fiscal 1999, and 7,000 t-CO_2 for fiscal 2000. The industry forecasts emissions of 7,000 t-CO_2 for fiscal 2005 and 6,400 t-CO_2 for fiscal 2010.

Transportation in this industry is outsourced to professional transport organizations, so no data on distribution-related CO_2 emissions was provided by the federation members responding to the survey. However, long-distance transportation of some products is now being done by freight trains instead of trucks as a means of reducing CO_2 emissions.

- Measures for greenhouse gases other than CO_2

If paper sludge is put into landfills unprocessed, some of it will generate methane gas due to anaerobic fermentation, so the industry aggressively incinerates organic sludge in order to reduce this waste output and prevent the creation of methane gas. Moreover, the ashes resulting from the incineration of organic sludge are actively used as thermal insulation in steel production, as a settling agent, and as an ingredient for cement.

- Projects implemented with regard for the Kyoto mechanism

The industry actively promotes afforestation in other countries, and has achieved total land coverage of 280,000 hectares as of the end of 2000. Nations where these projects are conducted include Australia, New Zealand, Brazil, Chile, South Africa, Vietnam, and Papua New Guinea.

7. Environmental management; environmental conservation in overseas business activities

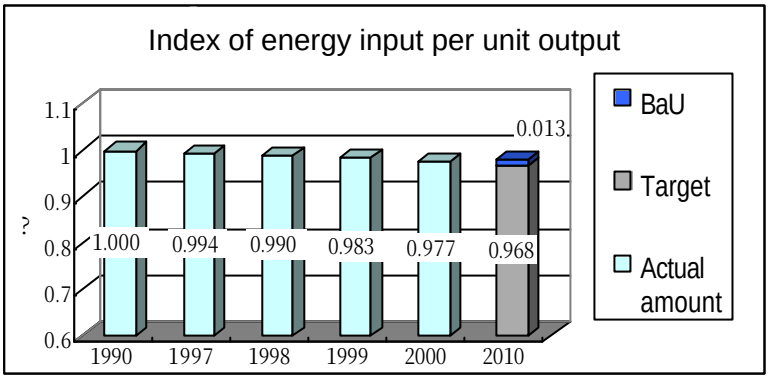
- Of the 96 plants that responded to the survey, 55 plants (57%) have already acquired ISO 14001 certification, and 20 plants (21%) intend to acquire certification. In addition, 79 plants (82%, including those already certified) manage their operations in accordance with ISO 14001 guidelines.
- The industry vigorously promotes overseas afforestation projects, and some companies have received awards from other countries for their achievements in afforestation projects in those countries.

Note: The principal products of this industry are paper and paperboard. The percentage of companies participating in this follow-up survey was 11% (40 out of 350 companies), representing a coverage ratio for energy consumed of 97.5%. Energy consumption amounts and CO_2 emission amounts were calculated using dynamic statistics on consumption of oil and other fuels for primary production (pulp, paper, and paperboard). In using these statistics, the industry checked for deviation between the totaled figures from the 40 responding companies (representing 98% of the total production volume for all federation members) and the amounts calculated from the statistics, and confirmed that there were no problems in the way the statistics were used. The forecast for production in 2010 is based on the following assumptions: annual real growth in GDP of 1.9%/year between 1995-2010; GDP elasticity of demand for paper and paperboard 0.904 (based on actual demand between 1990-1995); net balance of trade in unit terms: a deficit of 1.89 million tons.

Cement Association of Japan

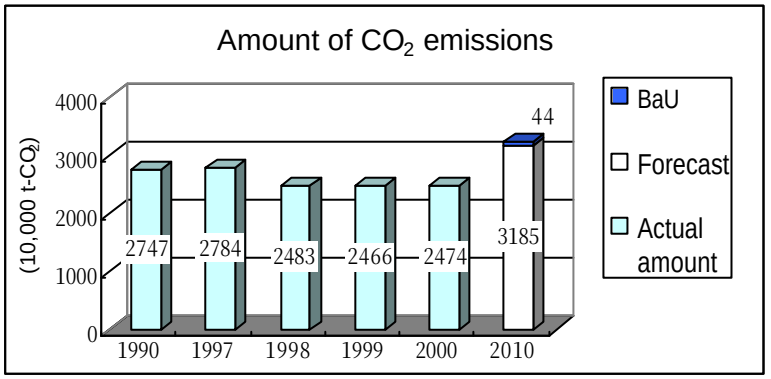
Target: To reduce energy input per unit of output in cement manufacturing by around 3% of the level of fiscal 1990 in fiscal 2010.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Note: Emissions do not include CO_2 emitted from industrial processes.

Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit output for cement manufacturing stood at 0.994 in fiscal 1997, 0.990 in fiscal 1998, 0.983 in fiscal 1999, and 0.977 in fiscal 2000. The cement industry is aiming to achieve an index value of 0.968 for fiscal 2010.

The cement industry has recorded the following amount of CO_2 emissions: 27.47 million t-CO_2 in fiscal 1990; 27.84 million t-CO_2 in fiscal 1997; 24.83 million t-CO_2 in fiscal 1998; 24.66 million t-CO_2 in fiscal 1999; and 24.74 million t-CO_2 in fiscal 2000. It attributes the rise in fiscal 2000 emissions to an increase in production (+0.2% compared to fiscal 1999) and increased use of electricity from inhouse generators (up from 60.9% in fiscal 1999 to 62.7% in fiscal 2000; calculations exclude non-heat-based power generation). It is forecasting emissions of 31.85 million tCO_2 in fiscal 2010, a 16%

increase over fiscal 1990. Were a voluntary action plan not executed, emissions would be 32.29 million t-CO_2 in fiscal 2010, 18% higher than in fiscal 1990.

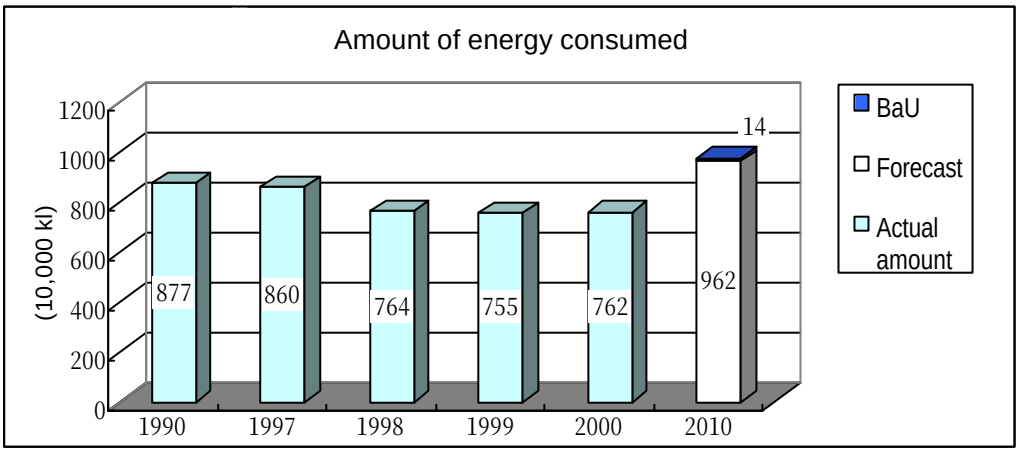
3. Measures undertaken to achieve goals

- Major undertakings
  - Promoting the dissemination of energy-saving equipment
  - Expanding the use of industrial wastes as fuel
  - Increasing the production ratio of blended cement
  - Expanding the use of other industrial waste materials

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

- Decreasing factors: A drop in the energy consumption per unit of output (the industry's target), and a decrease in production quantities
- Increasing factors: Increased reliance on inhouse power generation

5. Reference data



Energy consumption for cement manufacturing (in terms of crude oil) was 8.77 million kl in fiscal 1990, 8.60 million kl in fiscal 1997, 7.64 million kl in fiscal 1998, 7.55 million kl in fiscal 1999, and 7.62 million kl in fiscal 2000. The industry is forecasting consumption of 9.62 million kl in fiscal 2010, a 10% increase over fiscal 1990. Were a voluntary action plan not executed, consumption in fiscal 2010 would be 9.76 million kl, or 11% higher than in fiscal 1990.

7. Environmental management; environmental conservation in overseas business activities

As of March 2001, 27 of the 36 plants operating across the nation have acquired ISO 14001 certification.

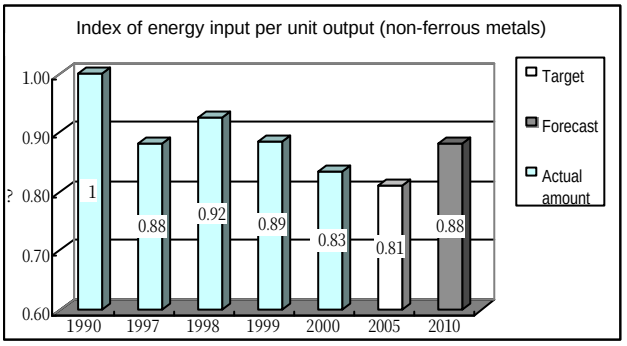
Note: The principal product of this industry is cement. The percentage of companies participating in this follow-up survey was 100% (20 out of 20 companies), representing a coverage ratio of 100% in terms of both production volume and energy consumed by the industry. The rough forecasts for fiscal 2010 assume a 0.4% rate of increase in production per year, starting from a base in fiscal 1996.

Japan Mining Industry Association

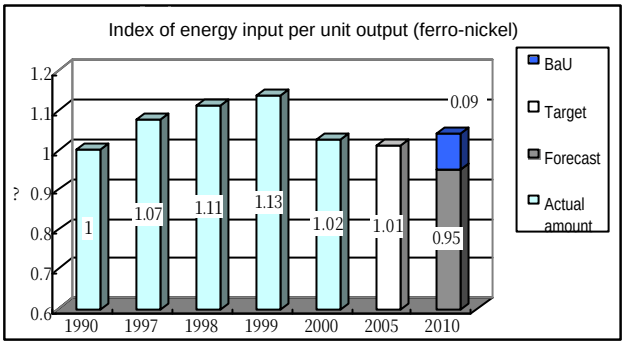
Targets: To reduce energy input per unit of output in fiscal 2010 as follows, in comparison to fiscal 1990.

- In non-ferrous metals (copper, lead, zinc, nickel), by 12%.
- In ferro-nickel, by 5%.

1. Degree of progress toward goal

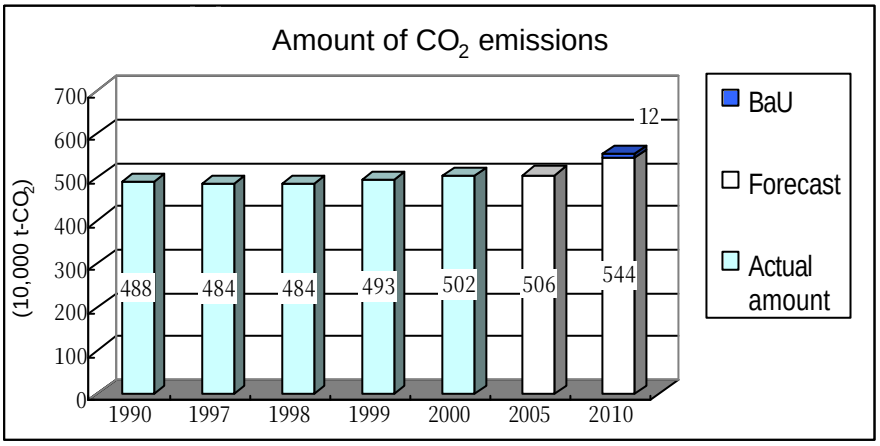


Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Note: Emissions include CO_2 emitted from industrial processes since fiscal 2000.

Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit output for non-ferrous metal production (copper, lead, zinc, nickel) stood at 0.89 in fiscal 1990 and at 0.83 in fiscal 2000. As the industry is forecasting an index value of 0.81 for fiscal 2005, and is aiming for a target value of 0.88 for fiscal 2010, its fiscal 2000 performance has achieved the target. Again, assuming a value of 1 for energy consumed in fiscal 1990, energy input per unit of output for ferro-nickel production stood at 1.13 in fiscal 1999 and at 1.02 in fiscal 2000. The industry is forecasting an index value of 1.01 for fiscal 2005, and is aiming for a target value of 0.95 for fiscal 2010.

The index of energy input per unit output for non-ferrous metal production for fiscal 2000 declined from the fiscal 1999 value due to the combined effect of such favorable factors as increased production, steady energy conservation efforts, and improvement of the electricity heat value coefficient. This was in spite of the negative factors experienced by some operating centers, such as an increase in the ratio of difficult-to-process foreign ore and decreased efficiency due to irregular deposits on the anode surface. The fiscal 2000 index value for energy consumption in ferro-nickel production was lower than that of fiscal 1999, but this is due to the fact that some fuel amounts were counted as material amounts in this report for process-related reasons; in actuality, the decline in ore quality has continued to fall, a trend that has a negative impact on energy usage.

The industry has emitted the following amounts of CO_2: 4.88 million t-CO_2 in fiscal 1990; 4.84 million tCO_2 in fiscal 1997; 4.84 million t-CO_2 in fiscal 1998; 4.93 million t-CO_2 in fiscal 1999; and 5.02 million t-CO_2 in fiscal 2000. The industry is forecasting emissions of 5.06 million t-CO_2 in fiscal 2005 and 5.44 million t-CO_2 in fiscal 2010, 4% and 12% more, respectively, than in fiscal 1990. Were the voluntary action plan not executed, CO_2 emissions would be 5.56 million t-CO_2 in fiscal 2010, 14% more than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Sustained stable operation of formation for increased copper anode production
  - Development of low-temperature boiler dust as a product
  - Promotion of optimized operation through computer control of Flash Smelting Furnace
  - Reduction in coal usage through processing of shredder dust
  - More efficient combustion in dryer blast furnaces through improvement of burner combustion

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

There were 47 energy conservation measures implemented in fiscal 2000, at a total of investment of ¥4.9 billion. These measures have resulted in an energy consumption reduction of 40,000 kl in crude oil equivalents.

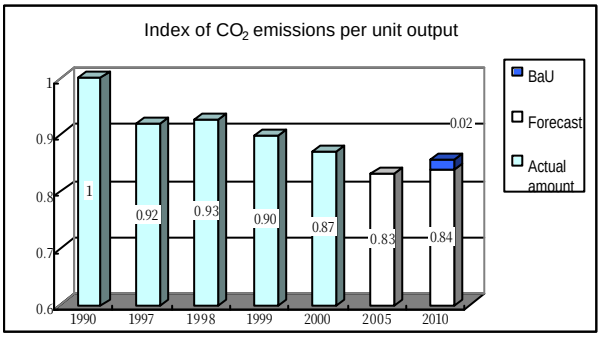
Measure	Investment (¥ million)	Energy Conserved (kl/year; crude oil equiv.)
Fuel reduction through processing of shredder dust	2,000	13,740
Reductions in electrolyte resistance and	58	280

contact resistance		
Changes to method for removing impurities in copper removal electrolysis	52	870
Reduction in electrical power consumption by replacement of oxygen plant	2,600	4,000
Other measures	227	20,510

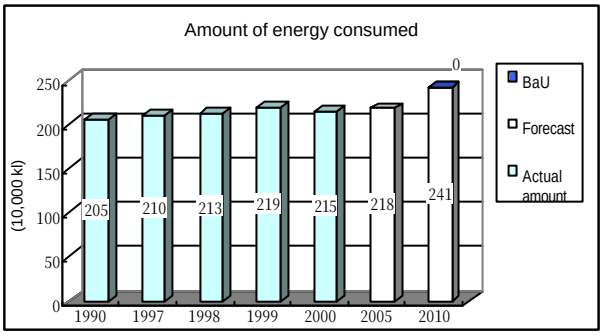
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

Improvements in electric power use per unit output	-210,000 t- CO_2	-23.3%
Efforts to reduce emissions by various segments of the industry	-550,000 t- CO_2	-61.1%
Economic expansion (changes in production output, etc.)	900,000 t- CO_2	100%
Total	140,000 t- CO_2	15%

5. Reference data



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.



Note: The figures in the energy consumption graph use the electricity heat value coefficient defined in the Revised Energy Conservation Law, i.e., 1kwh=9.91M1

Assuming a value of 1 for CO_2 emitted in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.92 in fiscal 1997, 0.93 in fiscal 1998, 0.90 in fiscal 1999, and 0.87 in fiscal 2000. The industry is forecasting index values of 0.83 and 0.84, respectively, for fiscal 2005 and 2010.

The non-ferrous metal mining sector has consumed the following amounts of energy (in crude oil equivalents): 2.05 million kl in fiscal 1990; 2.10 million kl in fiscal 1997; 2.13 million kl in fiscal 1998; 2.19 million kl in fiscal 1999; and 2.15 million kl in fiscal 2000. The industry is forecasting consumption of 2.18 million kl in fiscal 2005, and 2.41 million kl in fiscal 2010, 6% and 8% more, respectively, than in fiscal 1990. Were the voluntary action plan not executed, consumption would be 2.41 million kl in fiscal 2010, 8% more than in fiscal 1990.

7. Environmental management; environmental conservation in overseas business activities

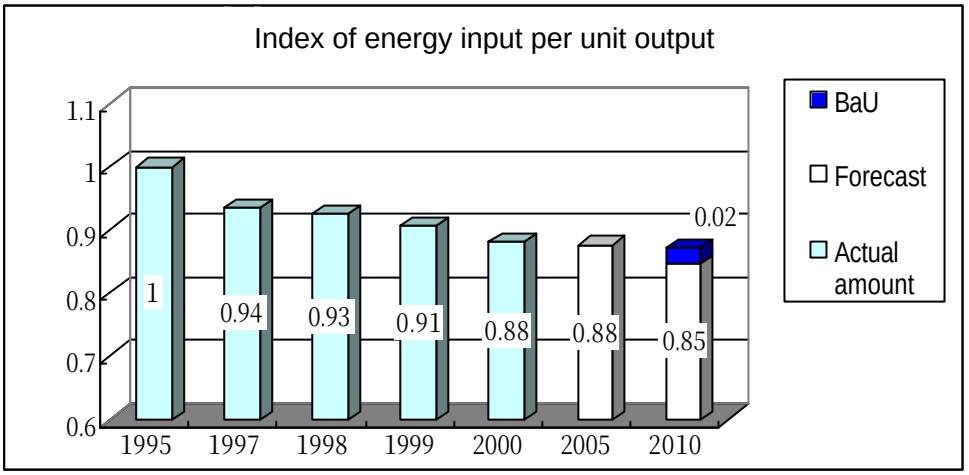
- Based on environmental protection technology that it has developed over the years, the mining industry is adopting measures to develop and deepen its system of voluntary environmental management, including by incorporating the thinking behind ISO 14001 and other measures.
- As in its domestic operations, the industry is establishing environmental management systems in its overseas operations as a means of assuring the protection of the environment. It is also making available domestically developed technology and know-how on environmental management to overseas partners, and is promoting its transfer and acceptance in overseas projects.

Note: The principal products of this industry are copper, lead, zinc, nickel, ferro-nickel alloys, etc. The percentage of companies participating in this follow-up survey was 28% (16 of 57 companies), representing a coverage ratio for energy consumed by the industry of approximately 80%. Calculations of the energy consumption amounts were based on the following sources: for the non-ferrous metals sector, from the designated product categories of the Monthly Report on Dynamic Statistics of Consumption of Petroleum and Other Fuels (issued by the Ministry of Economy, Trade and Industry); for the ferro-nickel sector, totals of the nickel data and the ferro-nickel data from the applicable companies. The rough forecasts for 2010 assume the following: (1) production volume will change as expected (designated categories), (2) the current revised value for the electricity heat value coefficient will remain the same, (3) waste-source fuel will not be counted as primary fuel, and (4) the pre-processing energy accompanying future recycling processing operations will not be included in the calculations.

Japan Aluminum Association

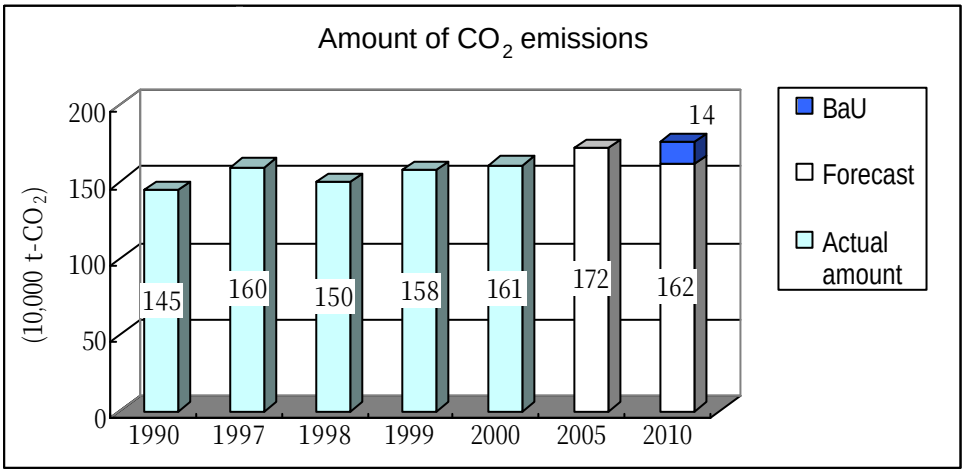
Target: In fiscal 2010, to achieve a 10% improvement in energy conservation compared to fiscal 1995, as measured by energy input per unit output (estimating a 15% improvement over fiscal 1995, and a 20% improvement over fiscal 1990).

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1995.

2. Amount of CO_2 emissions



Assuming a value of 1 for energy consumed per unit output in fiscal 1995, the index of energy input per unit output stood at 0.94 in fiscal 1997, 0.93 in fiscal 1998, 0.91 in fiscal 1999, and 0.88 in fiscal 2000. The aluminum industry is forecasting index values of 0.88 for fiscal 2005 and 0.85 for fiscal 2010, and has set a target value of 0.90 for fiscal 2010.

The industry has emitted the following amounts of CO_2: 1.45 million t-CO_2 in fiscal 1990; 1.60 million tCO_2 in fiscal 1997; 1.50 million t-CO_2 in fiscal 1998; 1.58 million t-CO_2 in fiscal 1999; and 1.61 million t-CO_2 in fiscal 2000. Although there was no change over fiscal 1999 in terms of emissions per unit of output, the amount of CO_2 emissions in fiscal 2000 increased by 1.6% as a result of a 1.7% year-on-year increase in production. Again, due to higher production, the industry is forecasting CO_2 emissions of 1.72 million t-CO_2 in fiscal 2005 and 1.62 million t-CO_2 in fiscal 2010, increases of 18% and 11%, respectively, compared to fiscal 1990. Were the voluntary action plan not executed, CO_2 emissions in fiscal 2010 would be 1.76 million t-CO_2, a 21% increase over fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Improving the efficiency of energy utilization through energy-saving operations and improvements in manufacturing processes (increases in yields, etc.)
  - Promoting improvements in equipment that enable recovery of energy, more efficient use of energy, etc.
  - Organizing meetings for the announcement of successful examples of energy conservation, and promoting the adoption of such technologies throughout the industry.

  The industry also expects the following measures to contribute toward curbing global warming.
  - Vigorous promotion of aluminum recycling (around the world)
  - Supporting the move toward lighter weights for automobiles, rolling stock, etc. through use of aluminum (in Japan)

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

There were 132 energy conservation measures implemented in fiscal 2000, at a total of investment of ¥724 million. These measures have resulted in an energy consumption reduction of 10,800 kl in crude oil equivalents.

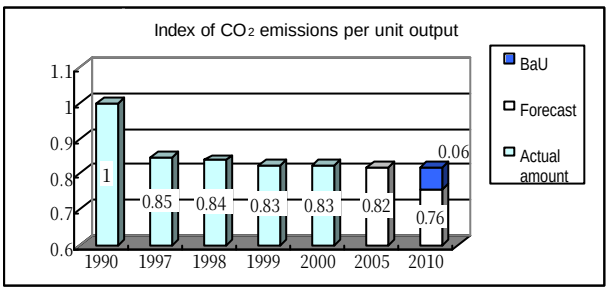
Measure	Investment (¥ million)	Energy Conserved (kl/year; crude oil equiv.)
Conversion to regeneration burner technology for melting furnaces (3 items)	220	2,873
Renewal of melting furnace recuperators, replacement of tiles in burners	80	2,895
Installation of magnetic heavy oil atomizers for melting furnaces	2.2	210
Optimizing of well pump capacity	3.0	46
Inverterization of Fume Incineration Exhaust Fan for Foil Coating	2.5	114

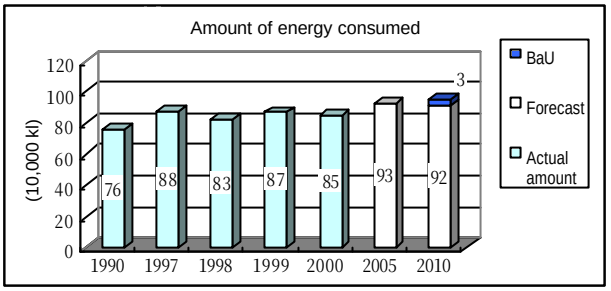
Inverterization of Trim Chip Blower Motor for Slitting Line	0.8	12

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

Although significant advances have been made towards the target of improving energy consumption per unit output, at the same time there have been increases in production output and the ratio of production processes involving painting and other surface treatment.

5. Reference data





Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

Assuming a value of 1 for CO_2 emissions in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.85 in fiscal 1997, 0.84 in fiscal 1998, and 0.83 in both fiscal 1999 and 2000. The industry is forecasting index values of 0.82 and 0.76 for fiscal 2005 and 2010 respectively.

The industry has recorded the following amounts of energy consumption (in terms of crude oil equivalents): 760,000 kl in fiscal 1990; 880,000 kl in fiscal 1997; 830,000 kl in fiscal 1998; 870,000 kl in fiscal 1999; and 850,000 in fiscal 2000. It is forecasting consumption of 930,000 kl in fiscal 2005 and 920,000 kl in fiscal 2010, 22% and 21% more, respectively, than in fiscal 1990. Were a voluntary action plan not executed, the forecast for energy consumption in fiscal 2010 would be 950,000 kl, a 25% increase compared to fiscal 1990.

6. Other efforts to deal with global warming

- Contributions to the transportation, offices and households sector (effect of products and services)
  - Improvement of fuel consumption in automobiles by greater use of aluminum (thereby reducing vehicle weight; effect has been an annual reduction of roughly 1.8 million t-CO_2 since fiscal 1990)
  - Reduced energy consumption by use of aluminum in train cars (bullet trains, subway trains, etc.; effect has been approximately 1.0 million t-CO_2, calculated as 100t-CO_2/car [for life of the car] x 10,000 cars)

7. Environmental management; environmental conservation in overseas business activities

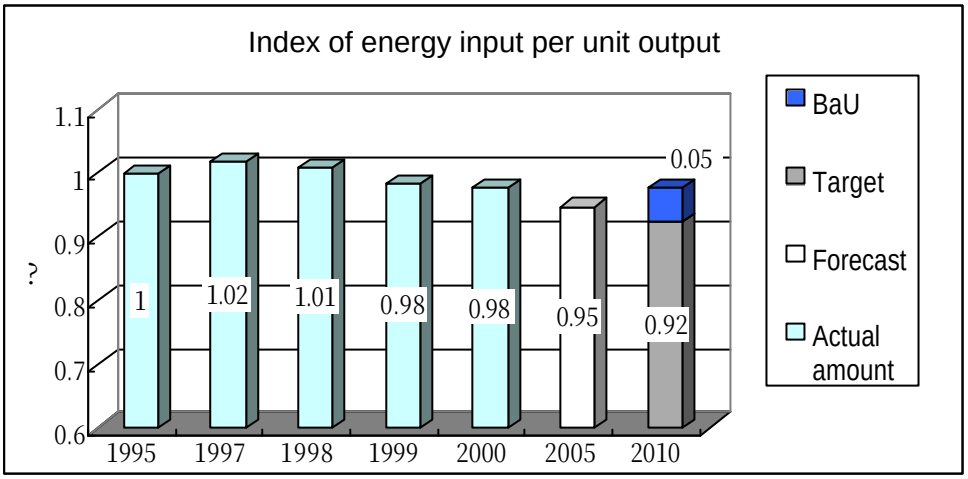
Seven major rolled aluminum manufacturers, holding up the industry's goals, successfully organized their ISO 14001 formations by the end of fiscal 2000. The industry has a few aluminum rolling operations and some aluminum metalworking operations overseas, and gives guidance in environmental management to these businesses.

Note: The principal products of this industry are rolled aluminum products (sheets and extrusions). The percentage of companies participating in this follow-up survey was 12% (7 of 60 companies), representing a coverage ratio of 62% (estimated on the basis of amounts produced) for energy consumed by the entire industry. In this context, energy input per unit output does not simply mean the amount of energy consumed per unit of production output; rather it refers to the amount of energy consumed per amount of rolled product, a concept that gives consideration to energy loads required for the rolling process. The forecast for production in fiscal 2010 assumes an annual rate of growth of 1% per year for the 20-year period from fiscal 1990 to fiscal 2010 (the assumptions are based on the demand forecasts of the Nonferrous Metals Division of the Ministry of Economy, Trade and Industry formulated at the drafting of the Report on the Survey on Decisions in Technological Strategy of the Non-ferrous Metals Industry in fiscal 1998). The amounts of CO_2 emissions were calculated using the energy consumption data of the 7 major aluminum rollers.

Japan Brass Makers Association

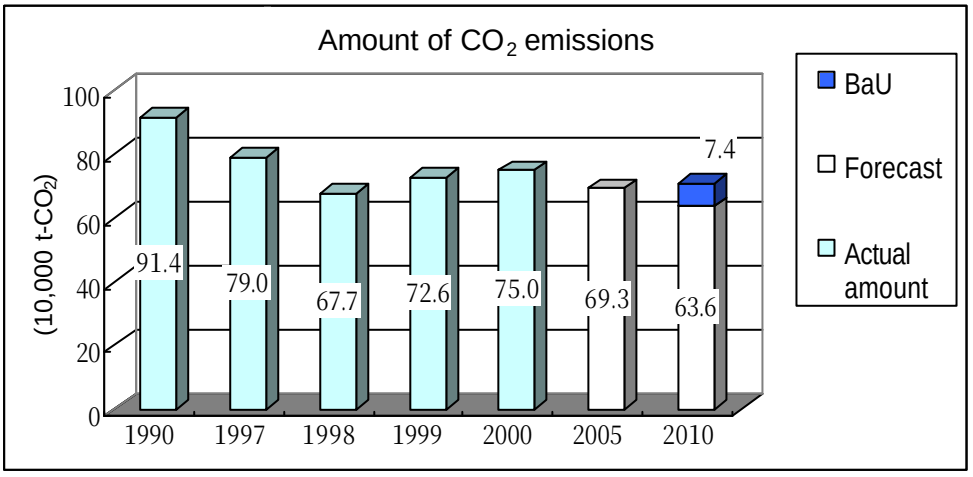
Target: By fiscal 2010, to reduce energy input per unit output in manufacturing by 7.5% compared to fiscal 1995.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1995.

2. Amount of CO_2 emissions



Assuming a value of 1 for energy consumed in manufacturing in fiscal 1995, the index of manufacturing energy input per unit output stood at 1.02 in fiscal 1997, 1.01 in fiscal 1998, 0.98 in fiscal 1999, and 0.98 in fiscal 2000. The industry is forecasting an index value of 0.95 for fiscal 2005, and is aiming for a target value of 0.92 for fiscal 2010.

The brass industry has emitted the following amounts of CO_2: 914,000 t-CO_2 in

fiscal 1990; 790,000 t-CO_2 in fiscal 1997; 677,000 t-CO_2 in fiscal 1998; 726,000 t-CO_2 in fiscal 1999; and 750,000 t-CO_2 in fiscal 2000. It is forecasting emissions of 693,000 t-CO_2 in fiscal 2005 and 636,000 t-CO_2 in fiscal 2010, 24% and 30% declines, respectively, compared to fiscal 1990. Were a voluntary action plan not executed, emissions in fiscal 2010 would be 710,000 t-CO_2, a 22% decline vis-à-vis fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Promoting uniformly adopted actions at all plants and operational sites (converting to 75kW energy-conserving compressors; converting to high-efficiency compressors; improving methods of operation for large capacity compressors; maintaining 100% power receiving-end ratios; converting to high-efficiency power transformers)
  - Installation, renewal, and improvement of facilities (adopting inverter technology for 5.5 kW equipment; adopting measures to conserve heat in electric melting furnaces on non-operating days; converting to heat exchangers in preheating furnaces)
  - Improving process and production-line controls, and operational management (improving each manufacturing process {from casting to rolling}; turning off cooling fans and cold water pumps; shifting from continuous to intermittent operations of cooling blowers used on indirect press coilers; reducing the number of processes through on-line production management)
  - Enlarging and integrating equipment (concentrating production activity on lines using the most advanced equipment while terminating operations on those using dated equipment; increasing size of slabs and billets; improving production efficiency and yields; increasing the speeds of rollers; integrating boiler functions {terminating operations of one low-efficiency boiler})

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

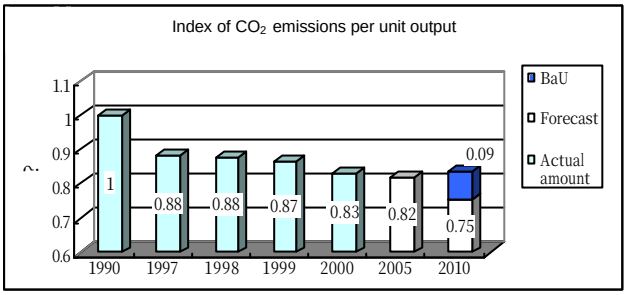
The industry adopted 45 measures that made a relatively significant impact; these entailed an investment of ¥662 million, and resulted in a 5,530 kl/year reduction in crude oil consumption.

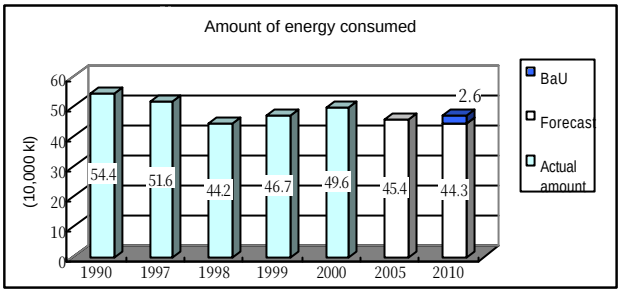
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The industry improved energy input per unit output by 7%. Although production increased by roughly 2%, overall CO_2 emissions declined by around 18%, indicating the achievement of steady progress in energy conservation.

Improvements in electric power use per unit output	-53,719 t-CO_2	-5.9%
Efforts to reduce emissions by various segments of the industry	-92,243 t-CO_2	-10.1%
Economic expansion (changes in quantities produced etc.)	-18,480 t-CO_2	-2.0%
Total	-164,442 t-CO_2	-18.0%

5. Reference data





Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

Assuming a value of 1 for CO_2 emissions in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.88 in both fiscal 1997 and 1998, at 0.87 in fiscal 1999, and at 0.83 in fiscal 2000. The industry is forecasting index values of 0.82 and 0.75 for fiscal 2005 and 2010, respectively.

The industry has consumed the following amounts of energy: 544,000 kl in fiscal 1990; 516,000 kl in fiscal 1997; 442,000 kl in fiscal 1998; 467,000 kl in fiscal 1999; and 496,000 in fiscal 2000. It is forecasting consumption of 454,000 kl in fiscal 2005 and 443,000 kl in fiscal 2010, 17% and 19% less, respectively, than in fiscal 1990. Were a voluntary action plan not executed, consumption would be 469,000 kl in 2010, or 14% less than in fiscal 1990.

6. Other efforts to deal with global warming

Contributions to the transportation, offices and households sector (effect of products and services)

The industry's demand comes primarily from manufacturers of electrical and electronic equipment; by responding exactly to manufacturers' demands for materials to be used in components for newly developed equipment—responding to needs for greater miniaturization and higher performance components—the industry is, in effect, contributing to a reduction of CO_2.

7. Environmental management; environmental conservation in overseas business activities

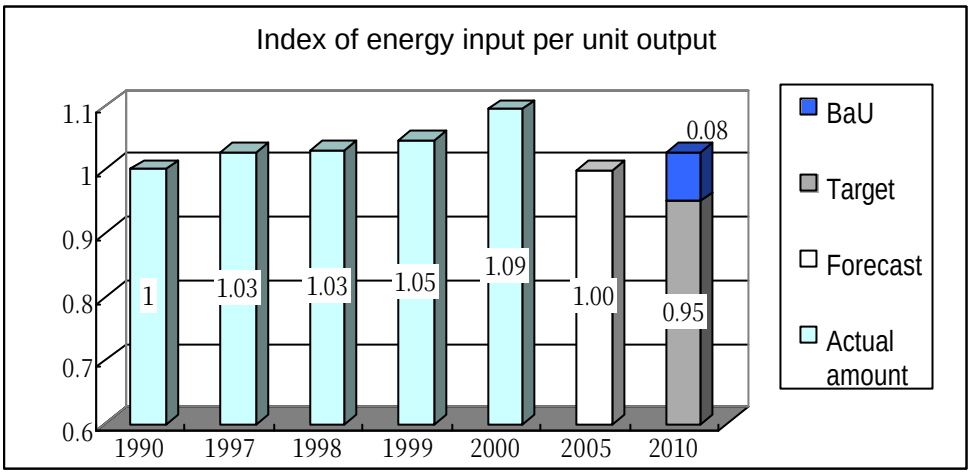
From six operational sites that had obtained ISO 14000 certifications as of last year, the number has increased to 10 sites in fiscal 2000. Because of the relatively large number of small and medium-sized enterprises in the industry, there is a sense that the pace of certification is slower than it should be; however, the industry believes that companies are making appropriate efforts to obtain certification on an individual basis.

Note: The principal products of this industry are sheets, rolls, rods, wire, and pipes made of copper and copper alloys. The results of the current follow-up survey are based on figures provided by the 12 major companies in the industry, whose results and targets were incorporated into the original Keidanren plan; however, the industry actually surveyed 33 of its total membership of 64 companies for the follow-up survey, most being firms that operate type-1 energy control sites. Production by the 12 major companies translated to a coverage ratio of 66.7% of total production on a nationwide basis, including that by non-member companies. To calculate CO_2 emissions, the industry added energy consumption by type of fuel for the 12 companies, and extrapolated these amounts into an industry-wide total, on the basis of share of production. Conversion to CO_2 was carried out on the basis of the designated indices. The industry's forecasts for fiscal 2010 used medium-term forecasts of demand made in fiscal 2000 and estimates of overseas business activity by manufacturers for its assumptions about demand, which it sees remaining flat at best over the forecast period; it also incorporates into its forecasts the assumption that it will achieve its original target for energy consumption per unit output.

Japan Dairy Industry Association

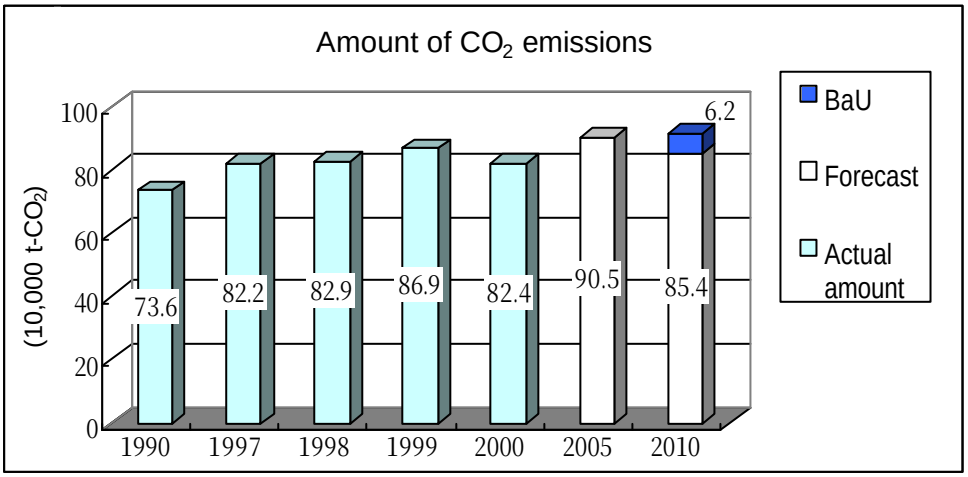
Targets: Using fiscal 1997 as the base year, the industry will reduce its energy input per unit output by 0.5% per year between fiscal 2000 and fiscal 2002, and by a further 1.0% per year over the 8-year period from fiscal 2003 to fiscal 2010.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit output stood at 1.03 in both fiscal 1997 and 1998, at 1.05 in fiscal 1999, and at 1.09 in fiscal 2000. The dairy industry is forecasting an index value of 1.00 in fiscal 2005, and is aiming to achieve a value of 0.95 in fiscal 2010.

The industry has emitted the following amounts of CO_2: 736,000 t-CO_2 in fiscal 1990; 822,000 t-CO_2 in fiscal 1997; 829,000 t-CO_2 in fiscal 1998; 869,000 t-CO_2 in fiscal 1999, and 824,000 t-CO_2 in fiscal 2000. It is forecasting emissions of 905,000 tCO_2 in fiscal 2005 and 854,000 tCO_2 in fiscal 2010, 23% and 16% increases, respectively, over fiscal 1990. Were a voluntary action plan not executed, emissions would be 916,000 t-CO_2 in fiscal 2010, 25% higher than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings

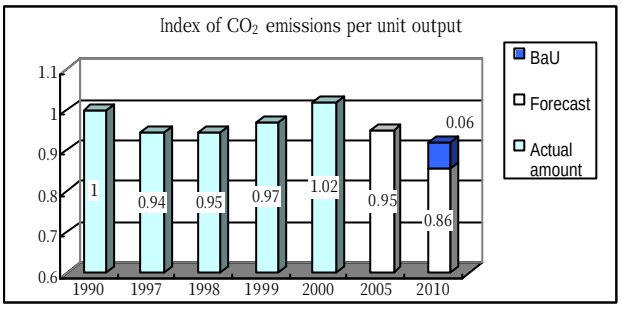
The industry has adopted the following principal measures: reorganizing and integrating milk processing plants, incorporating sharing arrangements among companies; reorganizing existing methods of transportation for raw milk and processed products; introducing energy-saving equipment, such as cogenerating boilers; installing solar electricity generating equipment; regulating pressures on air conditioning compressors; adopting energy-conserving measures and steps to replace chlorofluorocarbons in refrigeration equipment; decreasing rates of product spoilage and product disposal through quality control and management of distribution systems; reassessing systems based on frequent deliveries of small amounts; etc.

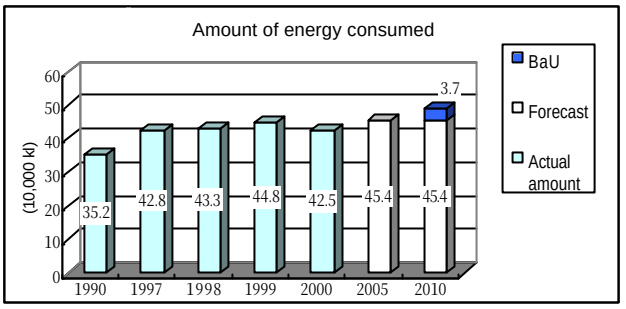
- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made
  - Increased productivity through integration of plants
  - Reduction in use of steam at three plants through installation of steam traps
  - Use of intermittent operation controllers for freezers at three plants
  - Utilization of inverters at three plants
  - More efficient operation of air compressors at two plants
  - Installation of water-cooled condensers at four plants
  - Installation of cogenerating equipment at seven plants
  - Elimination of all incinerators
  - Improvements in garbage separation management
  - Reduction in use of water for cleaning purposes
  - Introduction of drainage recovery equipment
  - Installation of resource recycling equipment (drying of food product waste and sludge, etc.)

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

Due to an accident that occurred at the industry-leading company (one of the seven participating companies), the figures for fiscal 2000 are abnormal, and consequently the overall results for the industry show negative changes.

5. Reference data





Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

Assuming a value of 1 for amounts emitted in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.94 in fiscal 1997, at 0.95 in fiscal 1998, at 0.97 in fiscal 1999, and at 1.02 in fiscal 2000. The industry is forecasting index values of 0.95 in fiscal 2005 and 0.86 in fiscal 2010. It has recorded the following amounts of energy consumption (in terms of crude oil): 352,000 kl in fiscal 1990; 428,000 kl in fiscal 1997; 433,000 kl in fiscal 1998; 448,000 kl in fiscal 1999, and 425,000 kl in fiscal 2000. It is forecasting consumption of 454,000 kl for both 2005 and 2010, which equals a 29% increase over fiscal 1990. Were a voluntary action plan not executed, energy consumption would be 491,000 kl in fiscal 2010, or 40% higher than in fiscal 1990.

6. Other efforts to deal with global warming

- Measures to deal with greenhouse gases other than CO_2
  - Converting refrigerants in large freezers from chlorofluorocarbons to ammonia (two plants)
  - Installing freezers that use ammonia refrigerants in new plants

7. Environmental management; environmental conservation in overseas business activities

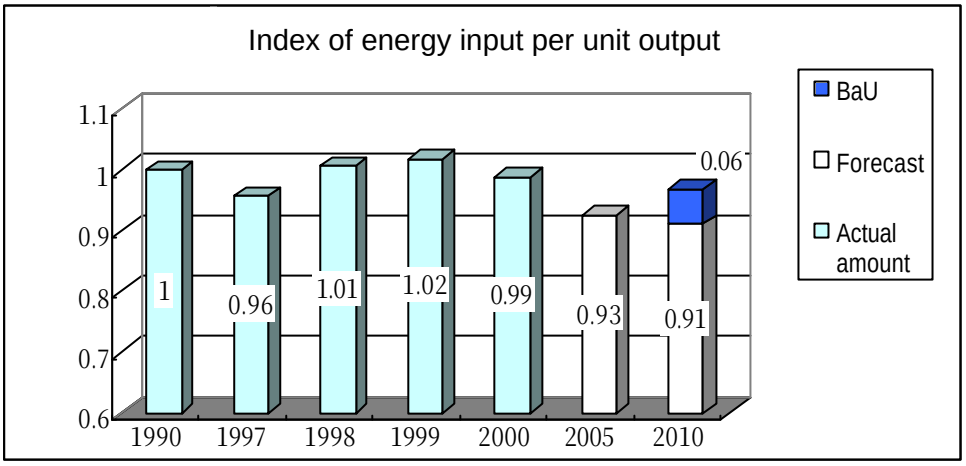
- Nationwide implementation of environmental management system
- Preparation of report on the environment

Note: The principal products of the industry are milk and milk-related products. Seven companies participated in the current follow-up survey, representing 52.3% of total industry sales. CO_2 emission amounts are based on the data provided by the seven participating companies. Assumptions for the fiscal 2010 forecast are: (1) annual production growth of 1%, compared to the level for fiscal 1999; and (2) the industry will improve the amount of emissions per unit output at an annual rate of 0.5% (compared to fiscal 1999) up to fiscal 2002, and 1.0% for the period thereafter.

The Limestone Association of Japan

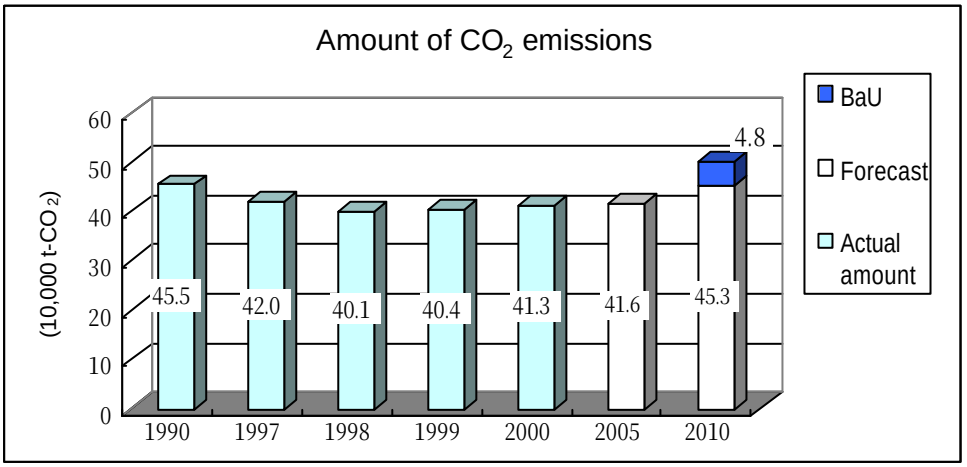
Target: By fiscal 2010, to reduce energy input per unit output in limestone production (per unit output for gas oil and electricity consumed) to 6% less than the level of fiscal 1990.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Assuming a value of 1 for energy consumed (gas oil and electric power) in fiscal 1990, the index of energy input per unit output stood at 0.96 in fiscal 1997, 1.01 in fiscal 1998, 1.02 in fiscal 1999, and 0.99 in fiscal 2000. The limestone industry is forecasting an index value of 0.93 for fiscal 2005, and is aiming for a target value of 0.91 for fiscal 2010.

The industry has emitted the following amounts of CO_2: 455,000 t-CO_2 in fiscal 1990; 420,000 t-CO_2 in fiscal 1997; 401,000 t-CO_2 in fiscal 1998; 404,000 t-CO_2 in fiscal 1999; and 413,000 t-CO_2 in fiscal 2000. It attributes the decline in emissions in fiscal 2000 to lower quantities of limestone produced and improvement of fuel efficiency. It is forecasting emissions of 416,000 t-CO_2 in fiscal 2005 which is 9% lower than in fiscal 1990, and 453,000 t-CO_2 in fiscal 2010, unchanged vis-à-vis fiscal 1990. Were a voluntary action plan not executed, emissions would be 501,000 t-CO_2 in fiscal 2010, that is 10% higher than in fiscal 1990.

3. Measures undertaken to achieve goals

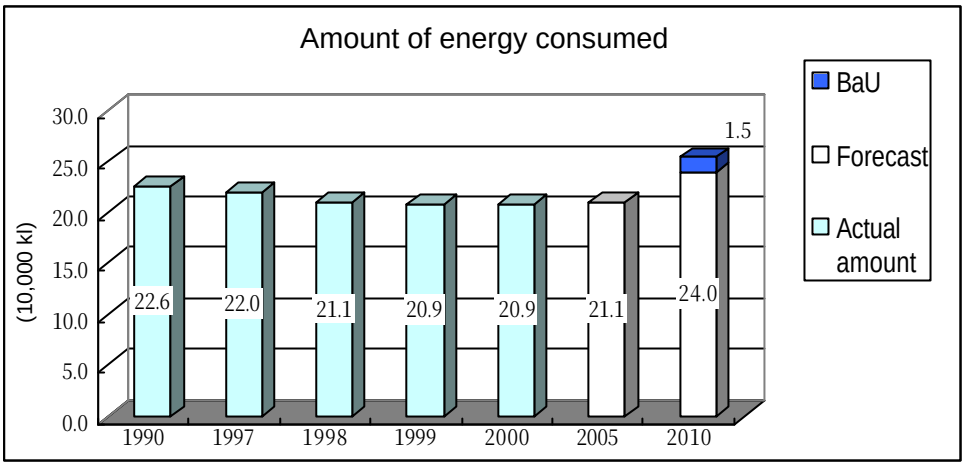
- Major undertakings
  - Measures to promote absorption of CO_2 (promotion of various greenery development projects)
  - Measures to deal with waste disposal (continuation of current zero emissions)
  - Reduction of gas oil consumption (promoting use of efficiency-enhancing additives; promoting the development and introduction of diesel engines that are adapted to the environment; using larger heavy equipment and using heavy equipment that is suitable to the task at hand; innovating mining technologies)
  - Reduction of electricity consumption (developing energy-saving production facilities; shortening production processes; etc.)
  - Introduction of cogeneration
  - Strengthening the cost councils (discussions on energy conservation etc.) that have been established at each mine

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

Overall CO_2 emissions were down approximately 10% compared to fiscal 1990 due to a cut in limestone production of about 9%. The limestone industry is making efforts to operate heavy machinery efficiently and to improve and rationalize the use of mining machinery. Energy consumption per unit output (in terms of crude oil equivalents) improved slightly.

Improvements in electric power use per unit output	8,202 t-CO_2	1.8%
Efforts to reduce emissions by various segments of the industry	-20,964 t-CO_2	-4.6%
Economic expansion (change in quantities produced etc.)	-29,054 t-CO_2	-6.4%
Total	-41,816 t-CO_2	-9.2%

5. Reference data



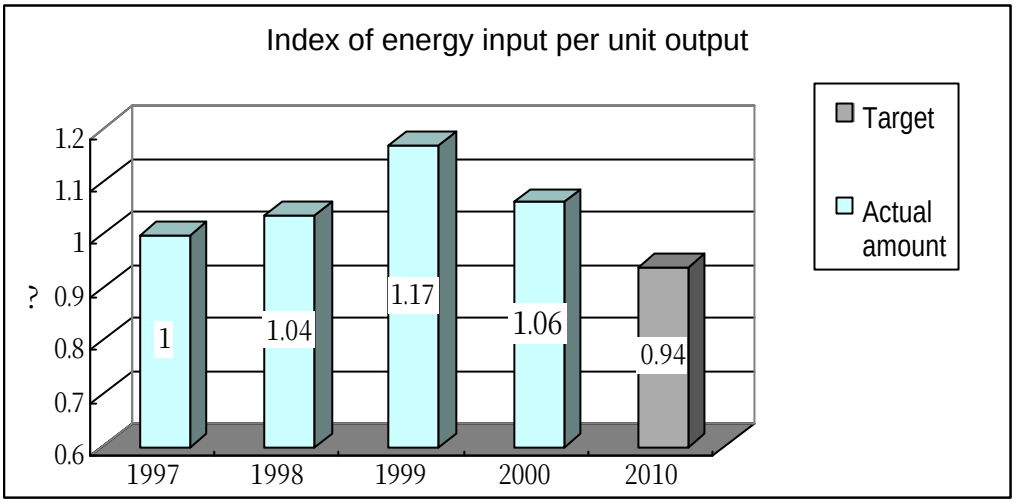
The limestone industry has recorded the following amounts of energy consumption (in terms of crude oil equivalents): 226,000 kl in fiscal 1990; 220,000 kl in fiscal 1997; 211,000 kl in fiscal 1998; 209,000 kl in fiscal 1999; and 209,000 kl in fiscal 2000. It is forecasting consumption of 211,000 kl for fiscal 2005 and 240,000 kl for fiscal 2010, a 7% decline and a 6% increase, respectively, vis-à-vis fiscal 1990. Were a voluntary action plan not executed, energy consumption in fiscal 2010 would be 255,000 kl, or 13% higher than in fiscal 1990.

Note: The principal product of the industry is limestone. The percentage of companies participating in this follow-up survey was 42% (99 out of 238 companies), representing a coverage ratio of 86% of total production output in the industry. Forecasts of production in 2010 are based on the outlook contained in the Report of the Limestone Industry Research Institute (Agency of Natural Resources and Energy). The CO_2 emissions were calculated using energy consumption data included in Yearbook of Minerals & Non-ferrous Metal Statistics issued by the Ministry of Economy, Trade and Industry.

Japan Machine Tool Builder's Association

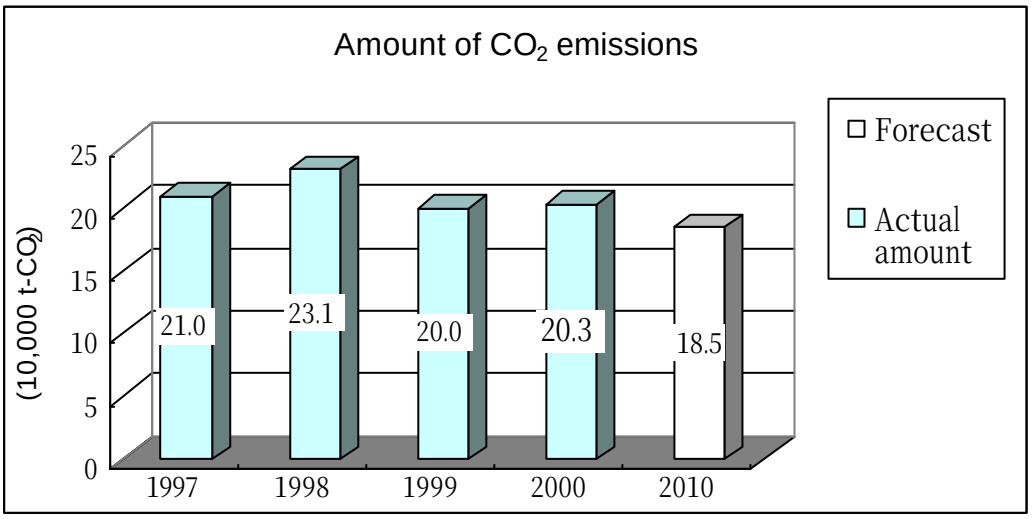
Target: To reduce the amount of energy used on a value-of-production basis by 6% in 2010 compared to 1997.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1997.

2. Amount of CO_2 emissions



Assuming a value of 1 (139.5 l/¥million) for energy consumed in 1997, the index of energy input per unit output stood at 1.04 (144.7 l/¥ million) in 1998, 1.17 (163.1 l/¥million) in 1999, and 1.06 (148.21/¥ million) in 2000. The industry has established a target index value of 0.94 (131.1/¥ million) for 2010.

The industry has emitted the following amounts of CO_2: 210,000 t-CO_2 in 1997; 231,000 t-CO_2 in 1998 (as a result of an increase in production output); 200,000 t-CO_2 in 1999; and 203,000 t-CO_2 in 2000. It is forecasting emissions of 185,000 t-CO_2 in 2010, a 12% decline compared to 1997.

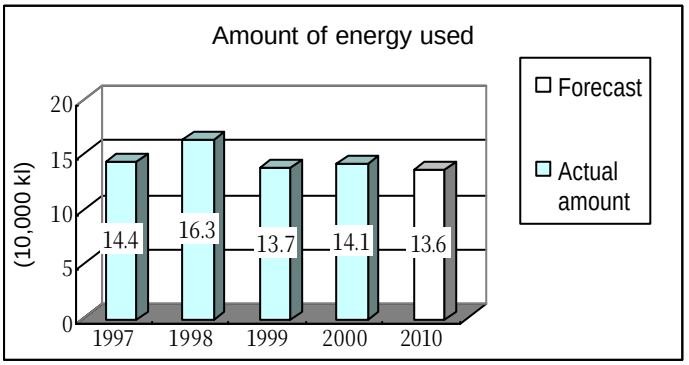
3. Measures undertaken to achieve goals

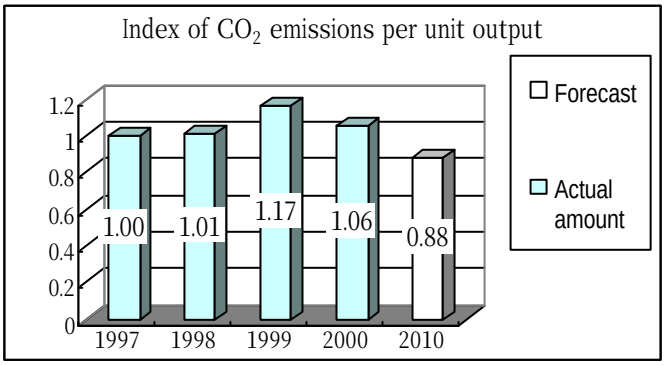
- Adopted further energy-conservation measures (installation of highly efficient equipment; adjustment of air conditioning and lighting; utilization of heated water from incinerators, etc.)
- Adjusted supply and demand for electric power
- Changed designs for components and materials in order to lighten processing loads
- Adopted cogeneration systems
- Promoted utilization of natural energy
- Increased production value by manufacturing increasingly sophisticated devices

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

In 2000, energy consumption and CO_2 emissions increased because of higher electric power usage, which was the result of a 12.7% increase in the production value of machine tools. Despite this increase in production, however, the use of energy other than electric power trended downward due to efforts to conserve energy on the part of member companies.

5. Reference data





The industry has consumed the following amounts of energy: 144,000 kl in 1997; 163,000 kl in 1998; 137,000 in 1999; and 141,000 kl in 2000. It is forecasting energy consumption of 136,000 kl in 2010, 6% less than in 1997. Assuming a value of 1 for CO_2 emissions in 1997, the index of CO_2 emissions per unit output stood at 1.01 in 1998, 1.17 in 1999, and 1.06 in 2000. The industry is forecasting an index value of 0.88 in 2010.

7. Environmental management; environmental conservation in overseas business activities

- The number of companies that have obtained ISO14001 certification increased from 17 in 1999 to 23 in 2000.

Note: The principal product of this industry is metal machine tools. The number of companies participating in this follow-up survey was 72, representing approximately 90% of the total output of the industry in value terms. The figures on energy use are summations of amounts used in the manufacture of machine tools. The industry's forecast for 2010 assumes that: there will be no change in the value of machine tool production from the level of 1997; that the industry will attain its goal for energy use (a 6% decline compared to 1997); and that that the fuel mix for energy used in 2010 will remain unchanged from 1997. Its estimate of CO_2 emissions is then calculated by summing up emissions by type of fuel used.

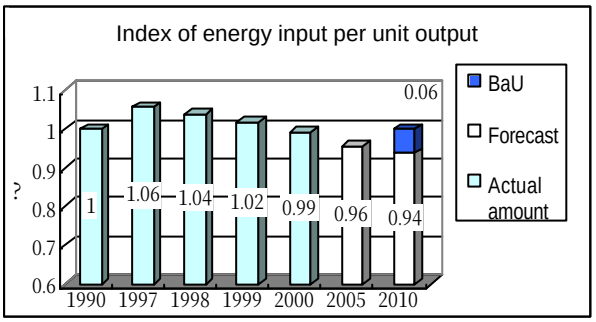
Flour Millers Association

Targets: By fiscal 2010:

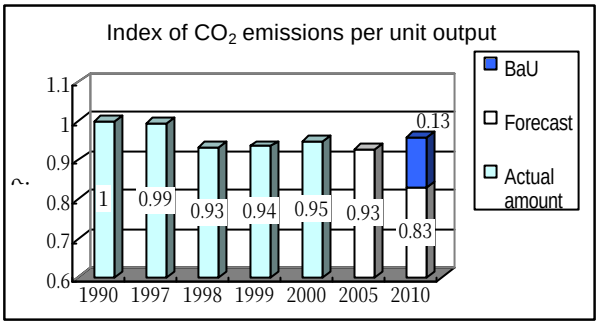
(1) To reduce energy input per unit output by more than 2% compared to fiscal 1990.

(2) To reduce CO_2 emissions per unit output by more than 5% compared to fiscal 1990.

1. Degree of progress toward goal

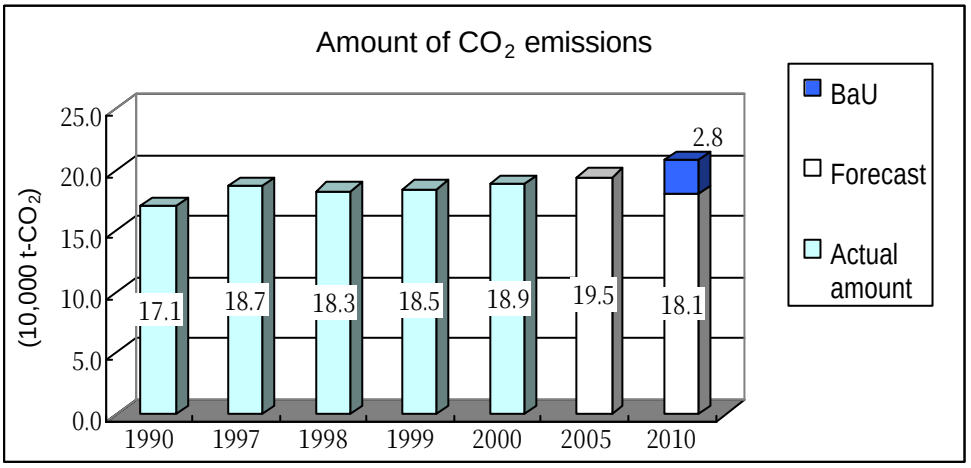


Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

2. Amount of CO_2 emissions



Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy consumed per unit output stood at 1.06 in fiscal 1997, 1.04 in fiscal 1998, 1.02 in fiscal 1999, and 0.99 in fiscal 2000. The flour industry is forecasting index values of 0.96 and 0.94, respectively, for fiscal 2005 and 2010. Assuming a value of 1 for CO_2 emitted in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.99 in fiscal 1997, 0.93 in fiscal 1998, 0.94 in fiscal 1999, and 0.95 in fiscal 2000. The industry is forecasting index values of 0.93 and 0.83, respectively, for fiscal 2005 and 2010.

The industry has emitted the following amounts of CO_2: 171,000 t-CO_2 in fiscal 1990; 187,000 t-CO_2 in fiscal 1997; 183,000 t-CO_2 in fiscal 1998; 185,000 t-CO_2 in fiscal 1999, and 189,000 t-CO_2 in fiscal 2000. It is forecasting emissions of 195,000 t-CO_2 in fiscal 2005 and 181,000 t-CO_2 in fiscal 2010, 14% and 6% increases, respectively, over 1990. Were a voluntary action plan not executed, emissions would be 209,000 t-CO_2 in fiscal 2010, 22% higher than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Integrating plants and achieving high operating rates
  - Introducing co-generation systems
  - Adopting use of high-efficiency electric motors
  - Installing high-efficiency ventilators and speed controllers
  - Installing pressure-optimizing systems for air compressors, and restricting the number of compressors used
  - Introducing new forms of energy

- Specific anti-global warming measures carried out in fiscal 2000; estimated investment and impact made

Nearly 90% of the energy used by the industry is electricity, so companies have concentrating primarily on the implementation of measures for saving electrical power. Below are some of the more widely implemented measures.

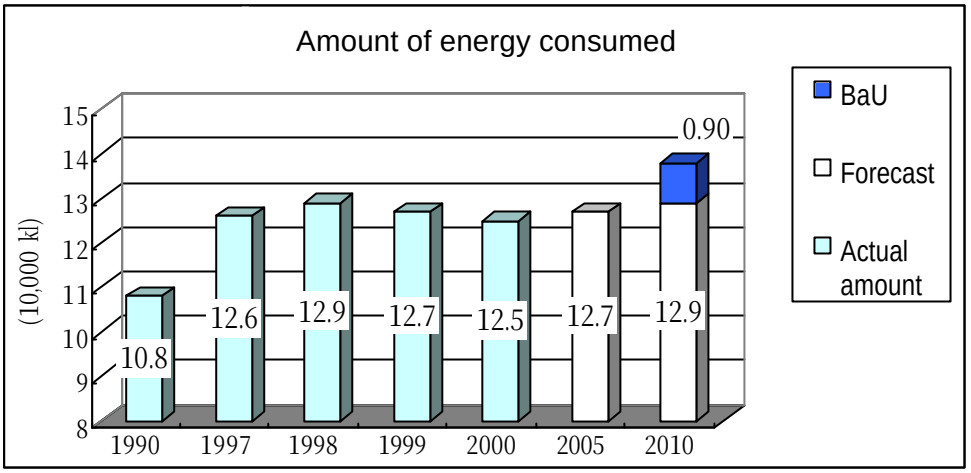
- Installing high-efficiency transmissions
- Installing high-efficiency compressors
- Adopting use of high-efficiency motors and conversion to inverter technology
- Installing energy-saving air conditioners
- Regulation of summer operation schedule through introduction of high-rate operating system

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

While the values of the energy consumption per unit output and the CO_2 emissions per unit output have dropped, the actual amount of CO_2 emissions has risen because of increased production. The following is an analysis of the approximately 11% increase in CO_2 emissions between fiscal 1990 and 2000.

Improvements in electric power use per unit output	-21,785 t- CO_2	-12.78%
Efforts to reduce emissions by various segments of the industry	11,557 t- CO_2	6.78%
Economic expansion (changes in production output, etc.)	28,307 t- CO_2	16.60%
Total	18,078 t- CO_2	10.60%

5. Reference data



The industry has consumed the following amounts of energy: 108,000 kl in fiscal 1990; 126,000 kl in fiscal 1997; 129,000 kl in fiscal 1998; 127,000 kl in fiscal 1999; and 125,000 kl in fiscal 2000. It is forecasting consumption of 127,000 kl in fiscal 2005 and 129,000 kl in fiscal 2010, representing, respectively, 18% and 19% increases over fiscal 1990. Were a voluntary action plan not executed, consumption would be 138,000 kl in fiscal 2010, a 28% increase over fiscal 1990.

6. Environmental management and environmental conservation measures

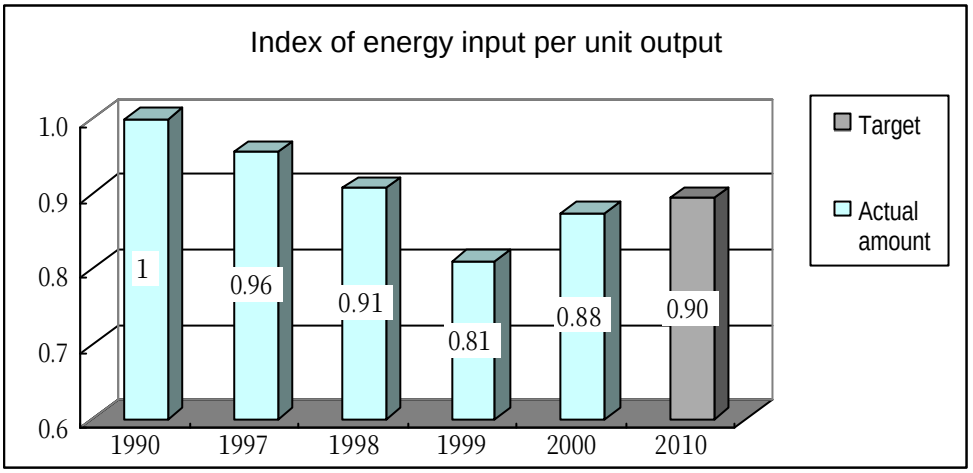
A large number of companies have either established, or are considering the establishment of, internal environmental conservation organizations. While working toward obtaining ISO 14000 certification, each company is vigorously moving to conserve energy and reduce waste.

Note: The principal products of the industry are flour and bran. The participation rate for the current follow-up was 26% (33 out of 128 companies), representing a coverage ratio of 90% in terms of product output in the industry. The CO_2 emission amounts were calculated as the totals of per-source energy consumption report data provided by the 33 association companies surveyed (all 33 responded) Forecasts for fiscal 2010 assume an annual rate of growth in production of 1%.

The Shipbuilders' Association of Japan

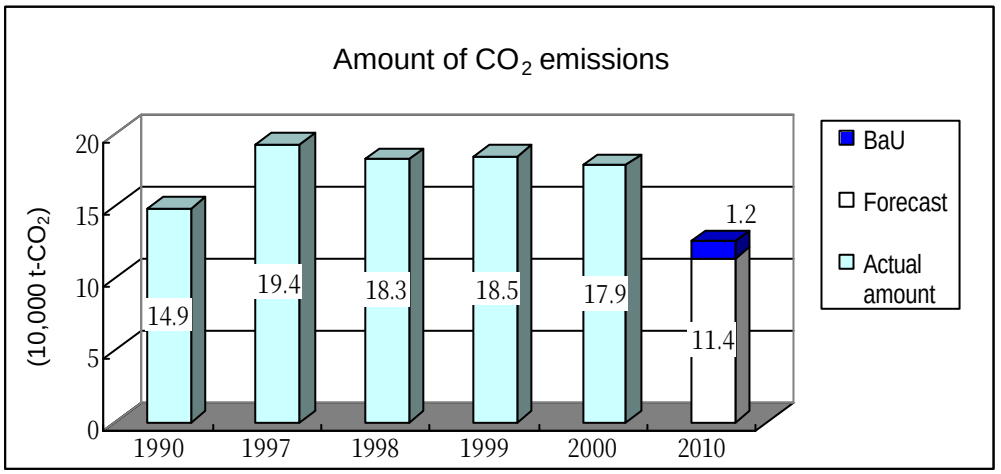
Target: By 2010, to reduce the amount of energy consumed on a per unit of output basis by approximately 10% of the level in the base year (1990).

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Note 1: The figure for fiscal 2000 represents the total of the actual emission amounts of members of the Shipbuilders' Association of Japan and members of the Cooperative Association of Japan Shipbuilders.

Note 2: The figures for fiscal 1990-1999 and 2010 are estimated amounts for the entire shipbuilding industry, including the amounts for the Cooperative Association of Japan Shipbuilders.

Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit output stood at 0.96 in fiscal 1997, 0.91 in fiscal 1998, 0.81 in fiscal 1999, and 0.88 in fiscal 2000. The industry is aiming for a target index value of 0.90 for fiscal

2010. Toward this end, it has adopted as its principal measure investing in automated equipment for the purpose of promoting greater efficiency and technical sophistication in production.

The shipbuilding industry has emitted the following amounts of CO_2 : 149,000 t-CO_2 in fiscal 1990; 194,000 t-CO_2 in fiscal 1997; 183,000 t-CO_2 in fiscal 1998; 185,000 t-CO_2 in fiscal 1999; and 179,000 t-CO_2 in fiscal 2000. It is forecasting emissions of 114,000 t-CO_2 in fiscal 2010, 24% less than in fiscal 1990.

Note 1: The amount for fiscal 2000 is the total of the actual emission amounts of members of the Shipbuilders' Association of Japan (SAJ) and members of the Cooperative Association of Japan Shipbuilders. As of this year, the Cooperative Association of Japan Shipbuilders is cooperating with SAJ in the follow-up survey, and together both associations cover nearly the entire shipbuilding industry.

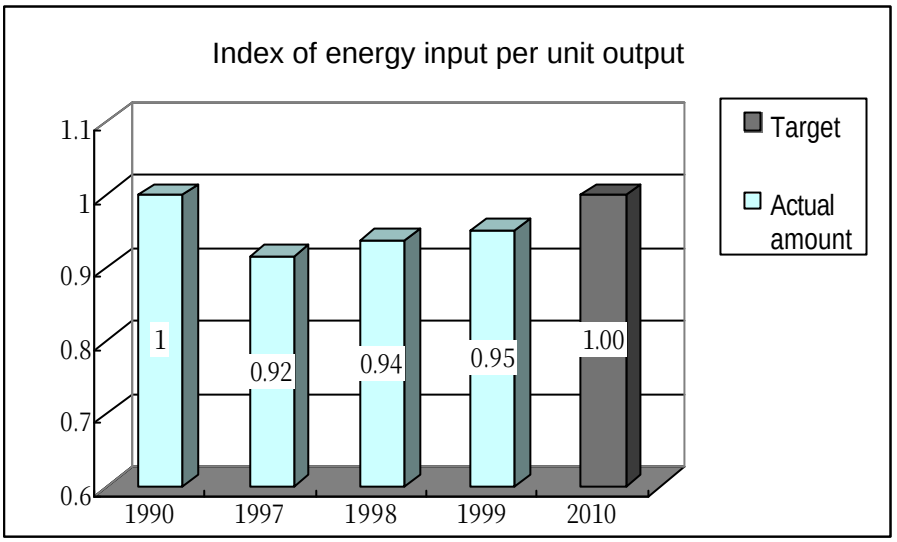
Note 2: The figures for fiscal 1990-1999 and 2010 are estimated amounts for the entire shipbuilding industry, including the amounts for the Cooperative Association of Japan Shipbuilders.

Note 3: The fiscal 2010 forecast estimates assume that the tonnage produced by Japan in that year will be near the same level as fiscal 2000.

Japan Department Stores Association

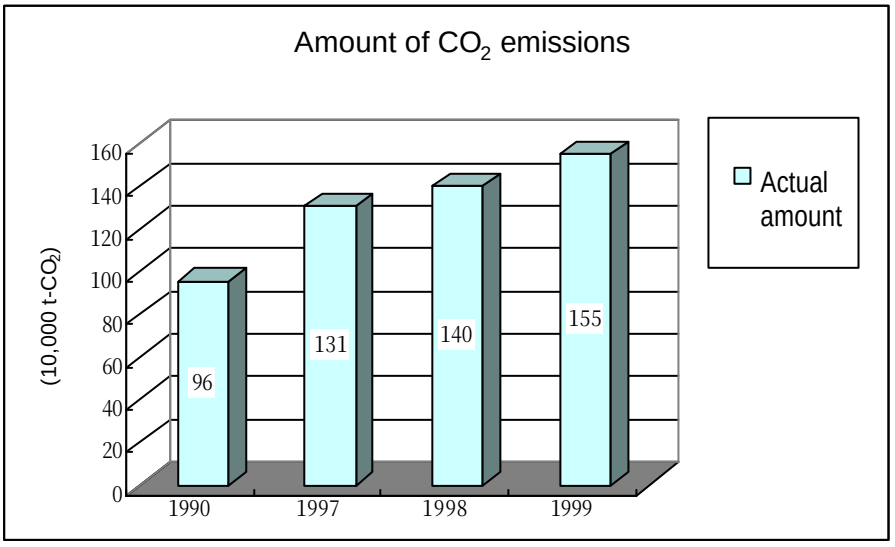
Target: To maintain the energy consumption per unit output at stores (based on floor space and business hours) of the period 2008-2012 at the same level as that of 1990.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Assuming a value of 1 for amount of energy consumed in fiscal 1990, the index of energy consumption per unit output stood at 0.92 in fiscal 1997, 0.94 in fiscal 1998, and

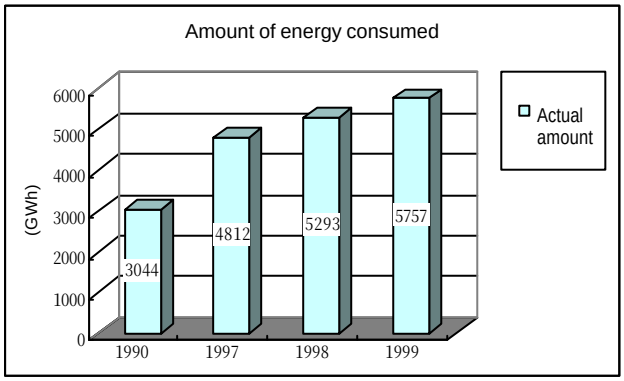
0.95 in fiscal 1999. The targeted index value for fiscal 2010 is 1.0, the same level as fiscal 1990. The industry plans to achieve this goal by such measures as adopting clean forms of energy, installing energy-saving equipment and devices, and streamlining of delivery operations.

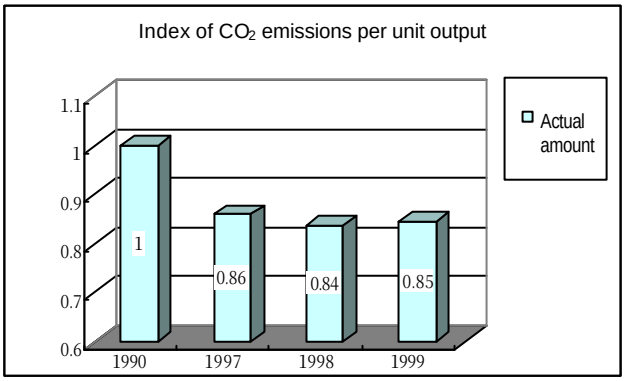
The industry has emitted the following amounts of CO_2: 0.96 million t-CO_2 in fiscal 1990; 1.31 million t-CO_2 in fiscal 1997; 1.4 million t-CO_2 in fiscal 1998; and 1.55 million t-CO_2 in fiscal 1999.

3. Measures undertaken to achieve goals

- Major undertakings
  - Store construction/remodeling and store management designed to reduce environmental impact, by implementing such measures as utilization of clean energy forms and preferential introduction of energy-saving equipment and devices.
  - Rationalization of distribution processes to reflect environmental concerns by working with apparel industry to promote on-hanger deliveries, outsourcing of procurement deliveries, adoption of joint delivery operations, etc.

5. Reference data





Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

The industry has recorded the following amounts of energy consumption: 3,044 GWh in fiscal 1990; 4,812 GWh in fiscal 1997; 5,293 GWh in fiscal 1998; and 5,757 GWh in fiscal 1999.

Assuming a value of 1 for amounts emitted in fiscal 1990, the index of CO_2 emissions per unit output stood at 0.86 in fiscal 1997, 0.84 in fiscal 1998, and 0.85 in fiscal 1999.

7. Environmental management; environmental conservation in overseas business activities

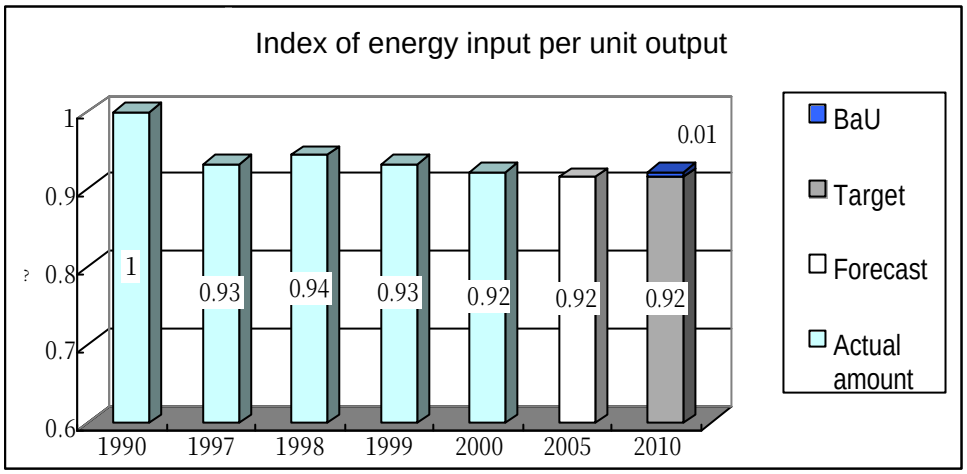
With an eye on the propagation of standardized environmental audits by external institutions, the association engages in the study of ISO guidelines and other international standards, promotion of and education in voluntary environmental management techniques that are adapted to reality, and regular tracking of the state of association members' environmental conservation efforts.

Note: The number of department stores participating in this follow-up survey was 311 (fiscal 1999), representing an industry coverage ratio of 80% in terms of sales area floor space.

Japan Association of Refrigerated Warehouses

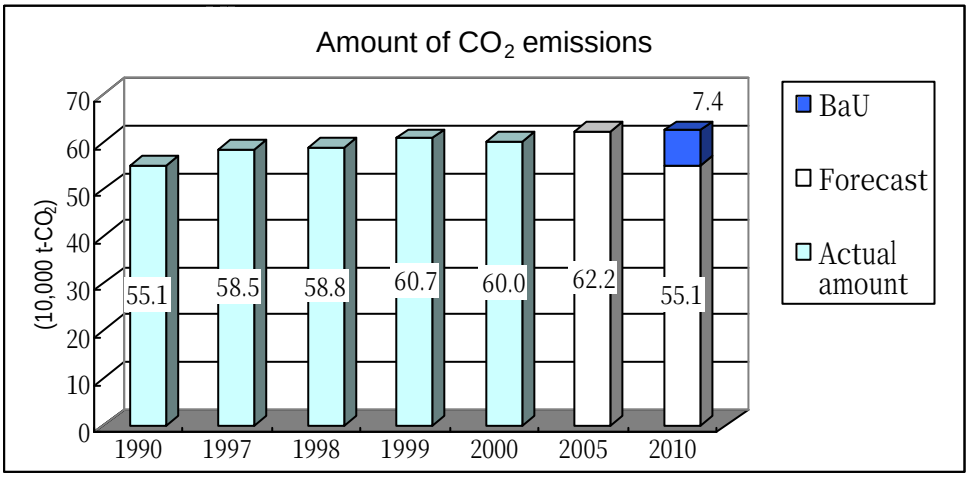
Target: To reduce the amount of electric power used per ton of facility capacity (kWh/facility-ton) by 8% of the amount used in 1990 by 2010.

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Assuming a value of 1 for energy consumed in 1990, the index of energy input per unit output was 0.93 in 1997, 0.94 in 1998, 0.93 in 1999, and 0.92 in 2000. The industry is forecasting index values of 0.92 for both 2005 and 2010.

The refrigerated warehouse industry has emitted the following amounts of CO_2: 551,000 t-CO_2 in 1990, 585,000 t-CO_2 in 1997; 588,000 t-CO_2 in 1998; 607,000 t-CO_2 in

1999; and 600,000 t-CO_2 in 2000. It is forecasting emissions of 622,000 t-CO_2 in 2005 and 551,000 t-CO_2 in 2010, which represent a 13% gain and no change, respectively, compared to 1990. Were a voluntary action plan not executed, CO_2 emissions in 2010 would be 625,000 t-CO_2, a 13% increase compared to 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Installation of energy-conserving equipment (introducing phase-advanced condensers to improve the power factor of motors; improving the diffusion rate for electronic expansion valves; improving the diffusion rate of demand control devices; promoting the wider use of energy-conserving lighting equipment; promoting the wider use of highly efficient compressors and heat-exchange devices)
  - Energy-conservation measures through improvements made in facilities (enclosing decks of loading platforms; preventing encroachment of outside heat through increased use of heat-insulation material; preventing cold air from leaking through the heat-resisting door)
  - Energy-conservation measures related to daily operational controls (maintaining refrigerator temperatures that are appropriate to the items being stored; making sure that heat-transfer tubing in condensers are always kept clean)
  - Other efforts (preparing manual for use in conserving energy and fostering comprehensive compliance with the guidance provided in the manual among members; holding seminars and other sessions relating to energy conservation, etc.)

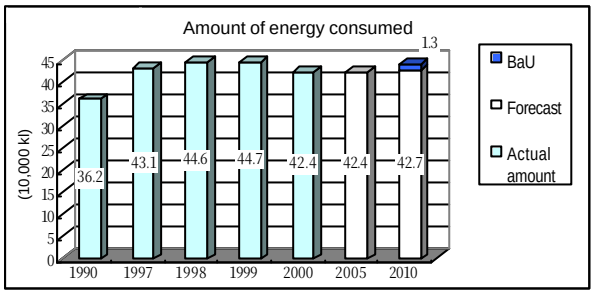
4. Factors accounting for increases or decrease in CO_2 emissions in 1990–2000.

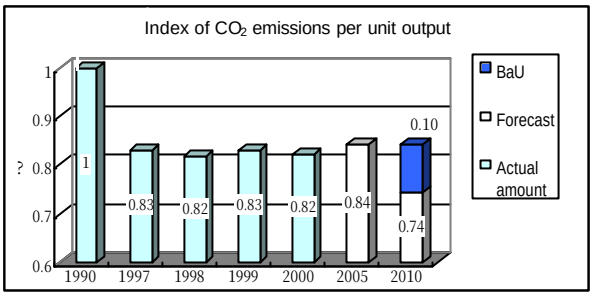
The amount of electric power used per unit of facility-capacity between 1990 and 2000 was reduced from 180 kWh/facility-t to 166kWh/facility-t. Consequently, CO_2 emissions per unit of output was also reduced.

The following is an analysis of the 9% increase in CO_2 emissions between 1990 and 2000.

Change resulting from improvements in electricity power consumed per unit of output	-73,000 t-CO_2
Reduction through efforts by various industry segments	-58,000 t-CO_2
Amount related to increase in production	180,000 t-CO_2
Total	49,000 t-CO_2

5. Reference data





Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

The industry has consumed the following amounts of energy (in terms of crude oil equivalents): 362,000 kl in 1990; 431,000 in 1997; 446,000 kl in 1998; 447,000 kl in 1999; and 424,000 kl in 2000. It is forecasting consumption of 424,000 kl in 2005 and 427,000 kl in 2010, 17% and 18% higher, respectively, than in 1990. Were a voluntary action plan not executed, the industry forecasts that it would use 440,000 kl in 2010, 22% more than in 1990.

Assuming a value of 1 for emissions in 1990, the index of CO_2 emissions per unit output was 0.83 in 1997, 0.82 in 1998, 0.83 in 1999, and 0.82 in 2000. The industry is forecasting index values of 0.84 and 0.74 in 2005 and 2010, respectively.

6. Other efforts to deal with global warming

- Measures to deal with greenhouse gases other than CO_2

  Approximately 80% of the warehouses in the industry use HCFC22 as the refrigerant; so the industry is counting on member companies to place maximum efforts into preventing leakage during operations and maintenance.

- Emissions from offices and internal distribution

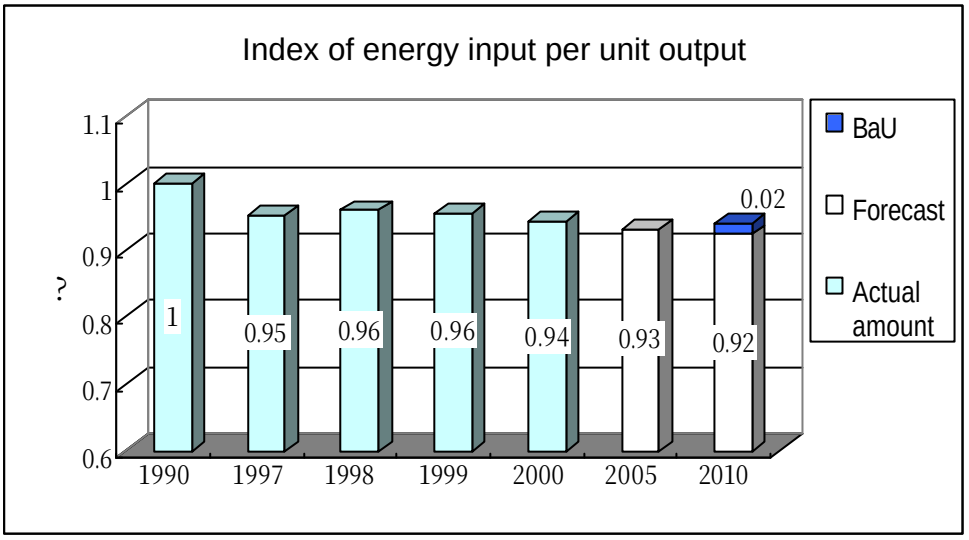
  Acting in concert with goods consignors and trucking companies, the industry is promoting greater efficiency in overall distribution through utilization of computer systems and other means.

Note: The industry's principal business is providing storage in refrigerated warehouses. The participation rate for the latest follow-up survey was approximately 58% (700 out of 1200 companies); the industry extrapolated its findings to calculate coverage rate for the entire industry. For CO_2 emissions, the industry surveyed 850 sites out of the 1,800 sites (47%) operated by member companies, and extrapolated the results to come up with emissions for the whole industry. The forecast for CO_2 emissions in 2010 was calculated on the assumption that the rate of growth in facilities capacity would be 1.0% between 2000–2005, and 0.5% between 2005–2010. To calculate CO_2 emissions from use of electric power, the industry used the emissions coefficient for production -use electricity.

Japan LP Gas Association

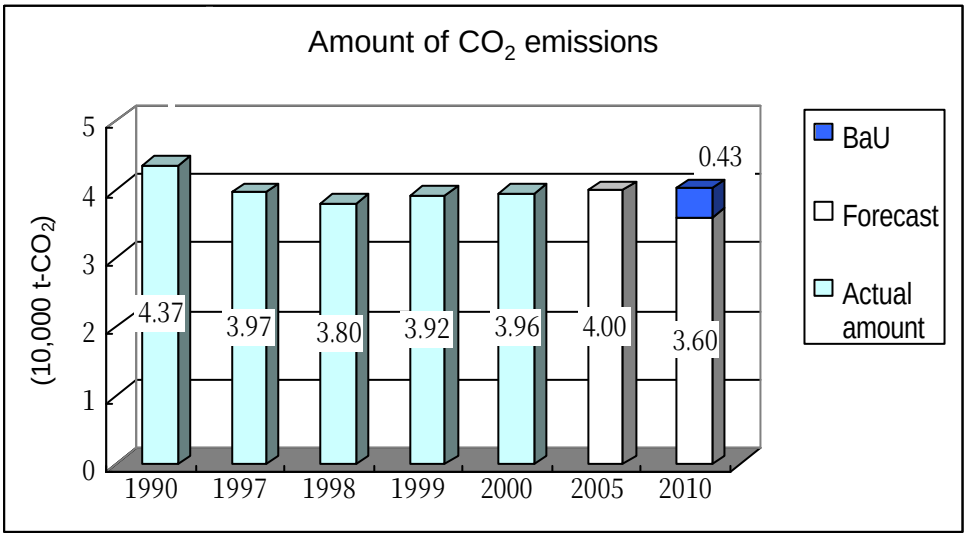
Target: To reduce energy consumed per unit output (kWh/LPG-ton) at LP gas storage and delivery facilities (import terminals, secondary terminals) in fiscal 2010 by more than 7% compared to the level of fiscal 1990.
(With respect to facilities owned by general-agent importers of LP gas)

1. Degree of progress toward goal



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.

2. Amount of CO_2 emissions



Assuming a value of 1 for energy consumption in fiscal 1990, the index of energy consumed per unit output stood at 0.95 in fiscal 1997, 0.96 in fiscal 1998, 0.96 in fiscal

1999, and 0.94 in fiscal 2000. The industry is forecasting index figures of 0.93 for fiscal 2005 and 0.92 for fiscal 2010. The target of under 0.93 for fiscal 2010 is an achievable forecast, which the industry will accomplish through integrating and closing LP gas facilities, rationalizing manufacturing processes, and other measures

The industry has recorded the following amounts of CO_2 emissions: 43,700 t-CO_2 in fiscal 1990; 39,700 t-CO_2 in fiscal 1997; 38,000 t-CO_2 in fiscal 1998; 39,200 t-CO_2 in fiscal 1999; and 39,600 t-CO_2 in fiscal 2000. It is forecasting emissions of 40,000 t-CO_2 for fiscal 2005 and 36,000 t-CO_2 for fiscal 2010, 9% and 18% reductions, respectively, compare to fiscal 1990. Were a voluntary action plan not executed, emissions in fiscal 2010 would be 40,300 t-CO_2, 8% less than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Through rationalization measures, including integration and closure of LP gas terminals located across the country, steps were taken to reduce total energy (electric power) consumed per unit output within each facility.
  - Through rationalization measures affecting storage and delivery processes at LP gas terminals, steps were taken to reduce energy (electric power) consumed per unit output.

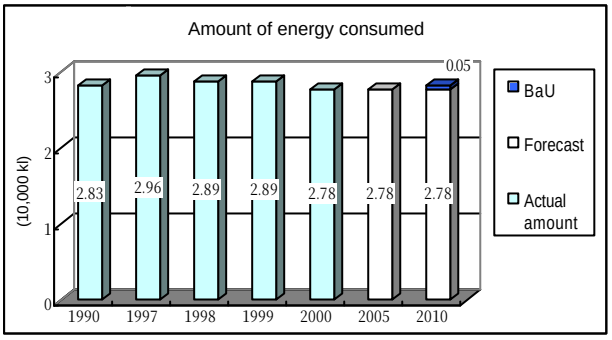
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

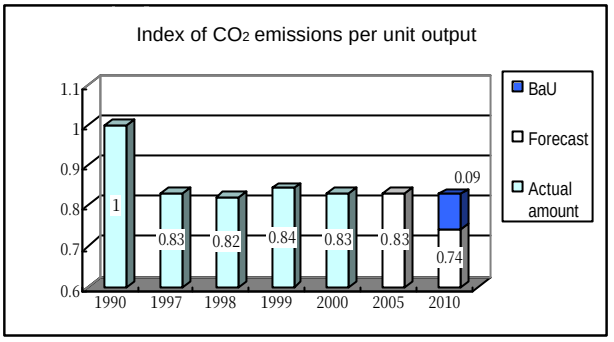
Although the industry succeeded in reducing electric power consumed per unit of output at its import terminals by 4.7% in fiscal 2000 compared to fiscal 1990, it was unable to reduce this index on a total operating basis because of an increase in electricity consumption per unit output resulting from improvements made to work environments. However, the amount of energy consumed per unit output at terminals decreased as a result of a reduction by 17% in the number of secondary terminals in existence compared to fiscal 1990. This reduction enabled the industry to reduce energy consumed per unit output.

The following is an analysis of the approximately 9% decline in CO_2 emissions between fiscal 1990 and 2000.

Improvements in electric power use per unit output	-12.1%
Efforts to reduce emissions by various segments of the industry	-6.4%
Economic expansion (change in quantities produced etc.)	9.0%
Total	-9.4%

5. Reference data





The industry has recorded the following amounts of energy consumption: 28,300 kl in fiscal 1990; 29,600 kl in fiscal 1997; 28,900 kl in fiscal 1998; 28,900 kl in fiscal 1999; and 27,800 kl in fiscal 2000. It is forecasting consumption of 27,800 kl in both fiscal 2005 and fiscal 2010, or 2% less than in fiscal 1990. Were a voluntary action plan not executed, emissions in fiscal 2010 would be 28,300 kl, unchanged from 1990.

6. Other efforts to deal with glo bal warming

- Emissions from offices and internal distribution

Due to integration and closures of secondary facilities, amounts consigned for shipment via domestic tankers have declined. Consequently the industry is contributing to energy conservation at this stage of transportation.

7. Environmental management; environmental conservation in overseas business activities

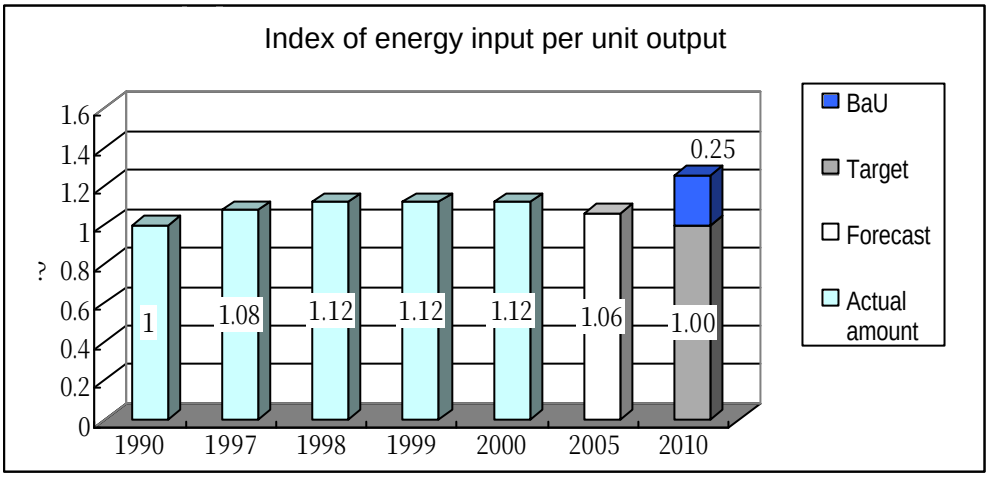
- As of fiscal 2000, 24% of the industry's import terminals had obtained ISO 14001 certification.
- Preparation and wide distribution of "clean stickers" and "LP Gas Booklet for Education" by four LP gas distribution organizations.
- Through technology and information exchange relating to LP gas, instruction and support to Asia on the uses of LP gas as a means of improving the environment.

Note: The industry is engaged principally in the import and distribution of LP gas (liquefied petroleum gas). Although the percentage of companies participating in the current follow-up survey was 75% (18 companies that own LP gas storage and delivery facilities out of a total of 24 member companies), the coverage ratio of facilities affected by the industry's goals was 100%. CO_2 emissions were calculated for import facilities on the basis of results received from roughly 72% of such facilities; for secondary facilities, on the basis of results received from roughly 62% of such facilities; CO_2 emissions at a total of LP gas storage and delivery facilities were calculated on the basis of an estimate of overall electric power delivered from estimated total imports of LP gas, and the figure for average electric power consumed per unit output for all sources of electricity. The forecast for fiscal 2010 assumes that the amount of LP gas handled at the terminal will rise in volume terms by 1% in fiscal 2005, and by 10% in fiscal 2010 compared to fiscal 2000.

The Real Estate Companies Association of Japan

Target: With regard to buildings that are to be renovated, rebuilt, or newly built hereafter, the member companies will aim to market ones whose energy consumption per unit of floor area (consumption per unit of output) does not exceed the level of fiscal 1990.

1. Degree of progress toward goal (actual amounts for existing buildings; and target for renovated, rebuilt, or newly constructed buildings)



Note: The index of energy input per unit output assigns a value of 1 to actual amounts consumed in fiscal 1990.
The target value indicates the energy input per unit output of buildings that are to be renovated, rebuilt, or newly built hereafter.
The actual amounts indicate the energy input per unit output of existing buildings that association members currently use.

Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy input per unit of output stood at 1.08 in fiscal 1997, and at 1.12 in fiscal 1998, 1999, and 2000. The target value for renovated, rebuilt, or newly constructed buildings is 1.06 in fiscal 2005, and 1.00 in fiscal 2010 (i.e., the same value as fiscal 1990).

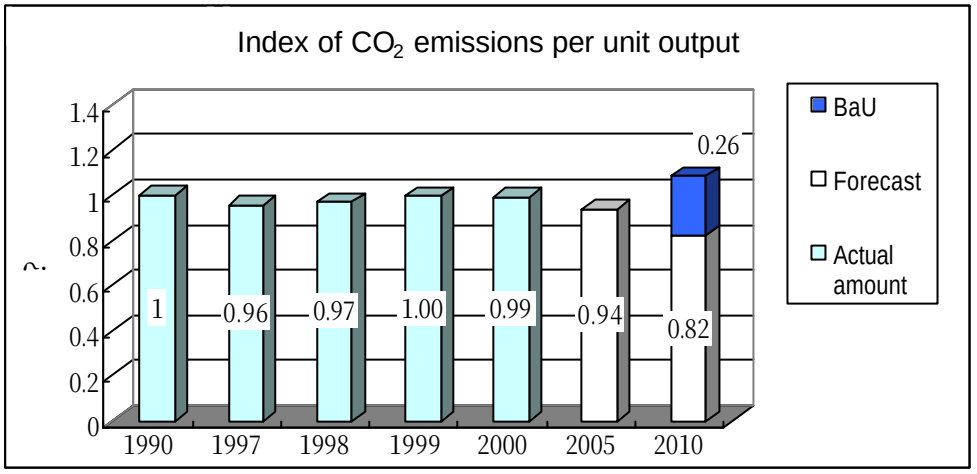
3. Measures undertaken to achieve goals

- Major undertakings
  - Promoting building design and introducing equipment aimed at saving energy and lowering CO_2 emissions
  - Promoting designs that extend building life
  - Promoting designs that facilitate the reuse of construction waste materials
  - Selecting construction materials and air conditioning systems that make allowances for the reduction of HFC
  - Promoting energy conservation in the management and maintenance of rental buildings and other such properties
  - Promoting energy conservation in day-to-day office activities

4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The amount of CO_2 emissions in fiscal 2000 did not change over the previous year, though the increased use of office automation operated as an increasing factor. Major factors that influence the amount of CO_2 emissions of this industry are building occupancy rates and climatic changes.

5. Reference data (actual amounts for existing buildings; and target for renovated, rebuilt, or newly constructed buildings)



Note: The index of input per unit of output assigns a value of 1 to the level of emissions in fiscal 1990.

The index of CO_2 emissions per unit of output, based on a value of 1 for emissions in fiscal 1990, stood at 0.96 in fiscal 1997, 0.97 in fiscal 1998, 1.00 in fiscal 1999, and 0.99 in fiscal 2000. The emission forecasts for renovated, rebuilt, or newly constructed buildings are 0.94 in fiscal 2005, and 0.82 in fiscal 2010.

7. Environmental management; environmental conservation in overseas business activities

The acquisition of ISO 14000 series certification or preparations for such acquisition (Mitsubishi Estate, Tokyo Tatemono, Tokyu Land Corporation, Meiho Enterprise, Tokyo Gas Urban Development, Hitachi Life, Isuzu Estate, Marubeni Real Estate, etc.)

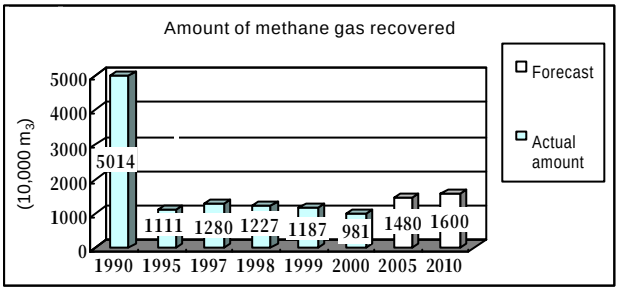
Note. The principal operations of members of the Real Estate Companies Association of Japan are the leasing, management, and maintenance of buildings and other properties; and subdivision development. Seventy-one companies participated in this follow-up survey (the association has 252 members, 174 of which deal primarily in real estate), and the energy consumption data reflected by the survey is from 13% of the real estate companies (23 out of 174 companies). The figures for energy consumption per unit output and CO_2 emissions per unit output are the unit index values determined from the annual data of the 23 companies for fiscal 1997-2000. The energy source makeup assumed for the fiscal 2005 and 2010 forecasts of the effect of the industry's environmental efforts is the same as that of fiscal 2000. The energy source makeup of fiscal 1990 and the fiscal 2010 prediction of the effect if no measures were implemented was estimated from the trends in the data from fiscal 1997-2000. The district heating and cooling unit value is taken from the value assigned by the Ministry of the Environment.

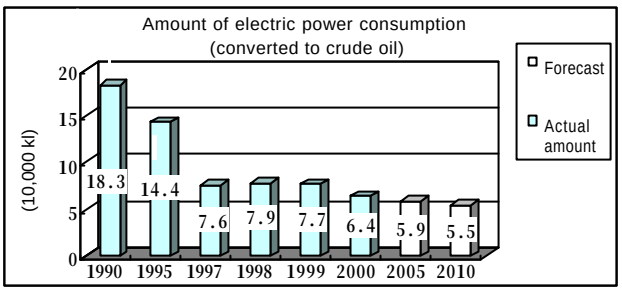
Japan Coal Energy Center

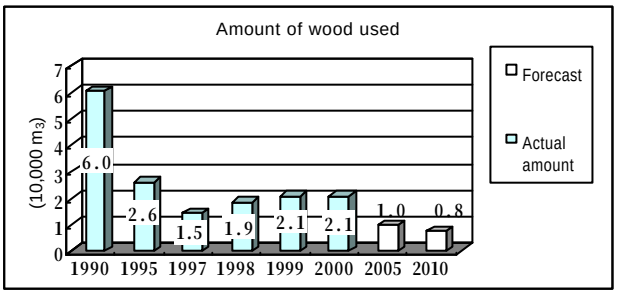
Targets: The industry's targets for fiscal 2010 are as follows, with comparisons made against fiscal 1995.

- To increase the amount of methane gas recovered in coal mining processes by 44%.
- To reduce electric power consumption by 58%.
- To reduce wood consumption by 71%.

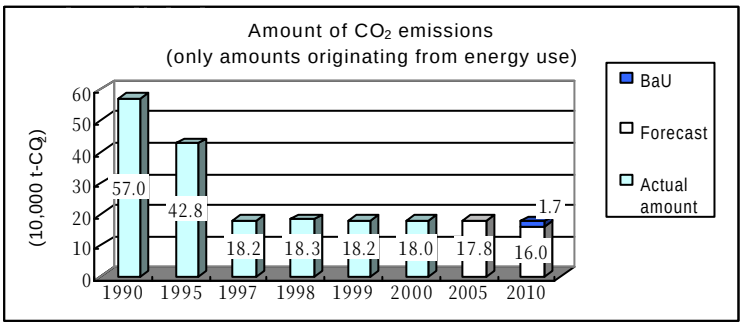
1. Degree of progress toward goal







2. Amount of CO_2 emissions



The coal industry has recovered the following amounts of methane gas from its coal mining activities: 50.14 million m^3 in fiscal 1990; 11.11 million m^3 in fiscal 1995, 12.80 million m^3 in fiscal 1997; 12.27 million m^3 in fiscal 1998; 11.87 million m^3 in fiscal 1999; and 9.81 million m^3 in fiscal 2000. It is forecasting recovery of 14.80 million m^3 in fiscal 2005, and 16.0 million m^3 in fiscal 2010, 33% and 44% more, respectively, than in fiscal 1995.

The industry has consumed the following amounts of electric power (in terms of crude oil equivalents): 183,000 kl in fiscal 1990; 144,000 kl in fiscal 1995; 76,000 kl in fiscal 1997; 79,000 kl in fiscal 1998; 77,000 kl in fiscal 1999; and 64,000 kl in fiscal 2000. It is forecasting consumption of 59,000 kl in fiscal 2005 and 55,000 kl in fiscal 2010, 59% and 62% less, respectively, than in fiscal 1995.

The industry has consumed the following amounts of wood: 60,000 m^3 in fiscal 1990; 26,000 m^3 in fiscal 1995; 15,000 m^3 in fiscal 1997; 19,000 m^3 in fiscal 1998; and 21,000 m^3 in both fiscal 1999 and 2000. The industry is forecasting usage of 10,000 m^3 in fiscal 2005 and 8,000 m^3 in fiscal 2010, 62% and 71% less, respectively, than in fiscal 1995.

The industry has emitted the following amounts of CO_2: 570,000 t-CO_2 in fiscal 1990; 428,000 t-CO_2 in fiscal 1995; 182,000 t-CO_2 in fiscal 1997; 183,000 t-CO_2 in fiscal 1998; 182,000 t-CO_2 in fiscal 1999; and 180,000 t-CO_2 in fiscal 2000. It is forecasting emissions of 178,000 t-CO_2 in fiscal 2005, and 160,000 t-CO_2 in fiscal 2010, 69% and 72% less, respectively, than in fiscal 1990. Were a voluntary action plan not executed, emissions in fiscal 2010 would be 177,000 t-CO_2, 69% less than in fiscal 1990.

3. Measures undertaken to achieve goals

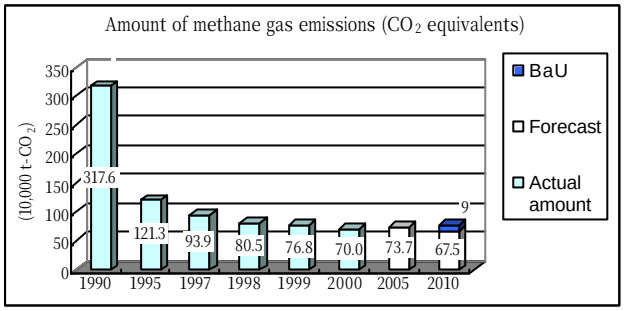
- Major undertakings
  - Methane: Promotion of methane recovery through gas-extraction boring (development and introduction of ultra-long hole boring machines), and effective use of the recovered methane. Transfer of methane-recovery technology to other coal-producing countries.
  - Electric power: Reduction of scale and integration of mines; enhancing efficiency through innovations and technical improvements relating to mining machinery.
  - Wood: Reducing the amount of wood used through improvements in mining methods, including replacing wood with steel for tunnel supports, and through expanded use of shafts built out of concrete.

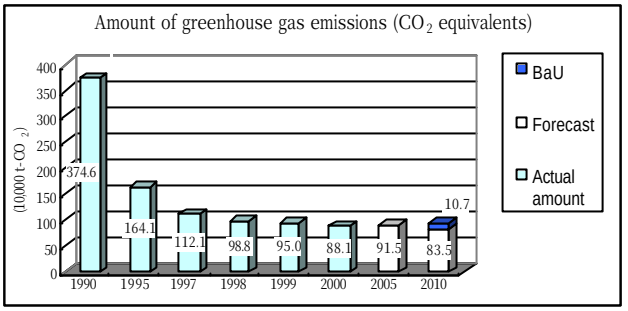
4. Factors accounting for increases or decreases in CO_2 emissions in fiscal 1990–2000

The following is an analysis of the decrease in CO_2 emissions between fiscal 1990 and 2000.

Improvements in electric power use per unit output	101,000 t-CO_2
Efforts to reduce emissions by various segments of the industry	-102,800 t-CO_2
Economic expansion (changes in production output, etc.)	-287,500 t-CO_2
Total	-390,300 t-CO_2

5. Reference data





Note: The figures in the graph are the total of CO_2 emissions (that originate in energy) and methane gas, converted into CO_2 equivalents.

Through its coal production activities, the industry has emitted the following amounts of methane gas (converted into equivalent units of CO_2): 3.176 million t-CO_2 in fiscal 1990; 1.213 million t-CO_2 in fiscal 1995; 939,000 t-CO_2 in fiscal 1997; 805,000 t-CO_2 in fiscal 1998; 768,000 tCO_2 in fiscal 1999; and 700,000 tCO_2 in fiscal 2000. It is forecasting emissions of 737,000 t-CO_2 in fiscal 2005 and 675,000 t-CO_2 in fiscal 2010, 77% and 79% less, respectively, than in fiscal 1990.

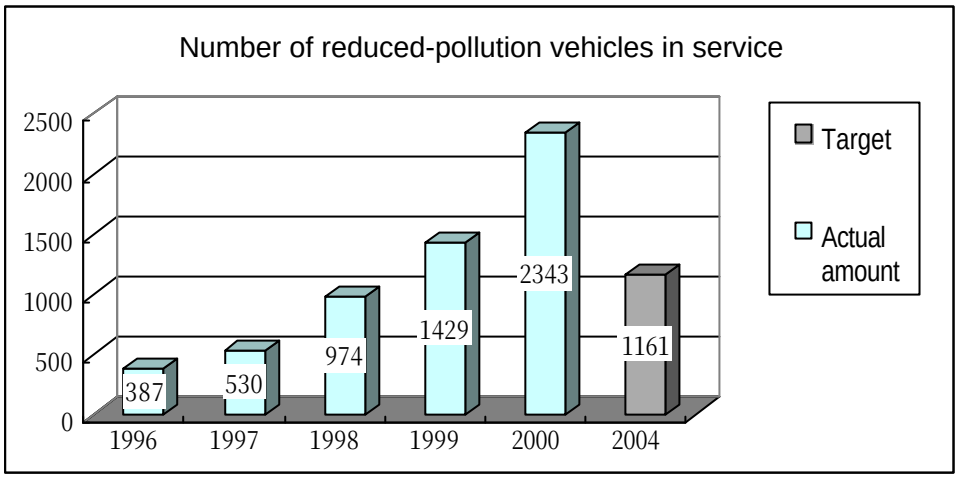
Total emissions of greenhouse gases, combining CO_2 equivalents of methane gas and of CO_2 emissions from energy consumption, were: 3.746 million t-CO_2 in fiscal 1990; 1.641 million tCO_2 in fiscal 1995; 1.121 million t-CO_2 in fiscal 1997; 988,000 tCO_2 in fiscal 1998; 950,000 tCO_2 in fiscal 1999; and 881,000 tCO_2 in fiscal 2000. Although emissions of greenhouse gases from energy consumption remained more or less unchanged year-to-year in fiscal 2000, they declined in total as a result of reductions in methane gas generated inside shafts. The industry is forecasting greenhouse gas emissions of 915,000 t-CO_2 in fiscal 2005 and 835,000 t-CO_2 in fiscal 2010, 76% and 78% less, respectively, than in fiscal 1990. Moreover, were the voluntary action plan not executed, the industry forecasts that greenhouse gases (in terms of equivalent units of CO_2) in 2010 would be 942,000 t-CO_2, 75% less than in fiscal 1990.

Note: The principal product of this industry is coal. Two major mines participated in this follow-up survey, representing a coverage ratio for energy consumed by the industry of 100%. Compared to the 21 mines that were in operation as of the end of fiscal 1990, only 13 were in production as of the end of fiscal 2000. Moreover, between fiscal 1990 and fiscal 2000, the number of major mines declined from six to two. The industry is forecasting annual production of 3.1 million tons for the period between fiscal 2005 and fiscal 2010. CO_2 emission amounts represent the totals of the figures provided by the participating companies.

Japan Trucking Association

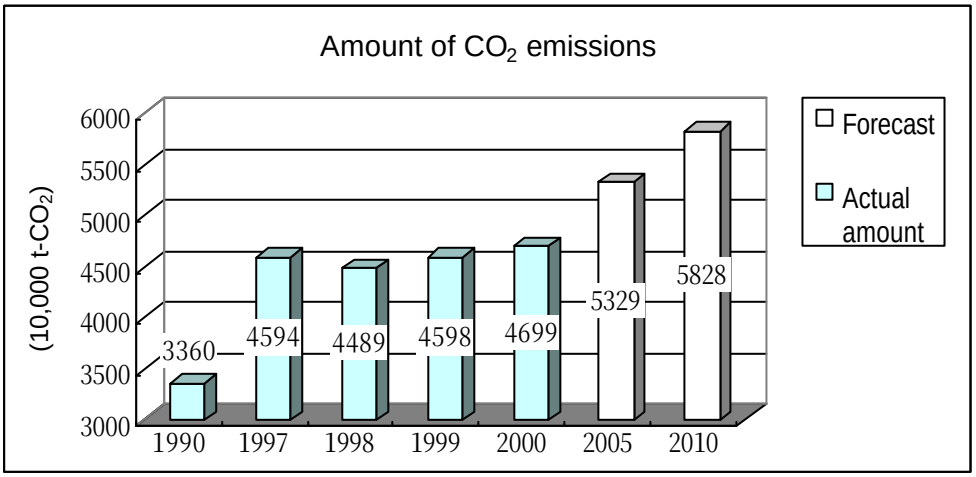
Target: By 2004, increase the number of reduced-pollution vehicles in service to a level three times that of 1996.

1. Degree of progress toward goal



Note: Numbers are as of the end of March of each year.

2. Amount of CO_2 emissions



The number of reduced-pollution vehicles (methanol, hybrid-engine, or compressed natural gas vehicles) operated by the trucking industry was 387 vehicles in 1996, 530 vehicles in 1997, 974 vehicles in 1998, 1,429 vehicles in 1999, and 2,343 vehicles in 2000. The industry's target for 2004 is to operate three times the number of reduced-pollution vehicles in service in 1996.

The industry has emitted the following amounts of CO_2: 33.603 million t-CO_2 in fiscal 1990; 45.941 million t-CO_2 in fiscal 1997; 44.891 million t-CO_2 in fiscal 1998; 45.985 million tCO_2 in fiscal 1999, and 46.991 million tCO_2 in fiscal 2000. It is forecasting emissions of 53.292 million t-CO_2 in fiscal 2005 and 58.279 million t-CO_2 in fiscal 2010, 59% and 73% more, respectively, than in fiscal 1990.

3. Measures undertaken to achieve goals

- Major undertakings
  - Propagation of environmentally friendly driving
  - Active encouragement of drivers to turn off engines during long vehicle stops
  - Promotion of use of reduced-pollution vehicles
  - Promotion of conversion to vehicles that comply with the latest environmental regulations
  - Measures to reduce black smoke and particulate matter
  - Improvement of efficiency of transportation operations
  - Measures against noise
  - Promotion of proper disposal of waste and recycling
  - Other environmental conservation measures
  - Measures for increasing environmental awareness
  - Appealing activity

4. Factors accounting for increases or decreases in CO2 emissions in fiscal 1990–2000

As there is concern that the economic situation of the trucking industry will worsen, fiscal 2000 efforts to switch from large commercial trucks to trailers and from 20-ton trucks to 25-ton trucks did not greatly advance as expected in comparison to fiscal 1999.

6. Other efforts to deal with global warming

In order to expand trucking operations while retaining a symbiosis with society, the industry is actively pursuing the goals of the Basic Action Plan of Environment that it voluntarily initiated in February 2001.

7. Environmental management; environmental conservation in overseas business activities

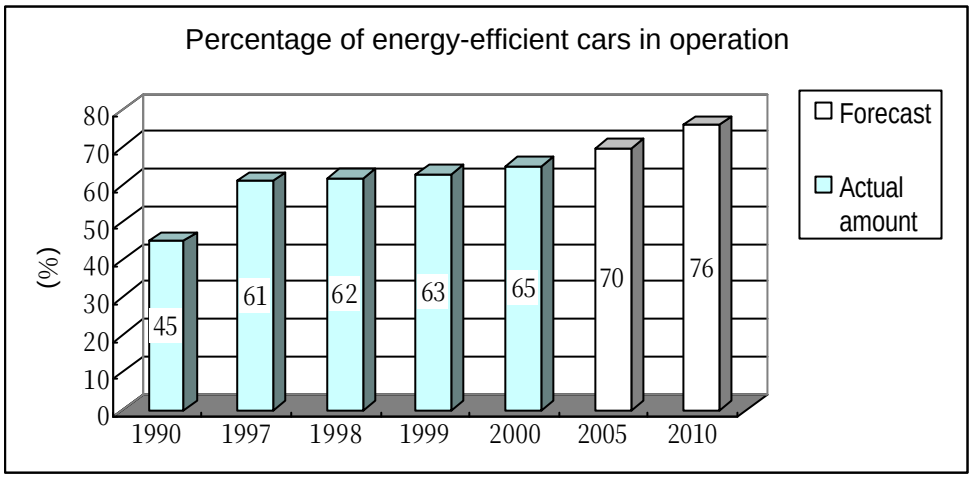
- Tracking the implementation status of the BEPA.
- Review and adjustment of numeric targets in response to progress of BEPA.
- The association reassesses the elements of the BEPA and considers modification of its decisions in response to sudden changes in the industry; for the time being, however, the association plans to continue with original plan.

Note: The principal service of this industry is the transportation of cargo by trucks. CO_2 emission amounts were calculated using the figures on commercial truck diesel oil consumption in the automobile fuel consumption statistics of the Ministry of Land, Infrastructure and Transport's Summary of Overland Transport Statistics. The forecast for emissions in 2010 is based on the same amount of fuel consumption (diesel oil for commercial trucks) as that of fiscal 1996, with the assumption that measures against nitrous oxides and measures for conversion to reduced-pollution vehicles will be advanced. Presently, it is very difficult to forecast the number of vehicles that will be operated by the industry in 2005 and 2010, as it is expected that there will be abrupt changes in the number of vehicles owned by trucking companies as a result of the impact of the Revised Law on Nitrous Oxides and Particulate Matter and the anti-particulate matter measures to be undertaken by the Tokyo metropolitan government and other governments.

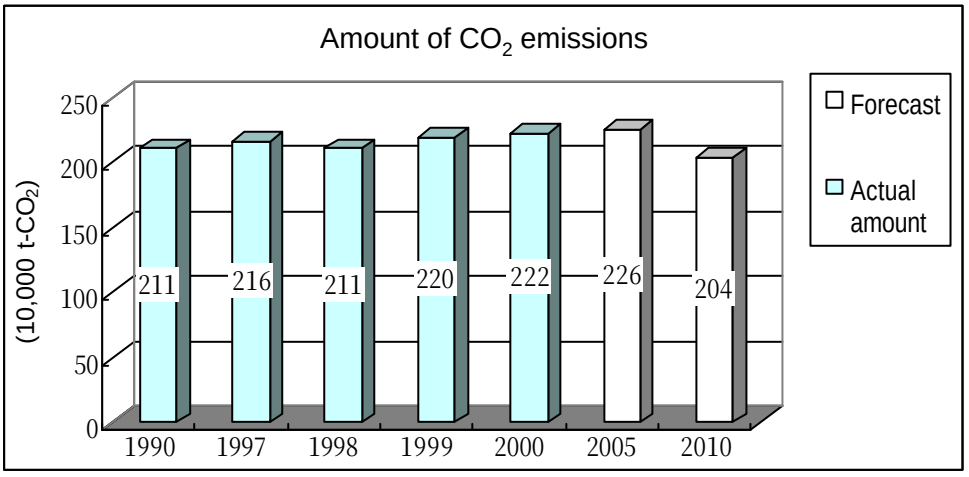
Japan Non-Government Railways Association

Target: The industry forecasts that energy-efficient cars as a percentage of total cars in operation will increase from 45% in fiscal 1990 to 76% in fiscal 2010, resulting in a 7% decline in the amount of energy consumed in fiscal 2010 compared to fiscal 1990.

1. Degree of progress toward goal



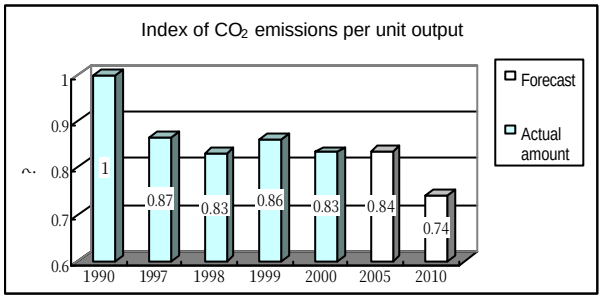
2. Amount of CO_2 emissions

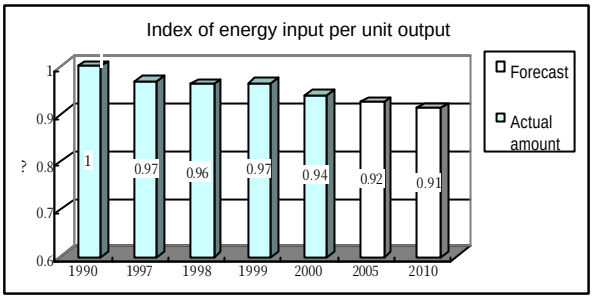


The percentage of energy-efficient cars in operation was 45% in fiscal 1990, 61% in fiscal 1997, 62% in fiscal 1998, 63% in fiscal 1999, and 65% in fiscal 2000. The private railways industry is forecasting an increase in this percentage to 70% in fiscal 2005 and 76% in fiscal 2010, and toward this end is endeavoring to introduce energy-efficient cars whenever rolling stock is increased or renewed.

The industry has emitted the following amounts of CO_2: 2.11 million t-CO_2 in fiscal 1990; 2.16 million t-CO_2 in fiscal 1997; 2.11 million t-CO_2 in fiscal 1998; 2.20 million t-CO_2 in fiscal 1999, and 2.22 million t-CO_2 in fiscal 2000. It is forecasting emissions of 2.26 million t-CO_2 in fiscal 2005 and 2.04 million t-CO_2 in fiscal 2010, 7% more and 3% less, respectively, than in fiscal 1990.

5. Reference data





Input-output indices assume a value of 1 for emissions generated or energy used in fiscal 1990.

Assuming a value of 1 for emissions in fiscal 1990, the index of CO_2 emissions per unit of output stood at 0.87 in fiscal 1997, 0.83 in fiscal 1998, 0.86 in fiscal 1999, and 0.83 in fiscal 2000. The industry is forecasting index values of 0.84 for fiscal 2005 and 0.74 for fiscal 2010.

Assuming a value of 1 for energy consumed in fiscal 1990, the index of energy consumption per unit of output stood at 0.97 in fiscal 1997, 0.96 in fiscal 1998, 0.97 in fiscal 1999, and 0.94 in fiscal 2000. The industry is forecasting index values of 0.92 for fiscal 2005 and 0.91 for fiscal 2010.

Note: The Japan Non-Government Railways Association carries out activities aimed at promoting increases in transportation capacity and improved transportation safety, and at fostering the healthy development of the railroad business. The percentage of companies participating in the current follow-up survey was 83% (60 that operate electrical railways out of a total of 72 member companies).