Results of the 5th Follow-up to the Keidanren Voluntary Action Plan on the Environment

(Measures Against Global Warming; Industry-Specific Reports)

December 16, 2002
Japan Business Federation (Nippon Keidanren)

Guide to Reading Sections on Specific Industries

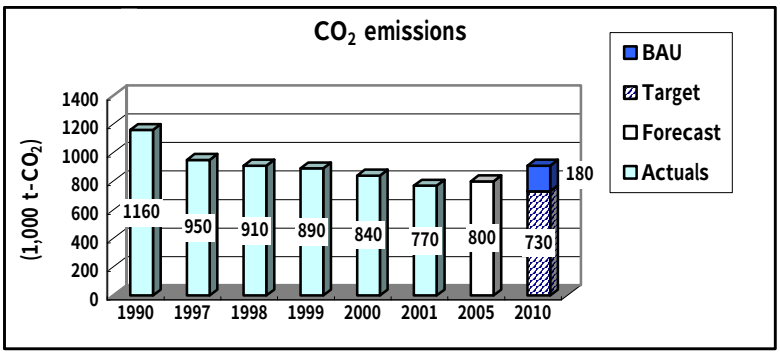
Industry Body

Target

1. Progress toward target

→ Graphical representation is given of progress being made by the industry toward its declared target. Where there are multiple targets, progress is depicted separately for each.

*BAU = increase in carbon dioxide emissions, energy consumption, carbon dioxide emissions intensity, or energy intensity expected in fiscal 2010, if fiscal 2002 Action Plans are not implemented.



If no measures are taken, carbon dioxide emissions in 2010 will reach 910,000 t-CO_2, or 180,000 t-CO_2 more than the target if measures are implemented.

2. Carbon dioxide emissions

→ Graphical representation of carbon dioxide emissions in each industry is given. For industries that have defined their targets in terms of carbon dioxide emissions, the graphs appear under "Progress toward target," rather than here.

3. Steps taken to achieve targets

●Major

→ Major initiatives implemented in each industry Action Plan to be undertaken to achieve targets are described.

●Fiscal 2001 actual

→ Measures taken against global warming in fiscal 2001, the investment cost, and impact on carbon dioxide emissions are described.

4. Factors accounting for increases or decreases between fiscal 1990 and 2001

→ Major factors accounting for increases or decreases in carbon dioxide emissions in fiscal 2001 compared with fiscal 1990 are described.

5. Reference data

→ Data other than the foregoing is given, disclosed by industry.

6. Other global warming initiatives

●Emissions from offices and in-house distribution

→ Carbon dioxide emissions associated with activities other than core businesses are described, such as the use of head or branch offices, or on-site transport or other in-house distribution activities.

●Contributions to the consumer goods and transport sectors (impact on products and services)

→ Specific examples are given of initiatives that are contributing to reduced carbon dioxide emissions in the consumer goods and transport sectors.

●Greenhouse gases other than carbon dioxide

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

●Kyoto Mechanism projects

→ Examples of Activities Implemented Jointly (AIJ), Joint Implementation (JI), Clean Development Mechanism (CDM), and other activities that comply with the Kyoto Mechanism are given.

7. Environmental management and conservation in overseas business activities

→ Updates on ISO14001 certification and international environmental conservation activities are given.

Footnotes:

→ Where necessary, information includes: basic industry data (principal products, percentage of companies participating in survey), assumptions underlying fiscal 2010 targets and forecasts, and industry-specific methods for estimating carbon dioxide emissions (use of the demand-end figure rather than the power generation-end figure for carbon dioxide emission intensity for electricity, etc.).

Contents

- **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: Transport Sector**

{Carbon dioxide emission levels}

{Carbon dioxide emissions intensity}

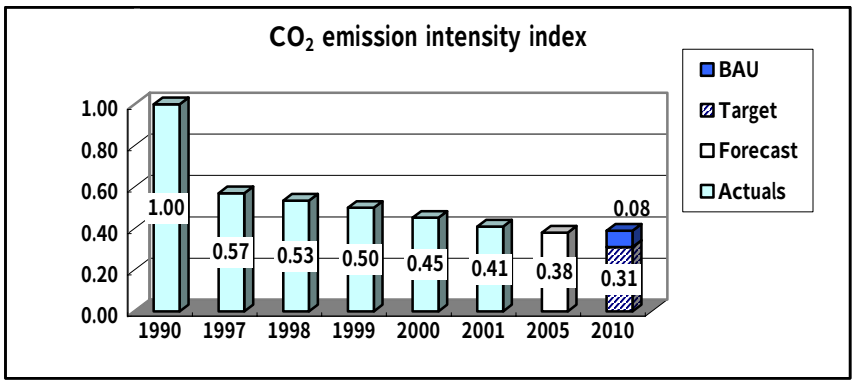
{Energy consumption}

{Energy intensity}

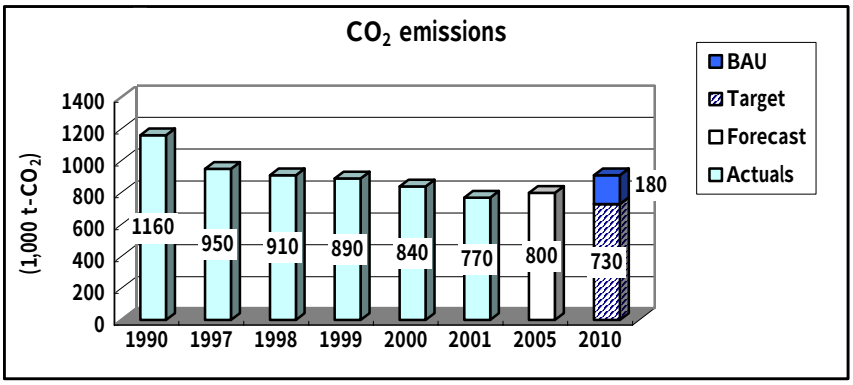
The Japan Gas Association

To reduce carbon dioxide emission in fiscal 2010 to 730,000 t-CO_2 from 1.16 million t-CO_2 in fiscal 1990. To be accomplished by reducing carbon dioxide emission intensity per cubic meter of gas in city gas manufacturing and distribution to one-third of fiscal 1990 levels.

1. Progress toward target



Note: A value of one (1) has been assigned to the fiscal 1990 intensity index.



Note: Emissions are the figures from manufacture and distribution of city gas.

Assigning a value of one (1) to the carbon dioxide emission intensity index for city gas manufacturing and distribution in fiscal 1990 gives: 0.57 in fiscal 1997; 0.53 in fiscal 1998; 0.50 in fiscal 1999; 0.45 in fiscal 2000; and 0.41 in fiscal 2001. The industry is forecasting an index of 0.38 in fiscal 2005, and has established a target of 0.31 for fiscal 2010. It has recorded the following carbon dioxide emissions: 1.16 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; 840,000 t-CO_2 in fiscal 2000; and 770,000 t-CO_2 in fiscal 2001—a 34% reduction on fiscal 1990 levels. As the trend indicates, the industry is on track to achieving its fiscal 2010 target. The Japan Gas Association is forecasting emissions of 800,000 t-CO_2 in fiscal 2005, a 31 percent decline compared with fiscal 1990, and from there aims to reduce emissions to 730,000 t-CO_2 in fiscal 2010—37 percent less than the level in fiscal 1990.

If voluntary action plans were not implemented in the years following fiscal 2001, the

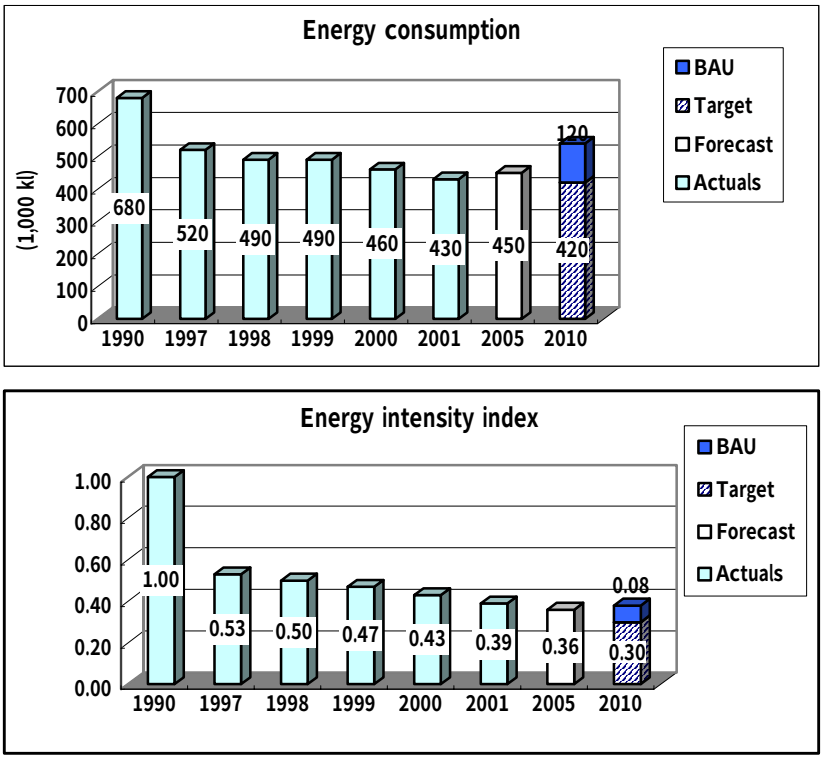
industry forecasts that carbon dioxide emissions would be 910,000 t-CO_2 in fiscal 2010, or 19 percent more than in fiscal 2001, and 22 percent less than in fiscal 1990.

3. Steps taken to achieve goals

- Major
  - City gas manufacturing was made more efficient by converting to high-calorific gas produced from natural gas.
  - Less heating fuel was used by adopting highly efficient LNG (liquefied natural gas) gasification facilities in place of reforming facilities, which burn naphtha or LPG to fuel reactions at high temperatures.
  - Various energy-conserving measures were implemented at city gas manufacturing plants.

- Fiscal 2001 actual
  - City gas manufacturing was made more efficient by converting to high-calorific gas produced from natural gas.
  - A number of energy-saving initiatives were undertaken, including improvements in the use of LNG cryogenic energy at city gas manufacturing plants, progress in achieving energy-saving operation, and the introduction of energy-efficient equipment.

5. Reference data



Note: A value of one (1) has been assigned to the intensity index of fiscal 1990.

Actual energy consumption (in crude oil equivalents) was: 680,000 kl in fiscal 1990; 520,000 kl in fiscal 1997; 490,000 kl in fiscal 1998; 490,000 kl in fiscal 1999; 460,000 kl in fiscal 2000; and 430,000 kl in 2001. The industry is forecasting consumption of 450,000 kl in fiscal 2005, and 420,000 kl in fiscal 2010; reductions of 34 percent and 39 percent respectively on fiscal 1990. If voluntary action plans were not implemented, energy consumption in 2010 would be 530,000 kl, a 22 percent reduction on fiscal 1990. Finally, assigning a value of one (1) to the fiscal 1990 energy intensity index gives: 0.53 in fiscal 1997; 0.50 in fiscal 1998; 0.47 in fiscal 1999; 0.43 in fiscal 2000; and 0.39 in fiscal 2001. The industry is forecasting indexes of 0.36 and 0.30 in fiscal 2005 and 2010, respectively.

6. Other global warming initiatives

- Emissions from offices and in-house distribution

  In the 1999, 2000, and 2001 fiscal years, the industry emitted 110,000 t-CO_2 per year from its offices and other locations. In these fiscal years, it also emitted 10,000 t-CO_2 per year from activities related to in-house distribution.

- Contributions to the consumer goods and transport sectors (impact on products and services)
  - The take-up of energy-efficient gas equipment such as latent heat recovering hot water heaters and internal flame gas tables was encouraged.
  - Carbon dioxide emissions were reduced through greater use of cogeneration and dispersed power sources, such as fuel cells.
  - Emission of atmospheric pollutants was reduced through greater use of vehicles powered by natural gas.
  - Environmental education activities included eco-cooking, support for environmental studies in schools, and activities to promote the environment in regional areas.

- Kyoto Mechanism projects
  - Plantation projects in Australia
  - The NEDO 2002 Basic Survey for Joint Implementation Project
  - A joint initiative with the Indonesian government to use VA mycorrhiza fungi in conservation of the global environment; the Project for the Practical Application of Afforestation Technology in Tropical Wastelands

7. Environmental management and conservation in overseas business activities

- Seventeen firms obtained ISO14001 certification. The amount of gas manufactured at facilities operated by these firms accounted for approximately 85 percent of all gas manufactured nationwide.
- Companies are transferring technology to combat global warming and other environmental problems, primarily to developing nations. Examples include:

a. A study concerning a project in the Philippines for a centralized district cooling and power supply system, and a feasibility study for a project to convert vehicles in the Manila Metropolitan Area to compressed natural gas (CNG)
b. Transfer of technology relating to a catalytic wet oxidation process to the Yunnan High Technology Environment Protection Engineering Company in Yunnan Province, China

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Note 1: The principal product of the industry is city gas, and 100% of member companies (233) participated in the follow-up survey. Carbon dioxide emissions from offices and transport are a summation of figures provided by three main firms (accounting for 75 percent of gas sold nationwide).

Note 2: In calculating carbon dioxide emissions from the purchase of electricity, the industry has used demand-end figures.

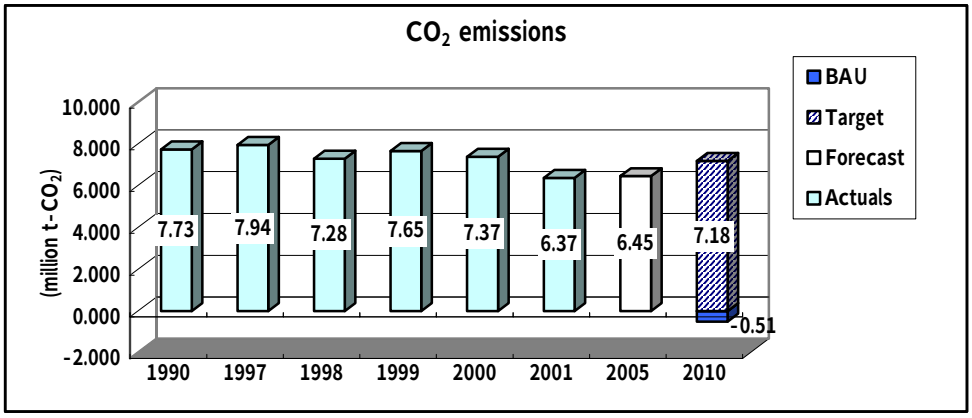
Note 3: Emissions in fiscal 2010 on a business-as-usual (BAU) basis if efforts were not made in the years following fiscal 2001 to reduce carbon dioxide were calculated by multiplying actual fiscal 2001 carbon dioxide emissions by the ratio of gas to be manufactured in fiscal 2010 to that manufactured in fiscal 2001. The difference in carbon dioxide emissions resulting from differences between the target amount of electricity purchased and BAU electricity purchased was calculated using the average thermal power coefficient

Note 4: City gas manufactured in fiscal 2001 totaled 25.7 billion m^3 (equivalent to 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 (32.0 billion m^3, based on forecasts of long-term energy demand).

Japan Auto Parts Industries Association

To reduce carbon dioxide emissions by 7% by fiscal 2010, compared with fiscal 1990 levels.

1. Progress toward target



Association member companies have emitted the following amounts of carbon dioxide: 7.73 million t-CO_2 in fiscal 1990; 7.94 million t-CO_2 in fiscal 1997; 7.28 million t-CO_2 in fiscal 1998; 7.65 million t-CO_2 in fiscal 1999; 7.37 million t-CO_2 in fiscal 2000; and 6.37 million t-CO_2 in fiscal 2001. It is forecasting emissions of 6.45 million t-CO_2 in fiscal 2005—a 17% decline compared with fiscal 1990. Association member companies are aiming for a 7% reduction in emissions in fiscal 2010 compared with fiscal 1990. If voluntary action plans were not implemented, the forecast for carbon dioxide emissions in fiscal 2010 would be 6.68 million t-CO_2, 14% lower than in fiscal 1990.

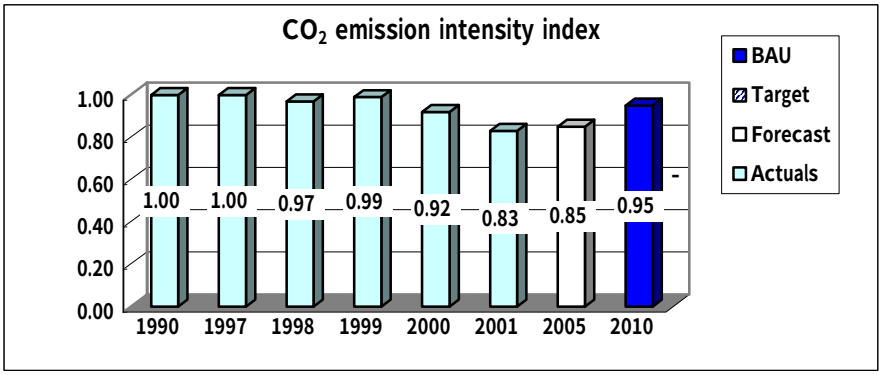
3. Steps taken to achieve goals

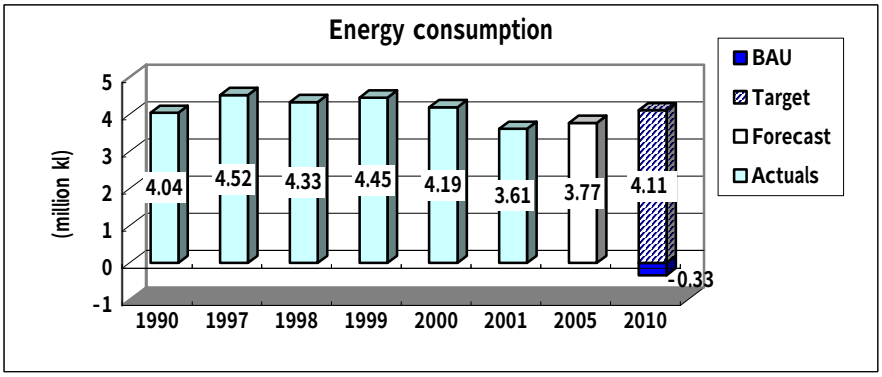
- Major
  - Methods of operation have been improved, including ending the practice of keeping machinery on during production downtime.
  - Equipment and machinery efficiency has been improved.
  - Processes have been rationalized.
  - Cogeneration and other approaches are being used to recover energy in the form of steam created from the combustion of fuels, for use in heating.
  - Industry members are engaging in mutual awareness-raising and sharing of information relating to energy-saving technologies.

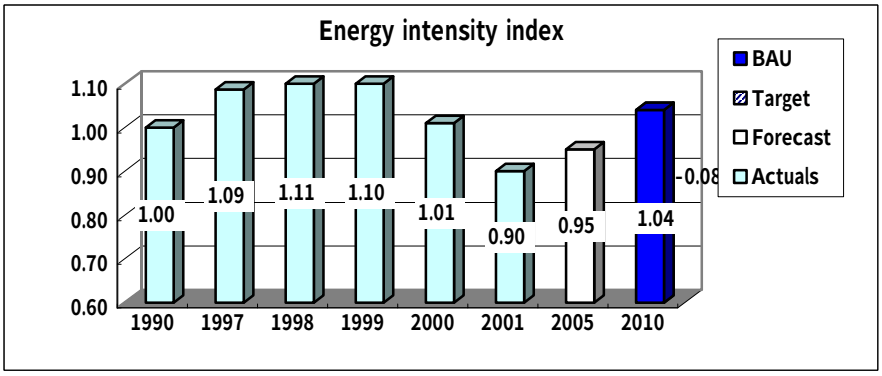
- Fiscal 2001 actual

The auto parts industry manufactures a diverse range of products, and their manufacturing processes are all dissimilar. It is therefore difficult to obtain a unified picture of the estimated value of investment and the actual effect of energy conservation examples. The Association has, however, surveyed its members to determine the status of a range of initiatives, asking questions about some 60 categories of energy-conservation initiatives. These fall under the headings of daily management, management of plant and equipment operation, production process improvements, introduction of energy-conserving equipment, heat source and fuel conversion, and heat recovery. The Association is also encouraging energy-conserving activity by sharing related information among its members.

5. Reference data







Assigning a value of one (1) to the fiscal 1990 carbon dioxide emission intensity index gives 1.00 in fiscal 1997, 0.97 in fiscal 1998, 0.99 in fiscal 1999, 0.92 in fiscal 2000, and 0.83 in 2001. Association member companies are forecasting indices of 0.85 in fiscal 2005, and 0.95 in fiscal 2010.

Association member companies have recorded the following energy consumption figures: 4.04 million kl in fiscal 1990; 4.52 million kl in fiscal 1997; 4.33 million kl in fiscal 1998; 4.45 million kl in fiscal 1999; 4.19 million kl in fiscal 2000; and 3.61 million kl in fiscal 2001. It is forecasting consumption of 3.77 million kl in fiscal 2005, and 4.11 million kl in fiscal 2010—levels that are respectively 6.5% lower and 0.2% higher than those of fiscal 1990. If voluntary action plans were not implemented, energy consumption in fiscal 2010 would be 3.78 million kl, or a 6.3% decrease over fiscal 1990.

Assigning a value of one (1) to the fiscal 1990 energy intensity index gives 1.09 in fiscal 1997, 1.11 in fiscal 1998, 1.10 in fiscal 1999, 1.01 in fiscal 2000, and 0.90 in fiscal 2001. The industry is forecasting indices of 0.95 in fiscal 2005, and 1.04 in fiscal 2010.

6. Other global warming initiatives

● Emissions from offices and in-house distribution

Carbon dioxide emissions associated with the use of offices in 2001 were approximately 50,000 t-CO_2, while emissions associated with in-house distribution were approximately 110,000 t-CO_2. (Traditionally both emission amounts were included in the totals for energy associated with business activities, but starting with the current follow-up, the data will now be collected by individual sector. Only half of the respondent companies, however, gave their answers by individual area.) Initiatives to limit carbon dioxide emissions associated with office use included optimizing air conditioner operation, turning off unused lighting, limiting the use of cooling and heating units, and limiting the use of office automation. Initiatives in the area of in-house distribution included more efficient distribution systems, better management of corporate fleet vehicles, and limits on the use of private vehicles for commuting.

● Contributions to the consumer goods and transport sectors (impact on products and services)

Developments such as greater use of magnesium in auto parts, conversion to aluminum die-casting, modular vehicle components, and reductions in the number of component parts have resulted in between 10% and 30% reductions in the weight of parts, which in turn contributes to improved vehicular fuel efficiency.

● Greenhouse gases other than carbon dioxide

CFC12HFC134a: In relation to the recovery and destruction of car air conditioning coolants, the Association has made use of systems developed by Japan Automobile Recycling Promotion Center, and is cooperating in the business of recovery and destruction.

7. Environmental management and conservation in overseas business activities

The Association is encouraging efforts by all members, including small and medium-sized enterprises, to acquire ISO14001 certification by providing guidance in relation to “green” procurement. The Association continues to offer consultancy regarding certification, and to provide support in the training of internal auditors.

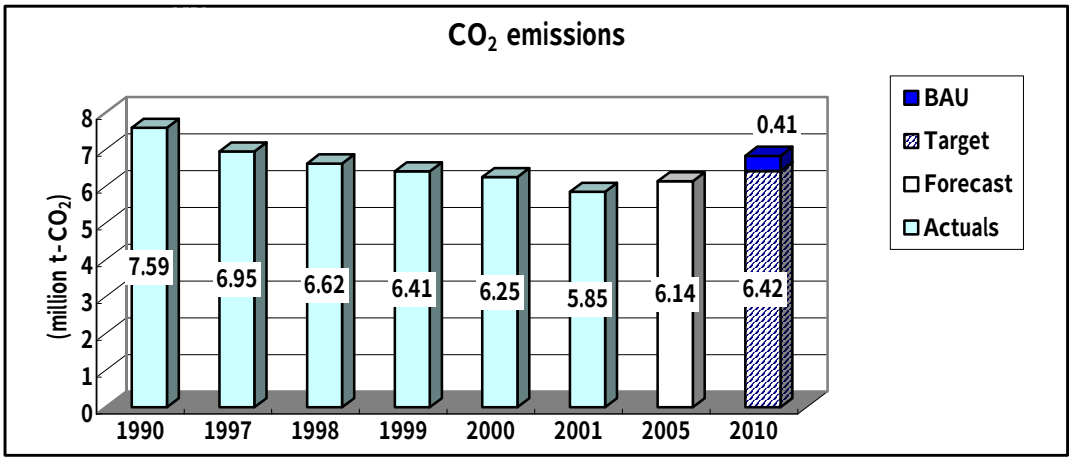
Member companies have voluntarily taken environmental conservation initiatives in the context of overseas business activities.

Note: The principal product of the industry is automobile parts (excluding tires, batteries, and window glass). The participation rate by industry member companies in the follow-up survey was 28.6% (127 out of 443), representing approximately 61.5% of the energy consumed by the industry. Based on the outlook for the value of production through fiscal 2005, the industry has assumed that the value of shipments of auto parts in fiscal 2010 (including exports and overseas production) will remain generally steady, at just over ¥13 trillion. Carbon dioxide emissions were derived from the data provided by the 127 companies that responded to the Association’s questionnaire. Carbon dioxide emissions for all member companies were extrapolated from the proportion of the total value of shipments for all member companies accounted for by respondent companies.

Japan Automobile Manufacturers Association

To reduce total carbon dioxide emissions from automobile production plants operated by the 13 member companies of the Japan Automobile Manufacturers Association* to 90% of fiscal 1990 levels by fiscal 2010.

1. Progress toward target



Carbon dioxide emissions from the automobile manufacturing process* were: 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; 6.25 million t-CO_2 in fiscal 2000; and 5.85 million t-CO_2 in fiscal 2001. As of fiscal 2001, the forecast for carbon dioxide emissions, should there be no new initiatives or changes in the makeup of new products, is 6.14 million t-CO_2 in fiscal 2005, and 6.42 million t-CO_2 in fiscal 2010. The target for fiscal 2010 is 6.83 million t-CO_2—10% less than in fiscal 1990.

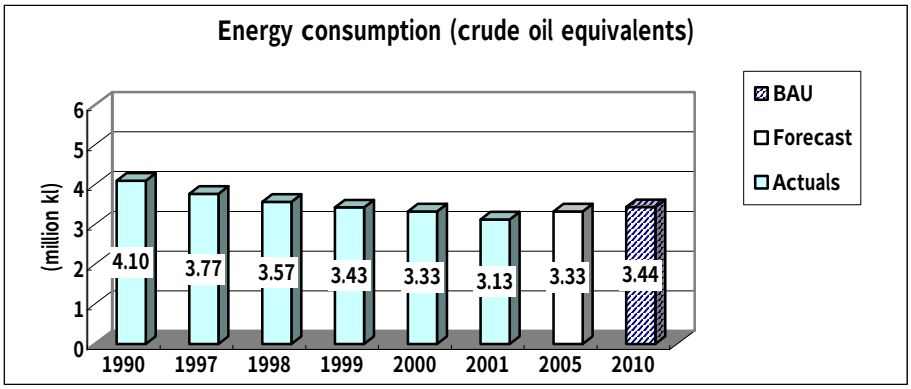
3. Steps taken to achieve goals

- Major
  - Energy conservation measures continue to be applied to all phases of production (specifically, energy supply and energy-consuming equipment).
  - Operation and control technology has been made more sophisticated (energy use is fine-tuned to production volumes).
  - Efficiencies have been achieved in materials handling through the use of lighter materials, and reductions in machining and trimming.

- Fiscal 2001 actual

Initiatives taken		Reductions (crude oil equiv.)
1. Plant and equipment	(1) Improvements in supply side	18,000 kl
	(2) Improvements in consumption side	10,000 kl
2. Improved productivity	(1) Improvements in operational management	8,000 kl
	(2) Scrapping and amalgamating production lines	51,000 kl
3. Fuel conversion		4,000 kl

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; 3.33 million kl in fiscal 2000; and 3.13 million kl in fiscal 2001. BAU for fiscal 2010 is 3.44 million kl.

6. Other global warming initiatives

- Contributions to the transport and consumer goods sectors (impact on products and services)

The industry is seeking to increase automobile fuel efficiency. It is also seeking to develop the technology for, increase the choice of models, and encourage the acceptance of clean-energy vehicles, as well as to improve traffic flow by becoming proactive about Intelligent Transport Systems. In line with the government's carbon dioxide reduction target (for 2010), the industry is contributing to improvements in vehicle fuel efficiency by working toward early introduction of vehicles that meet the fuel consumption standards defined in the revised Law concerning the Rational Use of Energy.

- Greenhouse gases other than carbon dioxide
  - Operation of systems to recover and break down designated chlorofluorocarbons (CFC12)

To protect the ozone layer and slow global warming, the industry acted promptly to convert from CFC12 as the coolant for car air conditioning systems to HFC134a. In cooperation with its associated auto parts, sales, and service industries, since 1998 the automobile industry has operated an integrated system that enables it to recover and break down CFC12 from scrapped automobiles. By June 2002, the industry had processed approximately 407 tons of CFC12.

- Curbing emissions of HFC134a
  HFC134a, the coolant now used in car air conditioners, has one-sixth the impact on global warming of CFC12. Additional initiatives to decrease the amount of coolant used and leakage, as well as to improve refilling methods, are considered to have further reduced the global warming effects of HFC134a over its lifespan, including when it is in use, to around one-fifteenth that of CFC12. The steps being taken to limit HFC134a emissions are as follows:
  (1) Development and introduction of coolant-conserving air conditioners,
  (2) Research into air conditioning systems that do not use HFC134a, and
  (3) Configuration and operation of systems to recover and break down HFC134a.

7. Environmental management and conservation in overseas business activities

In obtaining ISO14001 certification, Japan's automobile manufacturers are configuring systems that are more environmentally responsible. The industry is also conducting surveys with the objective of improving urban environments in a number of Asian countries.

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*1 Some 100% of industry members participated in the follow-up survey (13 companies with domestic production facilities), representing 100% of the energy consumed in the motor vehicle manufacturing process.

*2 The principal products of the industry are 4- and 2-wheel vehicles, and KD parts.

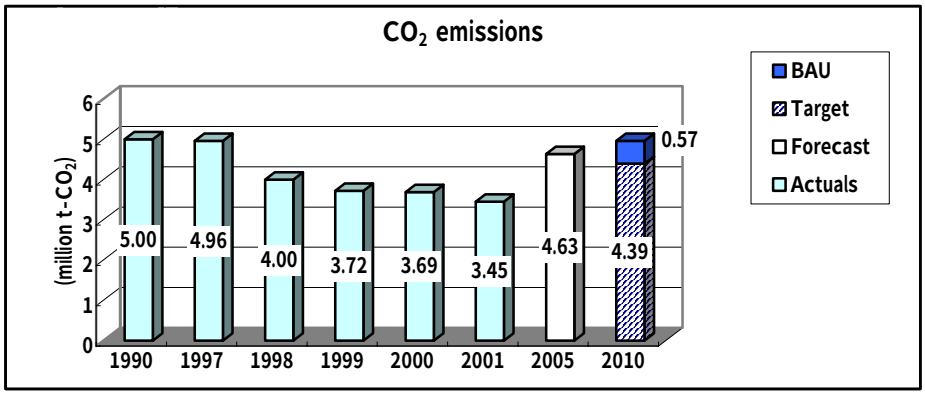
*3 Forecasts for fiscal 2010 assume the value of production will be at a similar level as that in fiscal 1990.

*4 The carbon dioxide coefficient for electricity has been fixed at the fiscal 1990 level of 0.104 kg-C/kWh, and carbon dioxide emissions were calculated from data aggregated from the plants for manufacturing 4- and 2-wheel vehicles and their parts, owned by the 13 member companies.

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

To endeavor to reduce the carbon dioxide generated during construction (on-site work) by 12% of the fiscal 1990 base year level by fiscal 2010.

1. Progress toward target



The construction industry has recorded the following carbon dioxide emissions: 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; 3.72 million t-CO_2 in fiscal 1999; and 3.69 million t-CO_2 in fiscal 2000. The trend is downward from fiscal 1990. Emissions in fiscal 2001 were 3.45 million t-CO_2. The decline in emissions was more the effect of an industry-wide fall in construction activity due to a decline in private capital investment, and cutbacks in public works spending, than it was due to industry's efforts, ongoing from last year, to reduce emissions.

The forecast for fiscal 2005 is for 4.63 million t-CO_2—7% less than in fiscal 1990. The target for fiscal 2010 is 4.63 million t-CO_2, a 12% reduction on 1990 levels. If voluntary action plans were not implemented, carbon dioxide emissions in fiscal 2010 would be 4.63 million t-CO_2, or 1% less than in fiscal 1990.

3. Steps taken to achieve target

- Major
  - Engines are turned off rather than idled.
  - The amount of dirt transported from construction sites has been reduced.
  - Residual dirt from construction sites is recycled.
  - The amount of materials and machinery transported to construction sites has been reduced, and efforts are being made to limit the by-products of construction.
  - Heavy construction vehicles are being properly serviced.
  - There are fewer by-products from construction activity.
  - Lighting is being turned off when not needed.
  - Greater use is being made of efficient on-site electrical equipment.
  - Excessive cooling and heating is being limited.

- Appropriate heating and cooling is being encouraged.
- Appropriate use is being made of heaters at construction sites.
- Drivers and machinery operators are being given training in fuel-efficient operation.

- Fiscal 2000 actual

Of activities designed to reduce carbon dioxide emissions, the 3 construction industry associations have found “Fuel-Efficient Operation Workshops” to be extremely effective in reducing carbon dioxide, and therefore convened 2 for dump truck operators and 1 for hydraulic shovel operators. The objective of the workshops was to give participants hands-on experience of the effectiveness of such measures, and to train workshop leaders in member companies, capable of ‘spreading the word’ to the industry in general. The reductions achieved were as follows.

Dump trucks

The two workshops each resulted in an average reduction of 20% to 30%.

Hydraulic shovels (back hoe)

Reductions of approximately 6% at the time of shovelling and 12% while driving were achieved.

6. Other global warming initiatives

- Emissions from offices and in-house distribution (from questionnaire responses)
  - Lights are being firmly switched off during non-working times.
  - It has been possible to switch off unnecessary lighting through efficient use of office floors.
  - Air conditioners are being operated efficiently, and energy-efficient equipment has been introduced.
  - The engines of fleet vehicles are turned off rather than idled.
  - Fuel-efficient vehicles are being introduced, or used as a priority.

- Contributions to the consumer goods and transport sectors (impact on products and services) (from questionnaire responses)
  - Initiatives have been undertaken to reduce gas emissions by converting from traditional dump trucks to conveyor belts for transport excavation waste from tunneling works.
  - Buildings have been designed to be energy-conserving, and targets have been established for the insulation performance of external building cladding and the efficiency of air conditioning and lighting systems that exceed legal requirements. Carbon dioxide emissions have been reduced from building use in fiscal 2001 design proposals by some 92,000 tons per year in excess of legal requirements.
  - Workshops are being convened in operating methods to reduce carbon dioxide

emissions, 'green' procurement is being encouraged (eg., blast furnace cement and electric arc furnace steel), information systems about soil sources are being operated and maintained to enable transport distances to be cut (reduction of 394,415 t-CO_2), and carbon dioxide during operation through environmentally-responsible design is being implemented (reduction of 23,953 t-CO_2).

- Transport sector supplier partners responsible for the carriage of materials and machinery are practicing a policy at all work sites of turning off engines on vehicles not in use. This has improved fuel consumption by approximately 1%, which represents a reduction of approximately 1,000 tons per year in carbon dioxide equivalents. Effort will continue to be focused on encouraging fuel-conserving driving
- Greening of rooftops has been undertaken in apartment and factory construction. Construction of biotopes has been implemented.

- Greenhouse gases other than carbon dioxide (from questionnaire responses)
  - Freon and halon from building demolition or upgrade are being appropriately treated and recycled. In fiscal 2001, approximately 14 tons of freon and 2 tons of halon were appropriately treated.
  - A 100% recovery of waste freon from demolitions (approx. 15,000 kg) has been achieved. The use of alternatives to freon in the recovery and design stages (alternatives for approx. 24,000 kg) has been encouraged.

  In addition, a growing number of individual member companies have indicated in their environmental reports that they have appropriately treated CFCs banned by the Montreal Protocol—including freon and halon—emitted during demolition and removal, and have also been able to quantitatively determine the amounts treated.

7. Environmental management and conservation in overseas business activities
   - Environmental management systems have been configured (948 operating centers with ISO14000 certification as of September 2002).
   - Questionnaires have been sent to assessment centers, and meetings have been held to enable exchange of views.
   - The environmental awareness reference "Construction Industry Environmental Risk Management" has been published.
   - information has been disseminated through the "Fiscal 2001 Compendium of Environmental Conservation Laws for the Construction Industry."

   Other activities: "Green Procurement Guidelines" and "Environmental Accounting Guidelines for the Construction Industry" have been published.

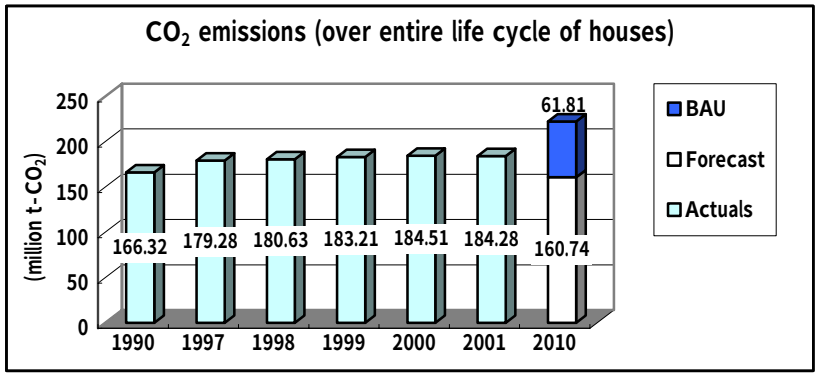
Note: The principal business of the industry is building and civil engineering construction. The participation rate in the follow-up survey was 0.03% (179 companies out of 590,000), representing 29% of construction

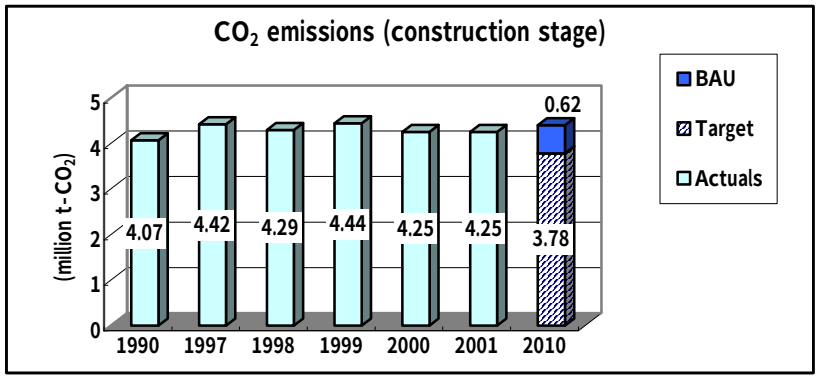
completed. Emission reduction initiatives were implemented over a year in accordance with the carbon dioxide emission reduction manual, and taking the fiscal 1990 carbon dioxide emission intensity as a benchmark, data collected in each category was converted to carbon dioxide reduction intensities using a set formula. The values were then deducted from the benchmark to arrive at the year's carbon dioxide emission intensity. That figure was multiplied by the amount of construction completed in the year, to arrive at an estimate of the year's carbon dioxide emissions. The fiscal 2010 forecast assumes that construction volume will be sustained at fiscal 1996 levels.

Japan Federation of Housing Organizations

To reduce carbon dioxide emissions at each stage of the housing life cycle, and, by fiscal 2010, to stabilize emissions over the entire life cycle of a house at fiscal 1990 levels. The target at the construction stage is to reduce emissions by 7% from fiscal 1990 levels.

1. Progress toward target





The housing industry estimates that carbon dioxide emitted over the entire house life cycle was: 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; 184.51 million t-CO_2 in fiscal 2000; and 184.28 million t-CO_2 in fiscal 2001. The industry forecasts emissions of 160.74 million t-CO_2 in fiscal 2010—a 3.3 percent decline compared with fiscal 1990. If voluntary action plans were not implemented, carbon dioxide emissions in 2010 would be 222.55 million t-CO_2, 34% higher than in fiscal 1990. One initiative in implementing voluntary action plans will be the development of guidelines that incorporate a description of the roles of people involved in the lifecycle of a house, and the points they should note. This information will then be compiled and published as “Environmental Guidelines for Housing”.

The industry estimates that it has emitted the following amounts of carbon dioxide 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; 4.25 million

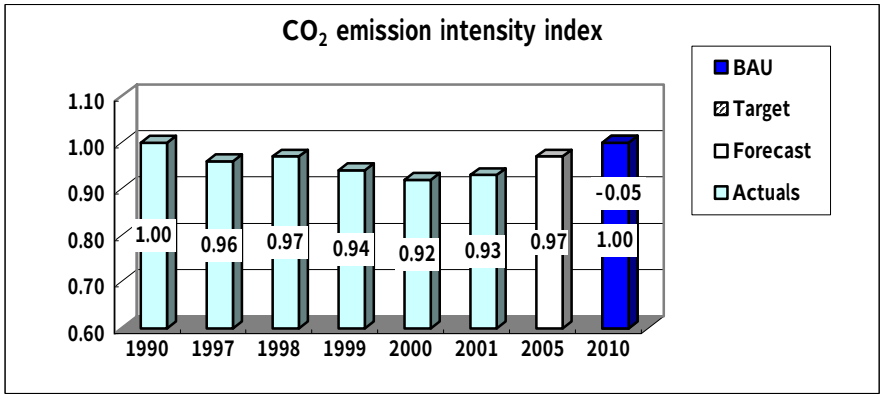
t-CO_2 in fiscal 2000; and 4.25 million t-CO_2 in fiscal 2001. Its goal for fiscal 2010 is 3.78 million t-CO_2—a 7% reduction compared with fiscal 1990. If voluntary action plans were not implemented, emissions in 2010 would be 4.40 million t-CO_2, or 8% more than in fiscal 1990.

Note: The housing life cycle is divided into the stages of materials, construction, use, demolition, recycling, processing, and disposal. The following assumptions are built into the fiscal 2010 forecast. New housing starts will be: an average of 1.46 million per year from fiscal 1990 to 2000; 1.39 million per year from fiscal 2001 to 2005; 1.23 million per year from fiscal 2006 to 2010; and 860,000 per year from fiscal 2011 to 2020. The forecasts also assume that the scale of construction (floor space per dwelling) will sustain the same growth as for the most recent ten-year period (from fiscal 1986 to 1995), during which time floor space increased 1.14 times.

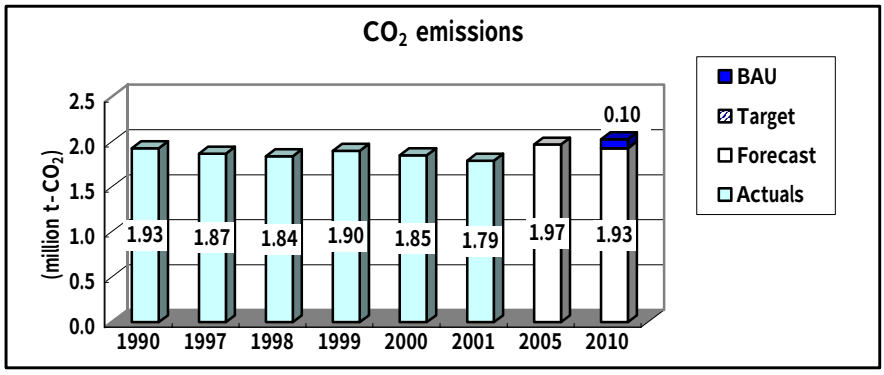
The Japan Rubber Manufacturers Association

For the immediate future, the Association has established the target of maintaining energy intensity and total carbon dioxide emissions at 1990 levels in 2010, and will strive to achieve this goal. This represents a countermeasure to global warming in respect of the reduction of carbon dioxide emanating from fuel and power used in production activities. The Association also intends to apply Life Cycle Assessment (LCA) to future efforts to reduce carbon dioxide.

1. Progress toward target



2. Carbon dioxide emissions



Assigning a value of one (1) to the fiscal 1990 carbon dioxide emission intensity index gives 0.96 in fiscal 1997, 0.97 in fiscal 1998, 0.94 in fiscal 1999, and 0.92 in fiscal 2000. In fiscal 2001 it is 0.93, an increase of 0.01 points on the previous year, and a reduction of 0.07 points on the benchmark year (fiscal 1990).

The industry has emitted the following amounts of carbon dioxide: 1.93 million t-CO_2 in fiscal 1990; 1.87 million t-CO_2 in fiscal 1997; 1.84 million t-CO_2 in fiscal 1998; 1.90 million t-CO_2 in fiscal 1999; and 1.85 million t-CO_2 in fiscal 2000. Carbon dioxide emissions in fiscal 2001 were 1.79 million t-CO_2—a decline of 60,000 t-CO_2 on the previous fiscal year, and a reduction of 140,000 t-CO_2 on the benchmark year (fiscal 1990).

3. Steps taken to achieve goals

- Major steps taken

(i) Steps already taken

a. New and expanded co-generation

- Established new and expanded existing highly efficient co-generation capability by burning city gas

b. Introducing high-efficiency equipment

- Installed highly efficient equipment in the form of fans, motors, and lighting

c. Implemented conventional, basic energy-conserving activities

- Insulated or maintained the heat in heated plants and equipment, prevented leaks, and recovered heat
- Improved operational efficiency by limiting revolutions, operating intermittently, and miniaturizing

d. Greater efficiency through energy conversion

- Improved processes through measures such as the introduction of furnaces burning waste oil and gasified heating furnaces

e. More efficient air conditioning systems

- Introduced ice-storage or absorption refrigerators

f. Other

- Developed low-fuel tires with reduced rolling resistance, based on LCA for tires, in order to achieve a comprehensive reduction in carbon dioxide emissions including in the product usage stage, and conducted a partial product release
- Conducted a review of operating styles across all operating sites, scrapped or amalgamated production processes and plant and equipment, and generally improved production efficiency

(ii) Steps to be taken

a. Continue traditional energy-conserving activities while becoming more proactive

- Continue traditional energy-conserving activities of the type described at (i) above while becoming more proactive

b. Regular information gathering

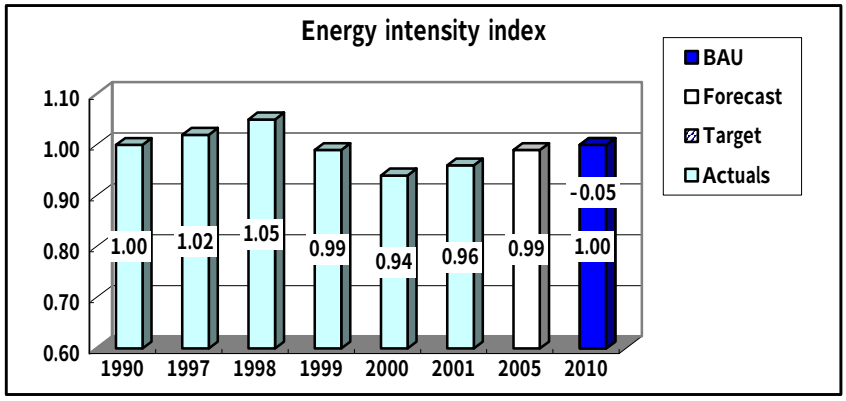
- As part of ongoing traditional activities, gather energy consumption data and examples of energy-conserving initiatives, and apply them to encouraging their uptake and further development within the industry

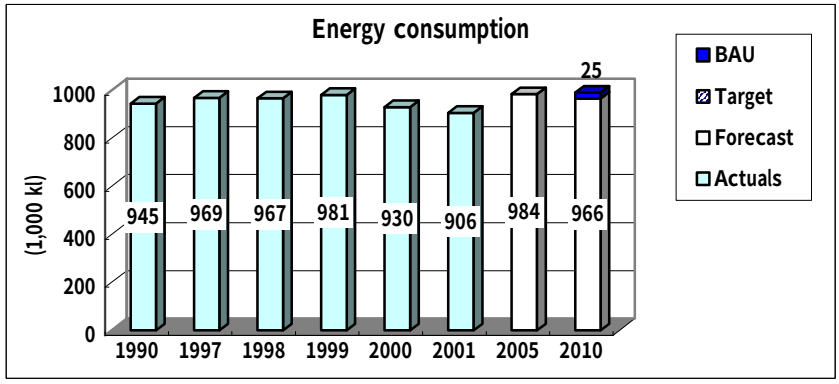
c. Achieve a shift in fuel conversion and manufacturing processes to enhanced energy efficiency, and target overall reductions in carbon dioxide emissions

d. Efforts to achieve innovative manufacturing methods

- Continue efforts at each operating site to develop innovative manufacturing methods that will substantially reduce the processes involved in tire manufacture

5. Reference data





Assigning a value of one (1) to fiscal 1990 energy consumption intensity gives 1.02 in fiscal 1997, 1.05 in fiscal 1998, 0.99 in fiscal 1999, 0.94 in fiscal 2000, and 0.96 in fiscal 2001.

Energy consumption was 945,000 kl in fiscal 1990, 969,000 kil in fiscal 1997, 967,000 kl in fiscal 1998, 981,000 kl in fiscal 1999, and 930,000 kl in fiscal 2000. In fiscal 2001, it fell 24,000 kl on the fiscal 2000 figure, to 906,000 kl. Compared with the fiscal 1990 benchmark year figure of 945,000 kl, consumption was down 39,000 kl.

Note: The principal products in the industry include automobile tires, conveyor belts, rubber hoses, industrial products such as vibration isolating rubber and sponge products, and footwear. Some 23 companies participated in the follow-up survey, representing approximately 85% of industry production (based on consumption of new rubber).

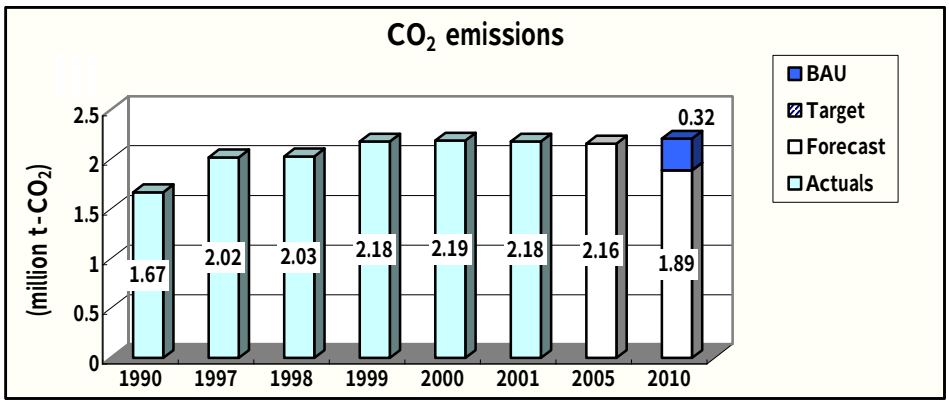
Data calculations: Carbon dioxide emissions were arrived at by (i) aggregating the fuel consumption for each category of fuel (other than electric power) from each company, and after multiplying that figure by the calorific output of each category of fuel (consumption x average calorific output), the carbon coefficient, and 3.67, deriving a total figure, and then by (ii) multiplying the total amount of power purchased by each company (only for electric power), the carbon coefficient , and 3.67. The total emissions are the sum of (i) and (ii).

Assumptions underlying the calculation of fiscal 2010 forecasts and targets: (i) assumptions relating to production levels and turnover = production forecasts; (ii) assumptions relating to energy and carbon dioxide emission intensity = trend to energy-conserving facilities and others (assumptions relating to the carbon dioxide emission intensity for electricity, etc.); and (iii) forecasts of production in fiscal 2010 (on a new rubber basis) assume an increase on the fiscal 1998 benchmark of 1% per annum.

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

To keep the amount of carbon dioxide emitted by pharmaceutical companies in fiscal 2010 at less than fiscal 1990 levels. To reduce the amount of HFCs used in pharmaceutical aerosols by 25% on levels if were plans not implemented, in fiscal 2010.

1. Progress toward target



The amounts of carbon dioxide emitted by industry increased from 1.67 million t-CO_2 in fiscal 1990 (benchmark year) to 2.02 million t-CO_2 in fiscal 1997, 2.03 million t-CO_2 in fiscal 1998, and 2.18 million t-CO_2 in fiscal 1999. However, at 2.19 million t-CO_2 in fiscal 2000, and 2.18 million t-CO_2 in fiscal 2001, emissions have remained generally constant. Industry turnover in fiscal 2001 rose 6% over the preceding year, but installation of energy-efficient equipment, improvements in operations, and conversion to alternative fuels reduced carbon dioxide emissions by 14,000 t-CO_2, an overall reduction of approximately 10,000 t-CO_2.

The industry is forecasting carbon dioxide emissions of 2.16 million t-CO_2 in fiscal 2005, a 29% increase compared with fiscal 1990, and is aiming to achieve an emissions target of 1.67 million t-CO_2 in fiscal 2010—the same level as in fiscal 1990. If voluntary action plans were not implemented, carbon dioxide emissions in fiscal 2010 would be 2.20 million t-CO_2, a 32% increase over fiscal 1990. The industry is endeavoring to keep emissions of carbon dioxide below the level emitted in fiscal 1990.

3. Steps taken to achieve target

- Major

It is reasonable to expect that production in the pharmaceuticals industry will increase only marginally in the coming years, in the face of policies aimed at cutting medical expenses and lowering the cost of pharmaceuticals. The energy needs of R&D concerning useful pharmaceuticals for our ageing society, and of maintaining and operating the facilities required for safe, high-quality pharmaceutical production, are nevertheless increasing. Thus, a wide range of energy-saving measures and initiatives to reduce carbon dioxide emissions will therefore be required to achieve the emission levels targeted for 2010. The main industry initiatives to achieve the target are as follows:

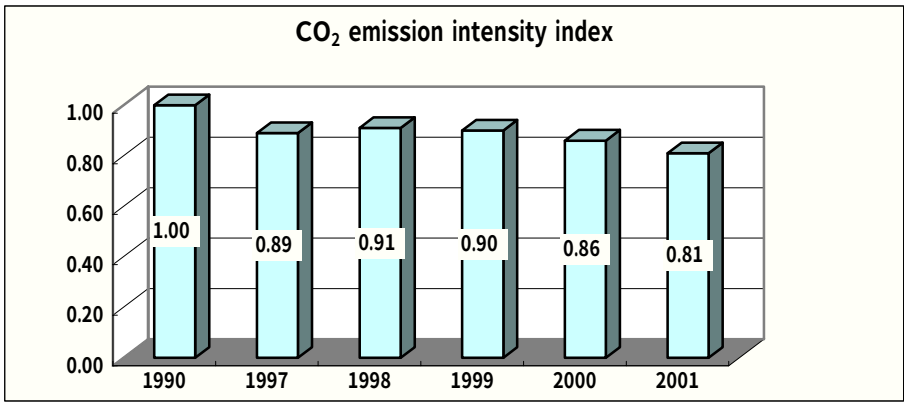
- Facilities and equipment are being converted to those that are energy-efficient.
- Cogeneration systems are being introduced (subject to evaluation of their efficacy in terms of energy conservation and carbonic acid gas reduction).
- Waste heat is being recovered, and operations are being better managed to promote energy-savings.
- Ways are being sought to improve how air conditioning systems and refrigeration and heating equipment are used, including starting, stopping, and hours of operation.
- Energy conservation has been realized by the introduction of small boilers and their advanced automatic control systems.
- Fans, agitators, and lighting are being adapted to incorporate inverter technology.
- Timer-controlled lighting is being installed, and through the use of automatic off switches, lights are being turned off when they are not required.
- Methods for controlling energy-supply equipment are being reviewed to achieve more efficient operation.
- Drained steam is being recovered, and initiatives are being developed to deal with radiated heat.
- Energy conservation is being promoted through more effective implementation of environmental management systems.
- Renewable energy is being adopted.
- Emissions trading is being implemented.

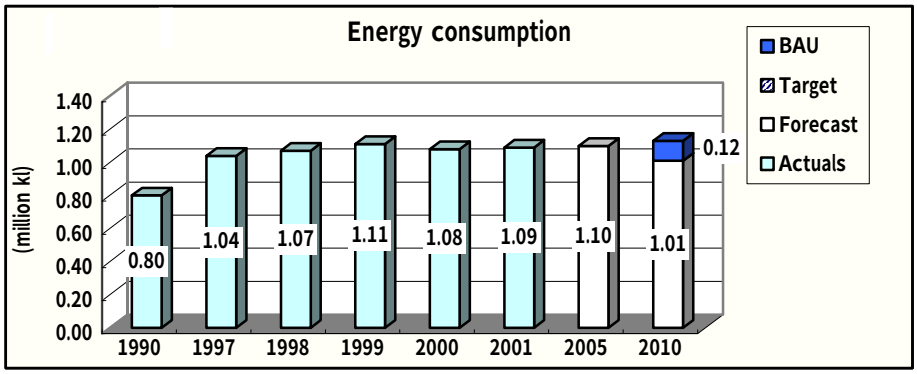
- Fiscal 2001 actual

There were 141 examples of anti-global warming initiatives reported in fiscal 2001. The industry invested ¥3.12 billion in plant and equipment for energy conservation and prevention of global warming, and achieved a reduction in carbon dioxide emissions of 14,000 tons. The energy-conserving effect in crude oil equivalents is estimated to have been a reduction of 9,000 kl. In implementing energy conservation and global warming preventive measures, emissions were held to levels below those of the previous year, despite turnover having increased on fiscal 2000. The following is a breakdown of major initiatives.

INITIATIVE (number of examples)	INVESTMENT (millions of yen)	PREVENTION OF GLOBAL WARMING ($t\text{-}CO_2$)	ENERGY REDUCTION (kl, crude oil equiv.)
Conversion to inverter technology (fans, agitators, and lighting) (14)	183	1140	1097
Use of small boilers, restricted number of boilers, operational improvements (11)	331	4016	2069
Introduction of cogeneration (2)	350	507	912
Introduction of heat storage systems (2)	556	1330	422

5. Reference data





	FY1990 ACTUAL	FY2001 ACTUAL	FY2005 FORECAST	FY2010 FORECAST	FY2010 BAU
Energy consumption (crude oil equivalents: '000 kl)	800	1,090	1,100	1,010	1,130
(compared with FY1990)	100.0	137.5	137.5	126.3	141.3
Carbon dioxide emissions ('000 t-CO_2)	1,670	2,180	2,160	1,890	2,200
(compared with FY1990)	100.0	130.5	129.3	113.2	131.7

The industry has consumed the following amounts of energy: 800,000 kl in fiscal 1990; 1.04 million kl in fiscal 1997; 1.07 million kl in fiscal 1998; 1.11 million kl in fiscal 1999; 1.08 million kl in fiscal 2000; and 1.09 million kl in fiscal 2001. Although it is forecasting consumption of 1.10 million kl in 2005 (up 37.5% on fiscal 1990), consumption in 2010 will be 1.01 million kl, (up 26.3% on fiscal 1990). The energy consumed by pharmaceutical companies is expected to increase as a result of air conditioning associated with R&D and safety assessments. Energy efficiency in the industry in general is expected to improve, as reform of the Pharmaceutical Affairs Law enables greater use of outsourcing in the manufacture of bulk chemicals and pharmaceutical preparations.

6. Other global warming initiatives

- Emissions from offices and in-house distribution (impact on products and services)

Data was only aggregated from respondent companies. Carbon dioxide emissions associated with office use amounted to 60,000 tons, and carbon dioxide emissions in the marketing vehicle and transport sectors totaled 90,000 tons. Carbon dioxide emissions from the factories and research facilities of the relevant companies were 1.95 million tons, making the proportion attributable to office use and transport (including marketing vehicles) 3.1% and 4.6% respectively.

Product-related initiatives have included lighter containers (bottles) and innovations primarily in relation to packaging.

Joint deliveries and optimization of cargoes and delivery vehicles have been the initiatives taken in relation to product transport. The engines of marketing vehicles are being turned off rather than left to idle, and low pollutant vehicles have been introduced, as companies seek to reduce the burden on the environment from a starting point of motor vehicles.

- Progress toward reduction targets for HFC emissions
  - Freon-based air conditioners and freezers are being eliminated when they are upgraded.
  - Becoming HFC-free: The industry has tended to use CFCs in asthma inhalers, but

progress is being made in conversion to HFCs given issues with ozone depletion.

HFCs, however, are substances that, through their action, exacerbate global warming. The industry is therefore exploring a shift to the use of powdered pharmaceutical preparations (DPI) that do not use HFCs.

Progress toward HFC freedom is steady, with already 3 preparations on the market that are direct conversions from CFC-based preparations to DPI. One is being prepared for sale, and one is currently the subject of an application for approval to manufacture.

- Planned initiatives

  Encourage conversion: Promote conversion to preparations that are not HFC-based (DPI).

  Recovery and breakdown: Promote the recovery and breaking down of HFCs from defective and returned HFC-based preparations.

7. Environmental management and conservation in overseas business activities

- As at November 2001, 36 companies and 77 operating sites had obtained ISO14001 certification (member companies of Japan Pharmaceutical Manufacturers Association).
- Environmental conservation activities overseas

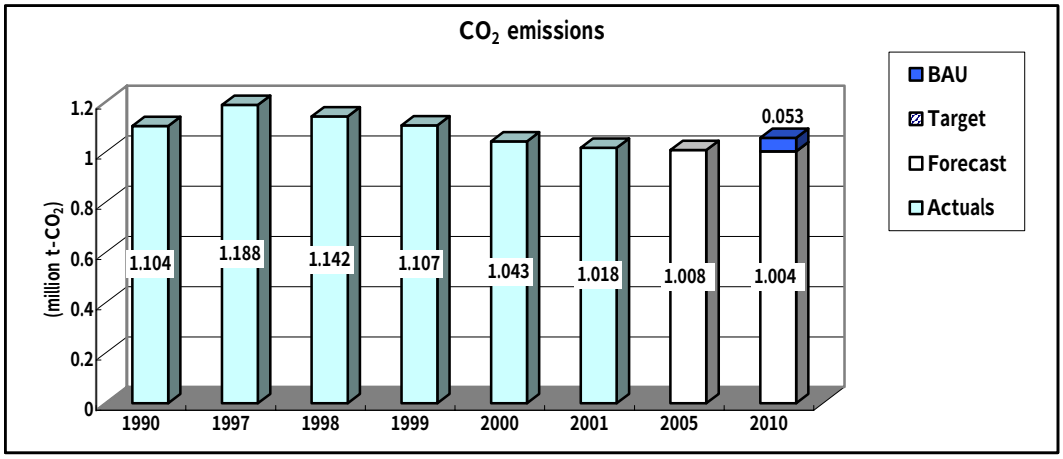
  In their overseas operations, companies as a matter of course comply with the rules and regulations of the countries in which they are investing. In line with the policy of voluntary action established by the Japan Pharmaceutical Manufacturers Association, member companies also adopt a global perspective in seeking to protect the environment. The same inspections are also carried out with the same standards as within Japan.

Note: The principal product of the industry is pharmaceuticals. The rate of participation in the follow-up survey was 5.4% (76 out of 1,419), representing 94.1% of sales. Forecasts for fiscal 2010 are from individual company estimates, and no particular assumptions were used.

Brewers Association of Japan

To reduce carbon dioxide emissions from beer production at breweries in fiscal 2010 to 94% of the fiscal 1990 level.

1. Progress toward target



The beer industry has emitted the following amounts of carbon dioxide: 1.104 million t-CO_2 in fiscal 1990; 1.188 million t-CO_2 in fiscal 1997; 1.142 million t-CO_2 in fiscal 1998; 1.107 million t-CO_2 in fiscal 1999; 1.043 million t-CO_2 in fiscal 2000; and 1.018 million t-CO_2 in fiscal 2001. It is forecasting emissions of 1.008 million t-CO_2 in fiscal 2005, a decline of 8.7% compared with fiscal 1990, and 1.004 million t-CO_2 in fiscal 2010, 9.1% less than in fiscal 1990. If voluntary action plans were not implemented, emissions in fiscal 2010 would be 1.058 million t-CO_2, 4.2% less than in fiscal 1990.

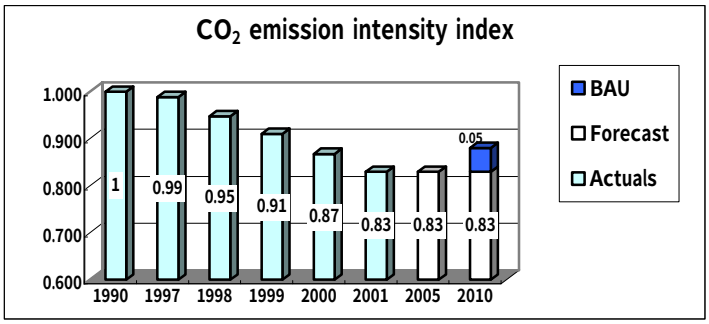
3. Steps taken to achieve targets

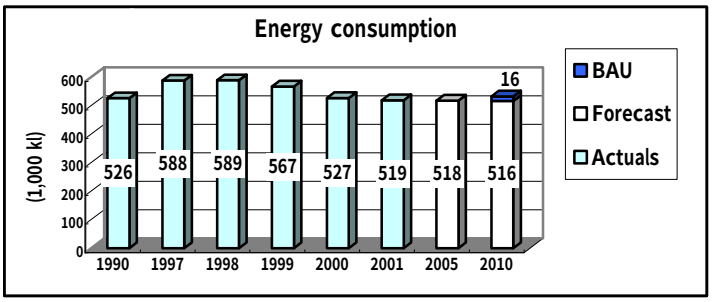
- More efficient anaerobic waste-water processing equipment has been installed.
- Cogeneration systems have been introduced.
- Productivity has been improved by increasing the proportion of canned products.
- High-efficiency boilers have been introduced.
- Energy-saving activities are being encouraged.

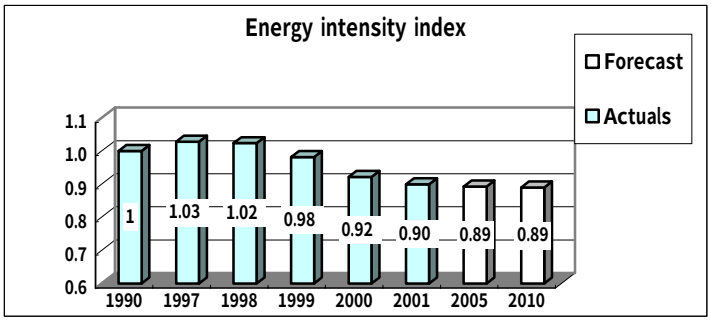
4. Factors accounting for increases or decreases between fiscal 1990 and 2001

(1) Productivity has been improved by integrating, closing, and upgrading factories and production lines.
(2) Productivity has been improved by increasing the proportion of canned products.
(3) Efficiency has been enhanced through the introduction of anaerobic wastewater treatment facilities and cogeneration systems.

5.Reference data







Assigning a value of one (1) to the fiscal 1990 carbon dioxide emission intensity index gives values of 0.99 in fiscal 1997, 0.95 in fiscal 1998, 0.91 in fiscal 1999, 0.87 in fiscal 2000, and 0.83 in fiscal 2001. The forecast is for 0.83 in both fiscal 2005 and fiscal 2010.

Energy consumption (in crude oil equivalents) was: 526,000 kl in fiscal 1990; 588,000 kl in fiscal 1997; 589,000 kl in fiscal 1998; 567,000 kl in fiscal 1999; 527,000 kl in fiscal 2000; and 519,000 kl in fiscal 2001. The forecast is for 518,000 kl in fiscal 2005, and 516,000 kl in fiscal 2010—1.5% and 1.9% less, respectively, than in fiscal 1990. If voluntary action plans were not implemented, the forecast for energy consumption in fiscal 2010 would be 532,000 kl, a 1.1% increase compared with fiscal 1990. Assigning a value of one (1) to the fiscal 1990 energy intensity index gives 1.03 in fiscal 1997, 1.02 in fiscal 1998, 0.98 in fiscal 1999, 0.92 in fiscal 2000, and 0.90 in fiscal 2001. The forecast is for 0.89 in both fiscal 2005 and fiscal 2010.

6. Other global warming initiatives

- Emissions from offices and in-house distribution

  The industry has adopted the following measures to reduce carbon dioxide in the consumer goods and transport sectors.

  - Using lighter cans and bottles, and cardboard to lighten packaging materials
  - Promoting the idea of turning off truck engines rather than leaving them idling
  - Reducing carbonic gas emissions by jointly delivering products and raw materials
  - Introducing larger delivery vehicles and low-pollutant vehicles (CNG vehicles)
- Greenhouse gases other than carbon dioxide
  - Installing freon-free equipment
  - Strict implementation of measures to recover unused freon

7. Environmental management and conservation in overseas business activities

- Obtaining and maintaining ISO14001 certification for breweries
- Disclosing information through ongoing publication of environmental reports and applying the principles of environmental accounting

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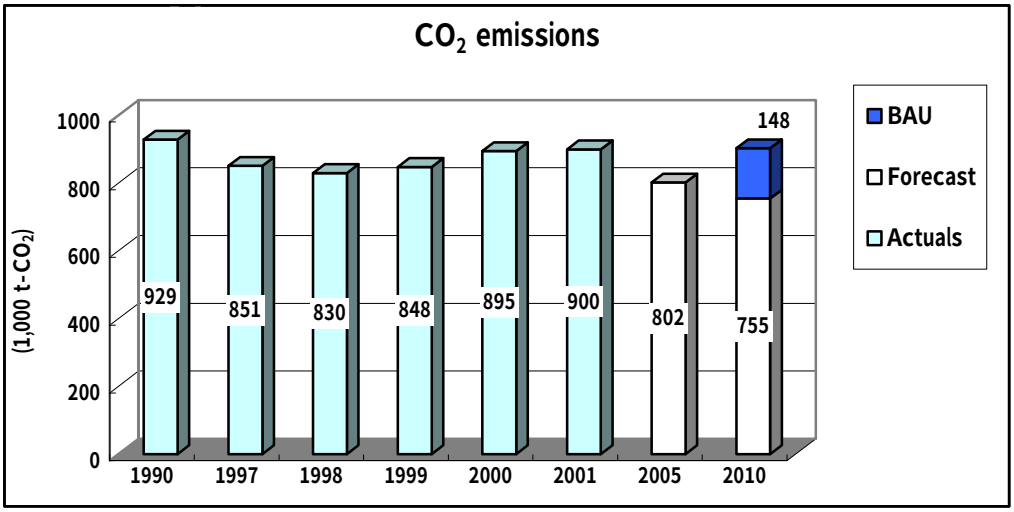
Note: The principal product of the industry is beer (including low-malt *happoshu* beer substitutes). The participation rate in the follow-up survey was 80% (4 out of 5), representing 99% of sales. Figures on carbon dioxide emissions are aggregates of data provided by the four participating companies. In fiscal 2010, the industry is projecting a 10.0% increase in production compared with fiscal 1990, and is forecasting a decline in the emission intensity index of 17% (from improvements in productivity through integration, closure and upgrade of factories and production lines, an increase in the ratio of canned products in total product mix, the introduction of anaerobic waste-water treatment and cogeneration facilities, and the encouragement of energy-saving activities).

Japan Auto-Body Industries Association

To reduce carbon dioxide emissions by 10% compared with fiscal 1990 by fiscal 2010.

1. Progress toward target



The auto-body industry has emitted the following amounts of carbon dioxide: 929,000 t-CO_2 in fiscal 1990; 851,000 t-CO_2 in fiscal 1997; 830,000 t-CO_2 in fiscal 1998; 848,000 t-CO_2 in fiscal 1999; 895,000 t-CO_2 in fiscal 2000; and 900,000 in fiscal 2001. It is forecasting emissions of 802,000 t-CO_2 in fiscal 2005, and 755,000 t-CO_2 in fiscal 2010, representing declines of 12.7% and 17.4% respectively, compared with fiscal 1990. If voluntary action plans were not implemented, the industry would emit 903,000 t-CO_2 in fiscal 2010—a 2% decrease.

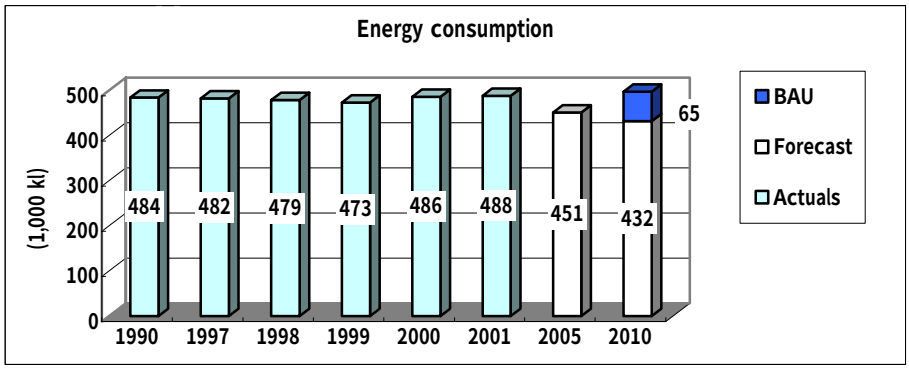
3. Steps taken to achieve targets

- Major

  Sharing of case studies on a wide range of initiatives taken to limit global warming

- Fiscal 2001 actual
  - Installation of gas turbine cogeneration facilities
  - Installation of inverters
  - Centralized production sites
  - Changing fuel from kerosene and fuel oil to city gas

5. Reference data



The industry has recorded the following energy consumption: 484,000 kl in fiscal 1990; 482,000 kl in fiscal 1997; 479,000 kl in fiscal 1998; 473,000 kl in fiscal 1999, 486,000 kl in fiscal 2000; and 488,000 in fiscal 2001. It is forecasting consumption of 451,000 kl in fiscal 2005, and 432,000 kl in fiscal 2010, representing 6.8% and 10.7% decreases respectively compared with fiscal 1990. If voluntary action plans were not implemented, industry would consume 498,000 kl of energy in fiscal 2010—an increase of 1.2%.

6. Other global warming initiatives

- Emissions from offices and in-house distribution
  - Turning off power on holidays
  - More efficient in-house distribution (shorter transport distances achieved by reviewing processes)
  - Raising awareness about energy conservation, and taking careful note of energy-savings on a daily basis

- Contributions to the consumer goods and transport sectors (impact on products and services)
  - Streamlining production by reducing the range of parts in new products
  - Joint operation of distribution trucks

- Greenhouse gases other than carbon dioxide
  - There is some use of other greenhouse gases (e.g. HFCs, PFCs, and SF_6), but no surveys have yet been conducted of initiatives being taken in relation to them.
  - Freon and other greenhouse gases are being recovered and broken down in accordance with the Law Concerning the Recovery and Destruction of Fluorocarbons.
  - Residual gas recovery units have been installed for use after vehicle air conditioners have been topped up with coolant.

7. Environmental management and conservation in overseas business activities

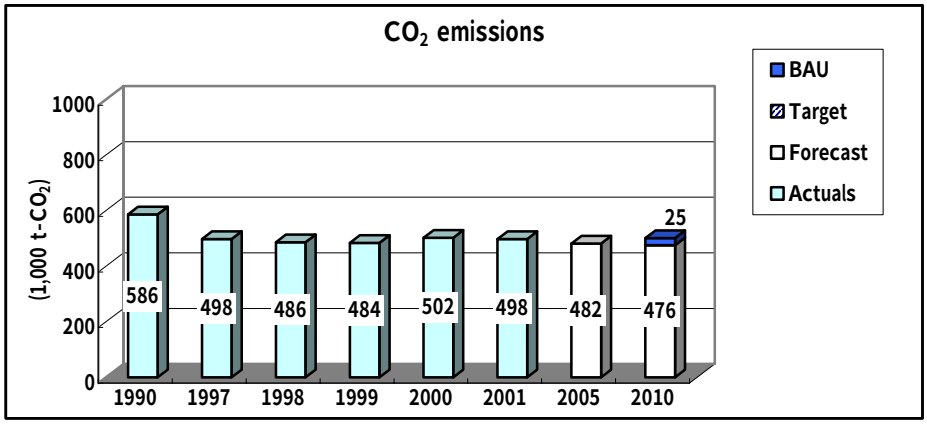
- The Association has formulated a Voluntary Action Plan on the Environment and established targets for carbon dioxide reduction. Through promotions in institutional journals, member awareness of the environment has improved and the number of companies participating in the survey increased as a result.
- Many companies are engaged in the process of acquiring ISO14001 certification.

Note: The principal products of the industry are bodies and equipment for trucks, vans, buses, trailers, specially outfitted vehicles, special vehicles, and compact vehicles. The rate of industry participation in the follow-up survey was 34% (61 companies out of 181), representing 90% of industry sales. Carbon dioxide emissions were aggregated from the data provided by respondent member companies (by type). The fiscal 2010 forecast assumes sales will decrease by 20% compared with fiscal 2001.

Japan Sugar Refiners' Association

To reduce industry emissions of carbon dioxide in 2010 by 20% compared with fiscal 1990.

1. Progress toward target



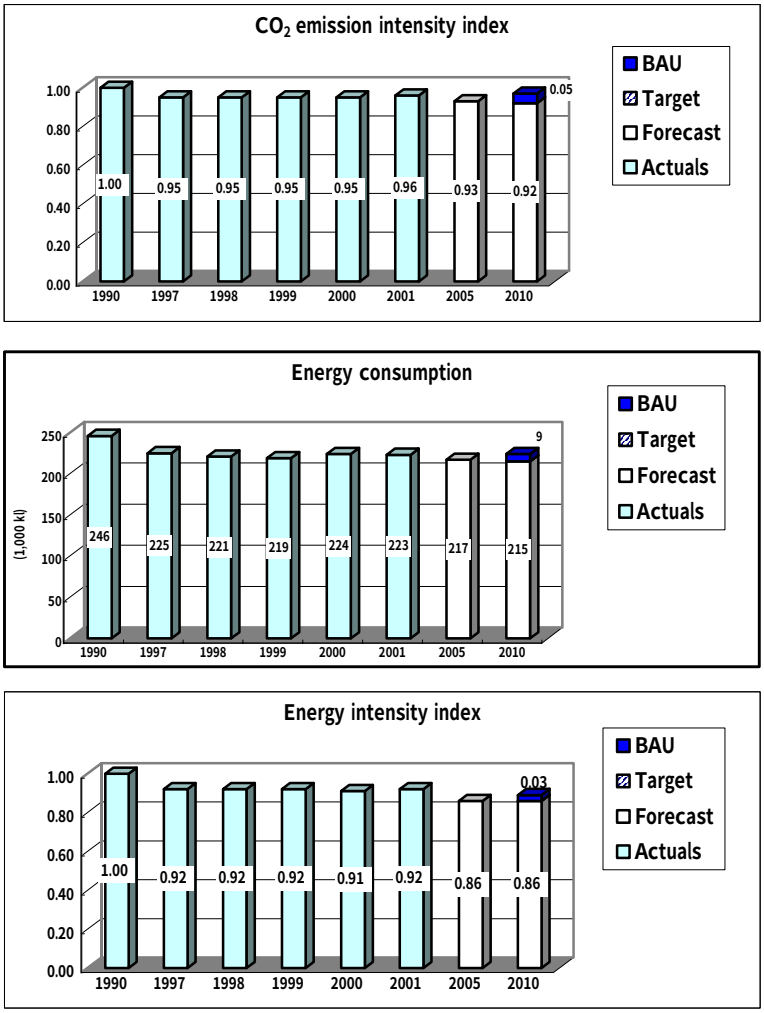
The sugar refining industry has recorded the following carbon dioxide emissions: 586,000 t-CO_2 in fiscal 1990; 498,000 t-CO_2 in fiscal 1997; 486,000 t-CO_2 in fiscal 1998; 484,000 t-CO_2 in fiscal 1999; 502,000 t-CO_2 in fiscal 2000; and 498,000 t-CO_2 in fiscal 2001—down 15% on fiscal 1990. The forecast for emissions is for 482,000 t-CO_2 in fiscal 2005, an 18% decline compared with 1990, and 476,000 t-CO_2 in fiscal 2010, a 19% reduction on 1990. If voluntary action plans were not implemented, emissions would be 501,000 t-CO_2 in 2010, or 14% less than in fiscal 1990.

3. Steps taken to achieve targets

- Major

The industry has cited the following: fuel conversion; installation of mechanical vapor recompression evaporators and vacuum pans with stirrer; introduction of automatic boiling vacuum pan system, cogeneration facilities, and steam accumulators; inverter control of motor revolutions; recovery of waste heat from boilers; turbo-driven compressors; conversion to energy-conserving transformers; air conditioning with absorption system; introduction of vacuum breakers; and insulated steam pipes.

5. Reference data



Assigning a value of one (1) to the fiscal 1990 index of carbon dioxide emission intensity gives 0.95 in fiscal 1997, 0.95 in fiscal 1998, 0.95 in fiscal 1999, 0.95 in fiscal 2000, and 0.96 in fiscal 2001. The industry is forecasting indices of 0.93 in fiscal 2005, and 0.92 in fiscal 2010.

The industry has recorded the following energy consumption levels: 246,000 kl in fiscal 1990; 225,000 kl in fiscal 1997; 221,000 kl in fiscal 1998; 219,000 kl in fiscal 1999; 224,000 kl in fiscal 2000; and 223,000 kl in fiscal 2001. It is forecasting consumption of 217,000 kl in fiscal 2005, and 215,000 kl in fiscal 2010.

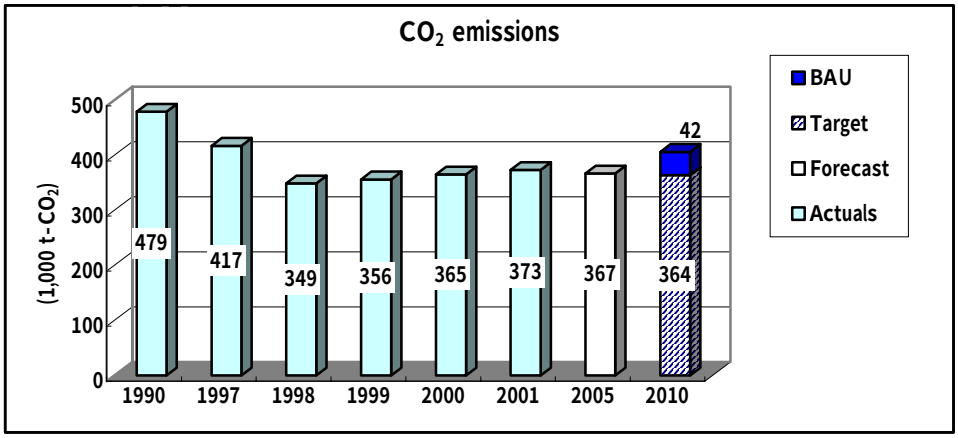
Assigning a value of one (1) to the fiscal 1990 index of energy intensity gives 0.92 in fiscal 1997, 0.92 in fiscal 1998, 0.92 in fiscal 1999, 0.91 in fiscal 2000, and 0.92 in fiscal 2001. The industry is forecasting indices of 0.86 in both fiscal 2005 and fiscal 2010.

Note: The principal product for the industry is sugar. The rate of participation in the follow-up survey was 89% (16 companies out of 18), representing 99% of industry production. In calculating its forecasts for fiscal 2010, the industry assumed sugar consumption would remain stable through to fiscal 2010, with perhaps a slight upward trend, and that production and energy efficiencies would improve.

Japan Sanitary Equipment Industry Association

To reduce the carbon dioxide emissions of production plants by 20% or more compared with fiscal 1990 by fiscal 2010.

1. Progress toward target



The industry has emitted the following amounts of carbon dioxide: 479,000 t-CO_2 in fiscal 1990; 417,000 t-CO_2 in fiscal 1997; 349,000 t-CO_2 in fiscal 1998; 356,000 t-CO_2 in fiscal 1999; 365,000 t-CO_2 in fiscal 2000; and 373,000 t-CO_2 in fiscal 2001. It is forecasting emissions of 367,000 t-CO_2 in fiscal 2005, a 24% decrease compared with fiscal 1990. The target for fiscal 2010 is 364,000 t-CO_2, which represents a 24% reduction over fiscal 1990. If voluntary action plans were not implemented, the industry would emit 406,000 t-CO_2 in fiscal 2010, a 15% decrease over fiscal 1990.

3. Steps taken to achieve targets

- Major

The following are the major industry initiatives taken to achieve the target.

(1) Ongoing

(a) Promoting fuel conversion

(b) Introducing cogeneration, and recycling the hot and waste water from it

(c) Improving plant and equipment operating efficiency and eliminating inefficiency

(d) Installing very efficient equipment and energy-efficient inverters

(e) Encouraging and building on individual employee efforts to reduce the use of energy and resources

- Meticulous and thorough management of production plant and equipment
- Meticulous management of air conditioner temperatures
- Strict control of unnecessary lighting
- Other initiatives

(2) Planned

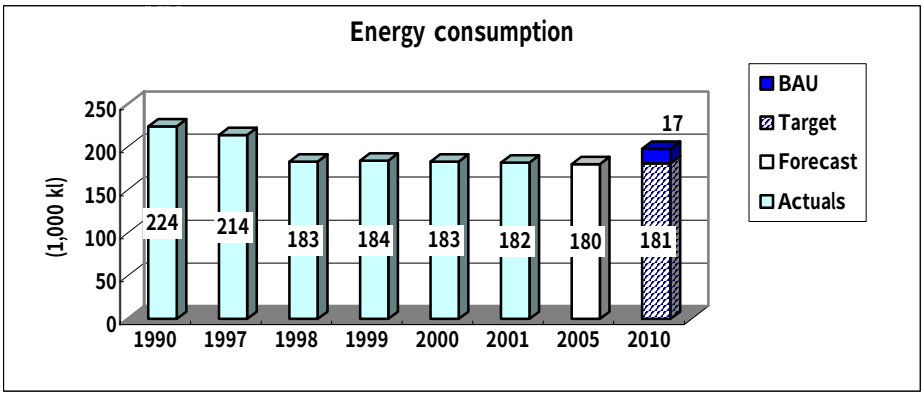
(a) Promoting use of new and untapped forms of energy, including introducing solar energy

(b) Integrating or scrapping production lines and centralizing production sites to improve efficiency

- Fiscal 2001 actual

Four examples of initiatives taken in fiscal 2001 to save energy were upgrading plant and equipment to enable fuel conversion, upgrading plant and equipment to eliminate inefficiency, converting to very efficient transformers, and introducing people sensors and automatic light level sensors. These measures amounted to a total investment of ¥98.2 million, with a carbon dioxide reducing effect of 5,460 t-CO_2.

5. Reference data



The industry has recorded the following energy consumption: 224,000 kl in fiscal 1990; 214,000 kl in fiscal 1997; 183,000 kl in fiscal 1998; 184,000 kl in fiscal 1999; 183,000 kl in fiscal 2000; and 182,000 kl in fiscal 2001. It is forecasting consumption of 180,000 kl in fiscal 2005, and the fiscal 2010 target is 181,000 kl, representing 19.6 percent and 19.2 percent decreases respectively, compared with fiscal 1990. If voluntary action plans were not implemented, the industry would consume 198,000 kl of energy in fiscal 2010—11.6% less than in fiscal 1990.

7. Environmental management and conservation in overseas business activities

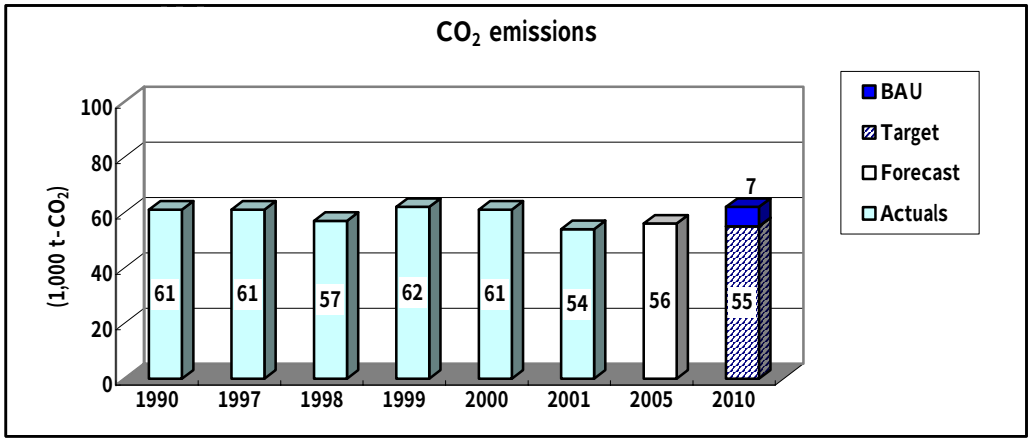
- ISO14001 certification has been acquired by 41 operating centers (including manufacturing group companies), and 3 companies have operating centers that are preparing for certification, or will achieve it within 1 to 3 years.
- Some companies are working towards ISO14001 certification in their overseas plants, as well as in Japan.
- Some companies require their overseas plants to install, maintain, and manage the same environmental conservation equipment as that used in Japan, in principle.

Note: The principal products of the industry are ceramic sanitary equipment, metal faucets, toilet seats equipped with warm-water bidets, bathtubs, and bathroom modules (some companies also produce tiles). The participation rate in the follow-up survey was 100% (8 companies out of 8). Energy consumption and carbon dioxide emissions were aggregated from the fuel consumption data (by type of fuel) provided by the 8 respondents that operate production centers manufacturing the products listed. The fiscal 2010 forecasts are based on the following assumptions: (1) production volume will continue to increase at an average annual rate of 2% after fiscal 2001, and (2) both the energy intensity and the carbon dioxide emission intensity of production will improve at an average annual rate of 2% after fiscal 2001, due to the effect of voluntary efforts to conserve energy.

Japan Industrial Vehicles Association

To reduce fiscal 2010 carbon dioxide emissions from the manufacturing process by 10% compared with fiscal 1990 levels.

1. Progress toward target



Carbon dioxide emissions from the manufacture of industrial trucks were 61,000 t-CO_2 in fiscal 1990, 61,000 t-CO_2 in fiscal 1997, 57,000 t-CO_2 in fiscal 1998, 62,000 t-CO_2 in fiscal 1999, 61,000 t-CO_2 in fiscal 2000, and 54,000 t-CO_2 in fiscal 2001. The fiscal 2001 figures were 12% down on the previous year, and 12% down on fiscal 1999.

The forecast for emissions in fiscal 2005 is 56,000 t-CO_2, down 8% on fiscal 1990, and the fiscal 2010 target is 55,000 t-CO_2, 10% down on fiscal 1990. If voluntary action plans were not implemented, the result would an increase on fiscal 1990 levels of 2%.

3. Steps taken to achieve goals

- Major

Encouraging energy-saving initiatives across all processes

- Fiscal 2001 actual

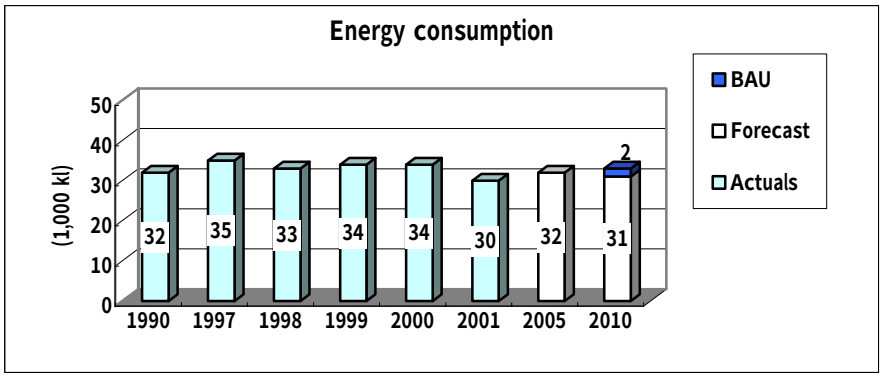
Examples of initiatives undertaken by several companies are as follows.

- Eliminating the use of stand-by power for automatic machinery
- Changing the fuel for industrial air conditioning from fuel oil to city gas
- Shutting down the operation of drying kilns by modifying the finish coating process

4. Factors accounting for increases or decreases between fiscal 1990 and 2000

- The greatest effect was from lower production volumes, but improvements in the efficiency of production and encouragement of energy saving are achieving steady progress.

5. Reference data



Energy consumption in the manufacture of industrial trucks was 32,000 kl in fiscal 1990, 35,000 kl in fiscal 1997, 33,000 kl in fiscal 1998, 34,000 kl in fiscal 1999, 34,000 kl in fiscal 2000, and 30,000 kl in fiscal 2001.

The forecast for consumption in fiscal 2005 is 32,000 kl, level with fiscal 1990, and the fiscal 2010 forecast is for 31,000 kl, down 3% on fiscal 1990. If voluntary action plans were not implemented, the result would be an increase of 3% on fiscal 1990 levels.

6. Other global warming initiatives

- Emissions from offices and in-house distribution
  Examples of major initiatives undertaken by several companies are as follows.
  - Efficient operation of office air conditioning, efficient use of lighting, and introduction of energy-efficient office automation
  - Replacement of internal combustion industrial trucks for use on site with electric industrial trucks
  - Promoting the practice of turning off engines when trucks that carry a product are standing on site, rather than leaving the engines idling

- Contributions to the consumer goods and transport sectors (impact on products and services)
  - The industry is promoting the development and uptake of products that contribute to initiatives against global warming:
    - Encouraging the take up of electric forklift trucks
    - Improving fuel consumption in internal combustion forklift trucks
    - Encouraging the take up of internal combustion forklift trucks powered by compressed natural gas (CNG)

- Greenhouse gases other than carbon dioxide
  Examples of major initiatives undertaken by several companies are as follows.
  - Meticulous management of freon gas from air conditioners

- Promoting the absence of freon from materials used in the production process

7. Environmental management and conservation in overseas business activities

A growing number of companies are seeking ISO14001 certification, including for their offshore plants.

Note: 'Industrial vehicles' refers to the transport and luggage-carrying trucks used in plant sites and warehouses. On this occasion, the only sector of the industrial truck manufacturing industry surveyed was the manufacture of forklift trucks. The reasons are as follows.

(i) According to a current survey of industrial production compiled by the Ministry of Economy, Trade and Industry, the value of production of forklift trucks accounts for two-thirds of the value of production of all industrial trucks.

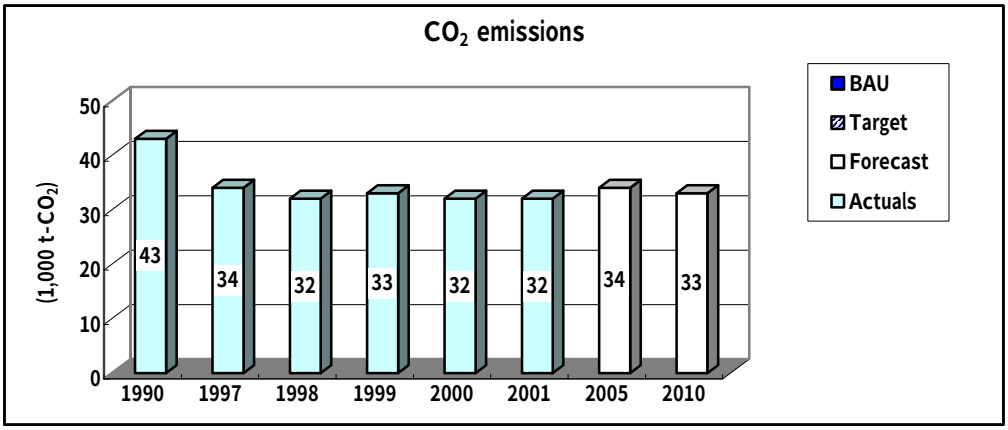
(ii) Shovel trucks, which account for one-quarter of production value, are counted into the construction machinery manufacturing industry by operating centers, and cannot therefore be incorporated into this category. The result is that from the perspective of production value, the survey has accounted for at least 91% of the total industry.

The follow-up survey provides figures aggregated from data from the manufacturing plants of all 7 of Japan's forklift truck manufacturers.

Japan Association of Rolling Stock Industries

To reduce carbon dioxide emissions in fiscal 2010 by 10% compared with fiscal 1990.

1. Progress toward target



The rolling stock industry has emitted the following amounts of carbon dioxide: 43,000 t-CO_2 in fiscal 1990; 34,000 t-CO_2 in fiscal 1997; 32,000 t-CO_2 in fiscal 1998; 33,000 t-CO_2 in fiscal 1999; 32,000 t-CO_2 in fiscal 2000; and 32,000 t-CO_2 in fiscal 2001—a reduction of 26% on fiscal 1990 levels.

The forecast for emissions in fiscal 2005 is 34,000 t-CO_2 and 33,000 t-CO_2 in fiscal 2010—21% and 23% less, respectively, than in fiscal 1990.

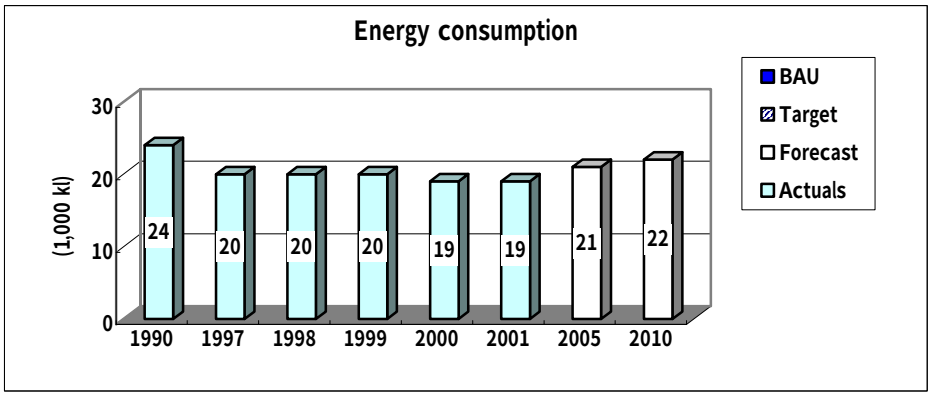
3. Steps taken to achieve targets

- Major
  - ① Greater use of clean energy, e.g., LNG, solar power
  - ② Energy-saving, e.g., adoption of very efficient machinery and equipment, and reduction of energy consumption
  - ③ Appropriate management of energy use, e.g., management of air conditioning and lighting, and prevention of air and steam leaks
  - ④ Reducing the amount of waste products for incineration through recycling

- Fiscal 2001

  The following initiatives were ongoing from the previous financial year.
  - ① Adopting energy-efficient and highly efficient machinery and equipment when replacing or upgrading production machinery and equipment
  - ② Converting fuel for production machinery and equipment to clean energy
  - ③ Improving energy savings by modifying the layout of factory production lines
  - ④ Day-to-day energy-saving activities to achieve incremental improvements, such as management of air conditioner temperatures and lighting

5. Reference data



The rolling stock industry has recorded the following energy consumption: 24,000 kl in fiscal 1990; 20,000 kl in each of fiscal 1997, 1998 and 1999; and 19,000 kl in fiscal 2000 and 2001, representing a reduction of 21% on fiscal 1990. The forecast for emissions in fiscal 2005 is 21,000 kl, and 22,000 kl in fiscal 2010—13% and 8% less, respectively, than in fiscal 1990.

6. Other global warming initiatives

- Emissions from offices and in-house distribution

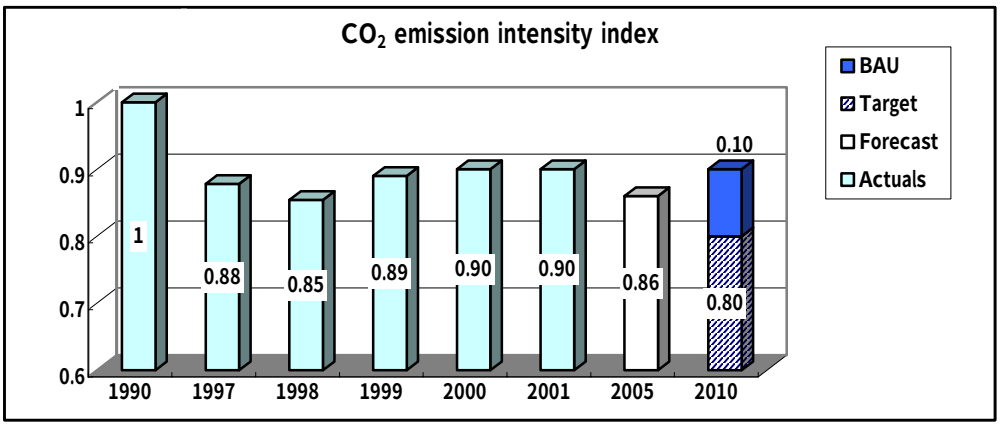
Initiatives being taken in offices include management and efficient operation of air conditioning temperatures, turning off lights and computers at lunchtime, and reducing the amount of photocopying performed. In relation to sawdust and paper scrap generated from distribution, the amount of waste being recycled is being increased, and the volume incinerated is being reduced.

Note: The principal product of the industry is rolling stock. The rate of participation in the follow-up survey by industry members was 17% (7 companies), representing approximately 60% of the energy consumed by industry.

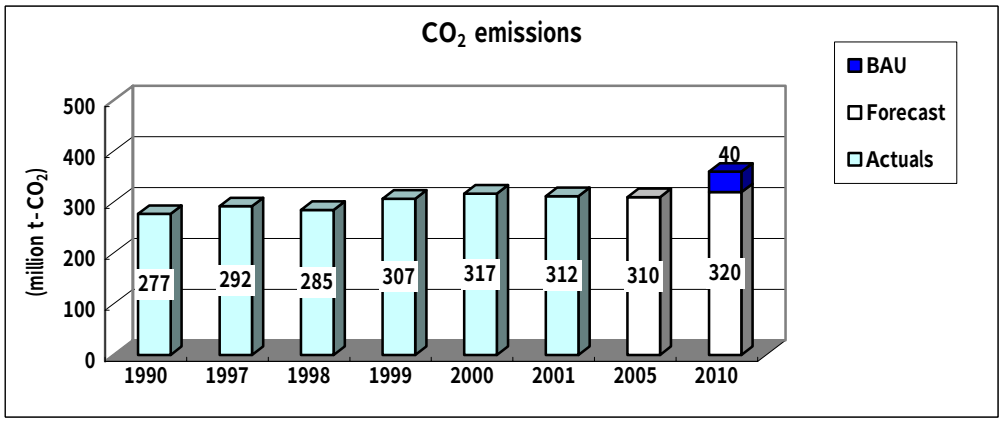
The Federation of Electric Power Companies of Japan

By fiscal 2010, we aim to further reduce CO_2 emissions intensity (emissions per unit of user end electricity) by approximately 20% from the 1990 level, to about 0.34kg-CO_2/kWh.

1. Progress toward target



2. Carbon dioxide emissions



CO_2 emission intensity was: 0.421 kg-CO_2/kWh in fiscal 1990; 0.369 kg-CO_2/kWh in fiscal 1997; 0.356 kg-CO_2/kWh in fiscal 1998; 0.375 kg-CO_2/kWh in fiscal 1999; 0.378 kg-CO_2/kWh in fiscal 2000; and 0.379 kg-CO_2/kWh in fiscal 2001. The industry is forecasting emissions of 0.36 kg-CO_2/kWh in fiscal 2005, and is aiming to reduce emissions in fiscal 2010 by around 20% on 1990 levels (to 0.34 kg-CO_2/kWh). CO_2 emissions intensity (user-end electricity) showed little significant change from the preceding year, remaining at a basically stable level. This was the result of an increase in the ratio of nuclear power to overall power generation, offset by a slight increase in the ratio of coal-fired power to thermal power generation. These developments took place despite decreasing power generation by thermal, hydroelectric, and nuclear sources brought about by the drop in energy consumption.

CO_2 emissions were: 277 million t-CO_2 in fiscal 1990; 292 million t-CO_2 in fiscal

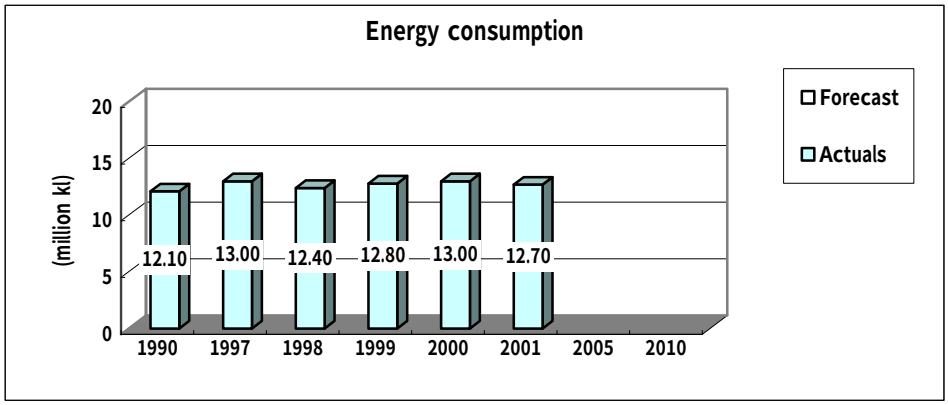
1997; 285 million t-CO_2 in fiscal 1998; 307 million t-CO_2 in fiscal 1999; 317 million t-CO_2 in fiscal 2000; and 312 million t-CO_2 in fiscal 2001. The industry attributes the decrease in CO_2 emissions in fiscal 2001 to a 1.6% year-on-year decrease in demand for electric power. It is forecasting emissions of 310 million t-CO_2 in fiscal 2005, approximately 12% more than in fiscal 1990, and 320 million t-CO_2 in fiscal 2010. While total electricity consumption is expected to increase 43% over the fiscal 1990 level by fiscal 2010, the increase in total CO_2 emissions is projected to be only 14%.

3. Steps taken to achieve targets

- Major
  - Increased use of non-fossil energy sources (expanded introduction of nuclear or LNG thermal power generation sources and increased use of nuclear power, as well as development and application of natural energy sources)
  - Efficiency improvement of electric power plants (efficiency improvement of thermal power generation, as well as reduction of transmission and distribution loss)

The industry will also engage in the task of developing technologies for the recovery, disposal, fixing, and effective use of CO_2, and implement initiatives for energy conservation and load leveling.

5. Reference data



Note: In arriving at the above figures in crude oil equivalents, in-house power consumption and transmission and distribution loss were deemed to be power consumed by the industry. There is no data on fiscal 2005 and 2010 forecasts.

6. Other global warming initiatives

- Emissions from office usage and the company fleet

In fiscal 2001, the volume of CO_2 emitted in the use of offices (consumer goods sector) was approximately 380,000 t-CO_2. The volume emitted in fiscal 2001 by the company fleet (transport sector) was approximately 80,000 t-CO_2.

The industry has sought to reduce emissions from office usage by operating air conditioning efficiently, turning off lights during lunch hours and other times when they are not needed, using elevators less, and introducing heat storage air conditioning systems and solar

power generation facilities to company buildings.

Initiatives for reducing CO_2 emissions from the company fleet include promoting fuel-efficient driving of company vehicles, introducing and making a priority of the use of fuel-efficient vehicles, and driving with optimum tire pressure.

- Measures to reduce the emission of greenhouse gases other than CO_2

The industry is putting great effort into limiting emissions of five greenhouse gasses through the measures described below. (The combined effect on the climate of these gasses emitted by the electric utility industry is about 1/300 of that of CO_2.)

- SF_6: Emissions are being limited when servicing or disposing of equipment by actively using gas recovery devices, and recycling recovered gas (reducing the proportion of emissions by fiscal 2005 to around 3% during device inspecting, and 1% during device disposal).
- HFC: Emissions are being limited by preventing leakage during device installation or repair, and the recovery and recycling of the gas.
- PFC: Liquid PFC is used as a refrigerant and an insulating medium for certain types of transformers. It is easy to recover and recycle, and there is no fear of leakage to the environment, either during normal operation or upon disposal.
- N_2O: Emissions are being strictly limited through improving thermal efficiency. (N_2O emissions occur at thermal power plants due to the combustion of fuels. N_2O emissions by the electric utility industry account for about 1.5% of total N_2O emissions in Japan.)
- CH_4: The concentration of CH_4 in gas emitted from thermal power plants is less than the concentration in the atmosphere, meaning emissions are essentially zero.

- Kyoto Mechanism projects

The industry's involvement in Activities Implemented Jointly (AIJ) includes projects in Indonesia, where industry members have installed solar power systems and built small-scale hydroelectric power systems. Members are also involved in afforestation projects (in several Australian states), and are participants in the World Bank Prototype Carbon Fund and a carbon fund and the European Bank for Reconstruction and Development Fund.

7. Environmental management and conservation in overseas business activities

- Members of the industry have established in-house environmental management systems. They have reported on their environmental protection efforts through environment action reports.
- According to their individual policies, industry members have voluntarily and actively worked to improve in-house environmental management systems in line with the international standards of the ISO 14000 series, and to earn ISO 14001 certification at

their representative sites.

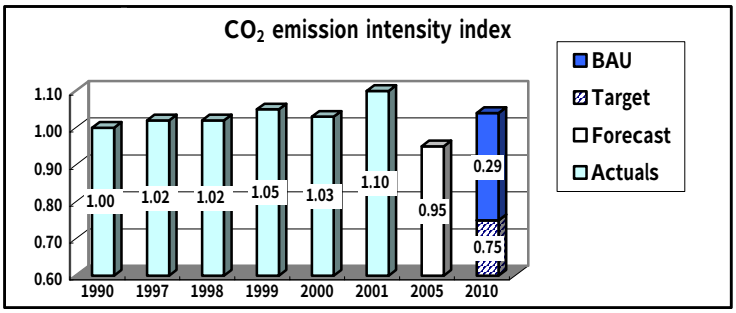
- The industry has always paid attention to environmental considerations when undertaking overseas projects, and intends to continue doing so.

Note: The principal product of the industry is electricity. The proportion of companies participating in the follow-up survey was 100% (12 companies), representing 100% of the energy consumed by the industry. CO_2 emissions were calculated by totaling the volume of fuel burned by each company (by fuel type) to produce the electricity sold (including electricity purchased from cooperative thermal power companies or independent power producers and then resold, but excluding electricity from power producers and suppliers), multiplying the totals for each fuel type by the CO_2 coefficient, and then summing the results. The electric power demand forecast for fiscal 2010 was estimated at 943 billion kWh. It was also assumed that the industry would achieve its voluntary target of reducing end-use CO_2 emission intensity by around 20% of the fiscal 1990 level.

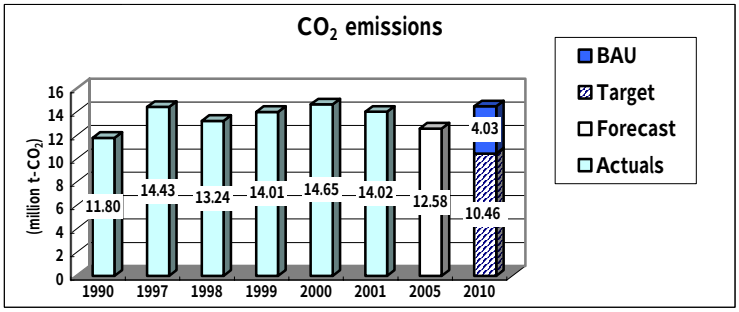
The Electrical and Electronics Industry:
The Japan Electrical Manufacturers' Association
The Japan Electronics and Information Technology Industries Association
The Communications and Information Network Association of Japan
The Japan Business Machine and Information System Industries Association

(Provisionally*) To improve the carbon dioxide intensity associated with production level, by 25% of the fiscal 1990 level, by fiscal 2010.

1. Progress toward target



2. Carbon dioxide emissions



The electrical and electronics industries have undergone substantial structural change in the last decade, compared with their positions in fiscal 1990. Overall, they have changed from being industries involved in assembling heavy and domestic electrical appliances, with

* To date, each industry association has established its own targets.
- The Japan Electrical Manufacturers' Association: undertook the improvement of carbon dioxide intensity associated with production levels with a goal of 25% in the manufacturing stage, compared with fiscal 1990, by fiscal 2010
- Japan Electronics and Information Technology Industries Association, and Communications and Information Network Association of Japan: improve carbon dioxide intensity associated with production levels by 25% compared with fiscal 1990, by fiscal 2010
- Japan Business Machine and Information System Industries Association: improve carbon dioxide intensity associated with production levels by 25% in the manufacturing stage, compared with fiscal 1990, by fiscal 2010
Each company has been conducting its follow-through in accordance with the targets established. In reporting the overall outcomes of follow-ups by the four electrical and electronics groups, the provisional target of the four groups has become to reduce the carbon dioxide intensity by 25% on fiscal 1990 levels, by fiscal 2010. The four electrical and electronics groups are currently planning a revision of their voluntary action plans, including the reconsideration of industry goals.

relatively low energy consumption, to being process industries requiring precise finishing processes, with an emphasis on the energy-intensive semiconductor and device sectors. Factory infrastructure is new, which has further increased relative energy consumption over original estimates.

In fiscal 2001, the industries continued their efforts towards energy saving and reduction of carbon dioxide emissions, while at the same time, the economic downturn saw a significant decline in production levels, and the industries were also affected by a downturn in selling prices. The situation is further exacerbated by the fact that the production structure works against fundamental initiatives that would reduce the fixed energy component, and the climate is not conducive to increased investment in energy savings. Year-on-year energy consumption and carbon dioxide emissions both declined, therefore, but the target index of carbon dioxide intensity associated with production level has become less achievable.

Assigning a value of one (1) to fiscal 1990 carbon dioxide emissions gives forecast estimates of 1.07 in fiscal 2005 and 0.89 in fiscal 2010. Assigning a value of one (1) also to the carbon dioxide intensity associated with production level that is the target of action plans gives estimates of 0.95 in fiscal 2005 and 0.75 in the fiscal 2010 target year.

3. Steps taken to achieve targets

- Major

Stage	Specific examples of initiatives to save energy or prevent global warming
Design, materials procurement	① Design that considers product lifecycles ・Using common raw materials or parts, integrating materials, using recyclable materials, encouraging green procurement ② Establishing an efficient materials procurement system with the introduction of EDI and CALS
Manufacture	① Introducing highly efficient machinery and equipment (systematic introduction in line with equipment upgrades) ・Very efficient industrial furnaces, very efficient light fittings, very efficient refrigerators and air compressors, very efficient heat pumps and boilers, automatically controlled air conditioning (fitted with inverters), inverter control of other industrial machinery and equipment, introduction of machinery fitted with sensors ② Introducing machinery and equipment that uses new or untapped energies (introduction is being sped up in hand with the provision of social infrastructure) ・Cogeneration systems (gas turbines, gas engines) ・Fuel cell power generation systems (introduced as part of cogeneration systems) ・Solar power generation systems and systems using solar power ③ Converting energy source from fuel oil to electric power or city gas ④ Introducing energy monitoring and control systems (central monitoring and control systems for heat and electric power consumption) ⑤ Introducing late night power use (cooperating with DSM initiatives, introducing ice storage systems) ⑥ Configuring very efficient production systems (conversion to manufacturing lines designed with high productivity in mind) ・Improving production technology and quality control, such as shortening development lead times, improving yield rates, and aging

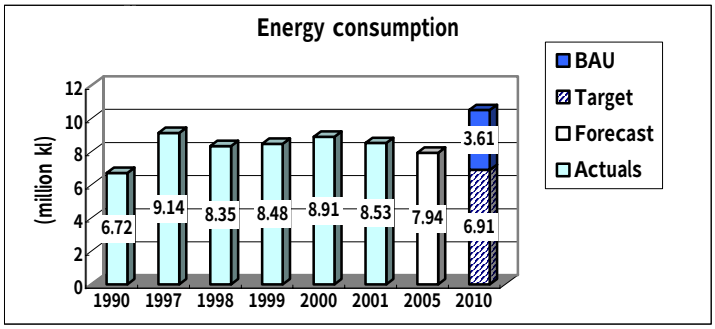
	⑦ Energy-saving initiatives in the office ・Very efficient lighting fixtures, purchasing energy-efficient office automation devices, carrying out central control of room temperature
Distribution	① Rationalizing distribution (modal shifts, unit load transport systems, joint transport) ② Rationalizing wrapping and packaging
Scrapping and recycling	① Reusing industrial water (reusing wash water and cooling water) ② Promoting the use of incineration heat (electricity from waste, and use of waste heat)
Other	① Extending initiatives to save energy and prevent global warming to offshore operating centers ② Extending technical guidance and transfer to developing nations on the basis of experience in implementing energy-saving initiatives and processes ③ Encouraging the greening of factories

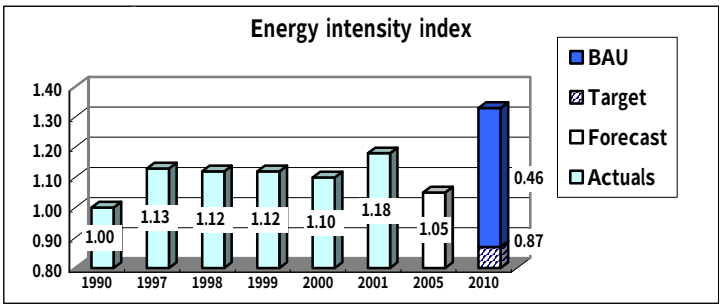
- Fiscal 2001 actual

A sampling survey produced 1,650 examples of fiscal 2001 energy-saving initiatives, the investment value of which reached the order of ¥23.8 billion. The energy reduction effect of this investment was approximately 177,000 kl in crude oil equivalents.

Major initiatives	Energy savings (kl crude oil equiv.)	Investment value (million yen)
New and untapped energy	1,931.6	3,276.6
Cogeneration, heat storage	2,767.0	1,968.3
Introduction of very efficient machinery	22,589.1	7,412.8
Better management	47,510.4	693.9
Improvements in production processes or product quality	26,777.5	2,658.1
Improvements in control methods (e.g., automatic control)	11,649.8	1,661.1
Use of waste heat	6,966.0	998.5
Preventing loss (insulation, heat retention)	4,702.8	1,021.8
Fuel conversion	6,272.8	1,246.5
Other	46,263.0	2,945.5
Total	177,430.0	23,883.1

5. Reference data





6. Other global warming initiatives

- Emissions from offices and in-house distribution

- In relation to carbon dioxide emissions from the consumer goods sector, which includes offices, and the in-house distribution sector, the four electrical and electronics industry groups have expanded the scope of their follow-through on current voluntary action plans, and therefore began to collect data as of the current survey.
- In the electrical and electronics industries, a change in business structure has created a tendency for the “hard” side of the business, the manufacturing sector, to be relocated offshore, and for Japan to specialize in the “soft” sectors and the R&D sector. In this context, member companies are engaged in energy-saving initiatives in the consumer goods sector, including offices, primarily in relation to air conditioning and lighting, and in cogeneration, ice storage, and solar power generation systems. In the in-house distribution sector, fleet vehicles are being driven in a manner that keeps fuel consumption low, fuel-efficient vehicles are being introduced, and work is being done to make distribution more efficient.
- In order to maximize the expertise and technological resources so far amassed, the industries are actively seeking to commercialize the energy service company (ESCO), building energy management system (BEMS), and home energy management system (HEMS).

- Contributions to the consumer goods and transport sectors (impact on products and services)

- The electrical and electronics industries are actively engaged in developing and encouraging the uptake of machinery and services that contribute to energy savings and prevention of global warming in a wide range of fields. These include systems for the use of atomic power and sustainable energy sources (e.g., solar power generation, fuel cells, and wind power), heavy electrical equipment, domestic appliances, and information technology.
- Examples of reductions in carbon dioxide emissions in products and services (Source: The New Climate Change Policy Programme - 19.3.2002)

① Reduction in carbon dioxide emissions from machinery that is the subject of “Top Runner Standards” under the Law concerning the Rational Use of Energy,

such as refrigerators, TVs, air conditioners, and PCs, equaling approximately 30.4 million t-CO_2

② Solar power generation, wind power, fuel cells, and other sustainable energy initiatives (target in fiscal 2010 = reduction of approximately 34 million t-CO_2)

③ Encouraging the uptake of the home energy system (HEMS) (target in fiscal 2010 = reduction of approx. 2.9 million t-CO_2); promoting the building energy management system (BEMS) for managing business demand for energy (target in fiscal 2010 = reduction of approximately 7.7 million t-CO_2)

- Semiconductors, liquid crystal displays, and the use of atomic power are all contributing significantly to limiting the emission of global warming gases under Japan's energy policy. These are technologies essential to achieving energy savings in many fields, and the industries overall are working to advance them.

● Greenhouse gases other than carbon dioxide

- The Japan Electrical Manufacturers' Association

(i) HFCs: manufacture of domestic refrigerators; prevention of leaks during use and repair; recovery, recycling and breakdown of coolants from scrapped products (under the Law for Recycling of Specified Kinds of Home Appliances, 100% of scrapped domestic refrigerators handed over to manufacturers are treated)

(ii) Conversion of insulation in domestic refrigerators to non-HFC materials: conversion of approximately 60% of home refrigerators to render them freon-free (the actual use of hydrocarbon-based insulating foam in 2000 was approximately 61% by weight)

(iii) Development and delivery to the market of freon-free refrigerators

(iv) SF_6: prevent leaks when manufacturing electrically insulated machinery; beef up gas recovery devices (both fixed and mobile); carry out upgrades to improve recovery rates at existing stages (the proportion of emissions at machinery manufacture are to be limited in 2005 to less than 3% of net purchased volumes of gas, compared with 30% in 1995)

- Electronics and Information Industries Association

(i) PFCs: Achieve a reduction in total volume of better than 10% (in carbonic gas equivalents) on 1995 levels of 2010 emissions when manufacturing semiconductors

(ii) Similarly, achieve a reduction of better than 20% on old production lines, and 90% on new when manufacturing liquid crystals (in terms of emission intensity per unit size of glass board)

● Kyoto Mechanism projects

- There have been few examples of projects specifically undertaken with the Kyoto Mechanism directly in mind. Rehabilitation and re-powering of thermal power plants, improvement in the efficiency of cogeneration plants, and the take-up of

very efficient lighting are examples where the follow-up survey has had an effect, and it is hoped that the future will bring the implementation of specific Kyoto Mechanism projects.

7. Environmental management and conservation in overseas business activities
    - As at end August 2002, of 9,929 registrations for ISO14001 assessment, the electrical and machinery industries accounted for the greatest share, at 1,462 registrations (14.7%) (Source: Japanese Standards Association)
    - The acquisition of ISO14001 certification by offshore sites, or integrated certification for entire corporate groups, are becoming more common, as environmental conservation initiatives are implemented at offshore sites to the same level as within Japan.

Note:

1. Basic data

The main products of the electrical and electronics industries include heavy electrical equipment (for power generation, transmission, distribution, and industrial electrical equipment), consumer domestic appliances, light fittings, communications machinery and fittings, devices adapted for wireless, consumer electronic appliances, parts and accessories for communications and electronic devices, electronic calculators and accessories, electronic application devices, electric meters, electronic parts and devices (electronic tubes, semiconductor elements, and integrated circuit boards), storage and dry batteries, and electronic office equipment. Member companies of the four electrical and electronics groups that participated in the follow-up survey numbered 355 (out of 529), equating to some 80% of energy consumed (in kl of crude oil equivalent), (compared with the scope of the relevant industry classification from the Current Structural Survey of Energy Consumption)

2. Method of deriving data

Carbon dioxide emissions were arrived at by aggregating the fuel and power consumption of respondent companies (by type of fuel), and multiplying by individual carbon dioxide emission intensity indices, to derive carbon dioxide emissions. The carbon dioxide emission intensity of purchased power was taken from the demand-end emission intensity for electricity published by the Federation of Electric Power Companies of Japan.

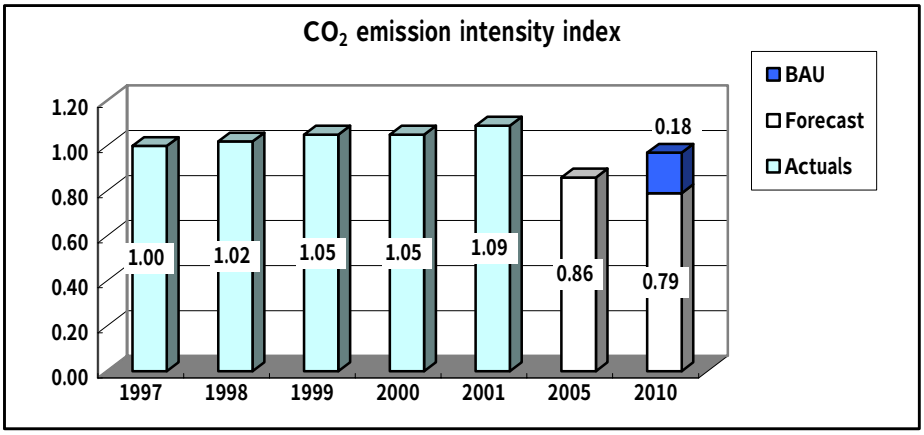
3. Fiscal 2005 forecasts and assumptions underlying calculation of fiscal 2010 targets

- Production volume: from fiscal 2002, value of production will increase 1% per annum
- Given their nature as process industries, it is estimated that in the semiconductor and device industries, which account for the major portion of energy consumption in the electrical and electronics industries, the ratio of fixed energy consumption within a plant to variable consumption will be generally seven to three (the increase in BAU energy consumption will be 30% of the increase in production level). Upward or downward fluctuations associated with production will be due to variations in the energy component, and the fixed component will remain constant, irrespective of increases or declines in production.
- If production level increases, it is assumed that investment in energy savings will continue to be sustained at healthy levels. Amount of energy savings: energy-saving initiatives will be sustained on the same scale as for the amount of energy saved in fiscal 2001, for every year through to fiscal 2005. From 2006 on, energy-saving initiatives on a scale of 1.25 to 1.50 times as great will be sustained every year through to fiscal 2010.
- The carbon dioxide emission intensity of electric power, which accounts for in excess of 70% of energy consumed, will be subject to the adoption by the Federation of Electric Power Companies of Japan of voluntary action plans (in fiscal 2010, an improvement of approximately 20% on fiscal 1990).

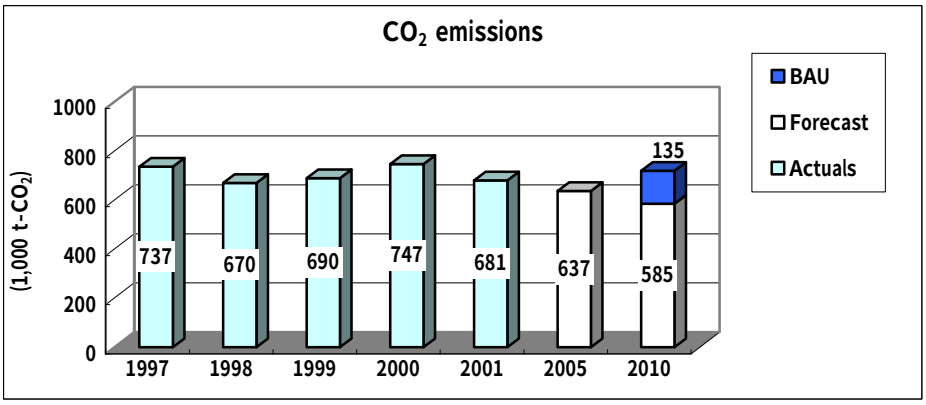
The Japan Bearing Industrial Association

To endeavor to reduce carbon dioxide emission intensity by 13% compared with fiscal 1997, by fiscal 2010

1. Progress toward goal



2. Carbon dioxide emissions



Assigning a value of one (1) to the fiscal 1997 carbon dioxide emission intensity index gives 1.02 in fiscal 1998, 1.05 in fiscal 1999, 1.05 in fiscal 2000, and 1.09 in fiscal 2001. The industry is forecasting indices of 0.86 in fiscal 2005, and 0.79 in fiscal 2010.

The industry has emitted the following amounts of carbon dioxide: 737,000 t-CO_2 in fiscal 1997; 670,000 t-CO_2 in fiscal 1998; 690,000 t-CO_2 in fiscal 1999; 747,000 t-CO_2 in fiscal 2000; and 681,000 t-CO_2 in fiscal 2001. The industry is forecasting emissions of 637,000 t-CO_2 in fiscal 2005 and 585,000 t-CO_2 in fiscal 2010—13.6% and 20.6% less, respectively, than in fiscal 1997.

3. Steps taken to achieve goals

- Major
  - Measures to prevent leaks and reduce pressure in compressors
  - Use of other fuels in and waste heat from heat treatment facilities
  - Introduction of ice thermal storage air conditioning systems and gas heat pumps (GHP)
  - Introduction of very efficient lighting
  - Turning off of lights
  - Use of more efficient, inverter-enabled motors
- Fiscal 2001 actual
  - Air-conditioning (including upgrade to heat pumps, ice thermal storage, and other energy-conserving technologies, and stringent management of temperature)
  - Compressor (including integrated operation, and measures to reduce pressure)
  - Lighting (including replacement of existing lighting with energy-conserving models, and diligent turning off of unnecessary lights)
  - Motors and motive power sources (including control by inverter)
  - Heat treatment (including conversion of fuels used in heat treatment facilities, and changes in operating conditions)
  - Power generation (including installation of in-house generators)
  - Other (including shorter cycle times for manufacturing machinery)

6. Other global warming initiatives

- Contributions to the consumer goods and transport sectors (impact on products and services)

Bearings are used in all revolving parts in automobiles, general machinery, and electrical machinery, and in their use, bearings per se contribute significantly to energy conservation.

7. Environmental management and conservation in overseas business activities

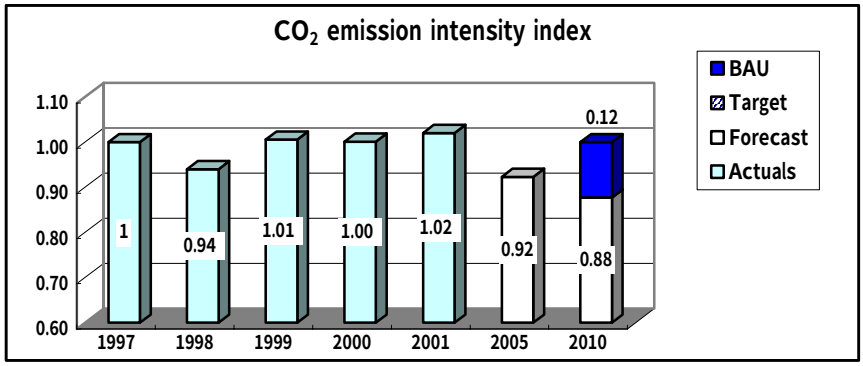
As of June 2002, member companies had obtained ISO14001 certification at 49 factories and operating centers within Japan (15 companies) and at 42 sites overseas (six companies).

Note: The principal product of the industry is bearings. The participation rate in the follow-up survey was 91.7% (33 companies out of 36), representing 99.7% of production. Carbon dioxide emissions for all member companies for each financial year were extrapolated from this starting point. The forecasts for fiscal 2005 and fiscal 2010 were calculated on the assumption that the value of production would be the same as in fiscal 1997.

The Japan Society of Industrial Machinery Manufacturers

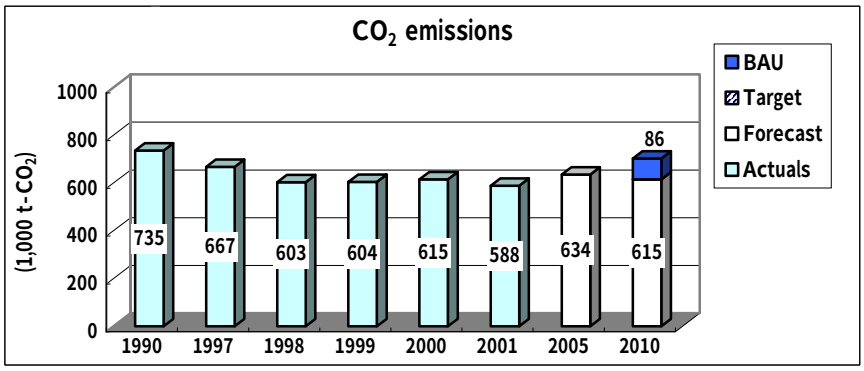
To endeavor to reduce carbon dioxide emission intensity for the production process by 1% or more per year.

1. Progress toward target



Note: A value of one (1) has been assigned to the fiscal 1997 intensity index.
Forecast CO_2 emission intensity was calculated by assuming an annual improvement of 1%.

2. Carbon dioxide emissions



Note: The fiscal 2005 value represents the median value of the range 615,000–653,000 t-CO_2.
Likewise, the forecast for fiscal 2010 is the median of 585,000–644,000 t-CO_2.
The forecast for the case that the voluntary action plans were not implemented is the median of 667,000–734,000 t-CO_2.

Assigning a value of one (1) to carbon dioxide emissions in fiscal 1997, the carbon dioxide emission intensity index stood at 0.94 in fiscal 1998, 1.01 in fiscal 1999, 1.00 in fiscal 2000, and 1.02 in fiscal 2001. The industry is forecasting indices of 0.92 in fiscal 2005 and 0.88 in fiscal 2010.

The industry has emitted the following amounts of carbon dioxide: 735,000 t-CO_2 in fiscal 1990; 667,000 t-CO_2 in fiscal 1997; 603,000 t-CO_2 in fiscal 1998; 604,000 t-CO_2 in fiscal 1999; 615,000 t-CO_2 in fiscal 2000; and 588,000 t-CO_2 in fiscal 2001. It is forecasting emissions of between 615,000 and 653,000 t-CO_2 in fiscal 2005, and between 585,000 and 644,000 t-CO_2 in fiscal 2010. If voluntary action plans were not implemented, emissions in fiscal 2010 would be between 667,000 and 734,000 t-CO_2. (Secretariat's note: fiscal 2005 and 2010 forecasts in the graph are median values.)

3. Steps taken to achieve goals

- Major
  - Product-related initiatives (development and adoption of very efficient boilers, development and adoption of highly efficient combustion systems for waste disposal plants, and environmentally responsible development and design of plant and equipment)
  - Introduction of cogeneration systems
  - Conversion to inverter-enabled equipment
  - Limits on number of compressors; operational efficiencies achieved through centralized control

- Fiscal 2001 actual

There were 199 initiatives taken in fiscal 2001, including: environmental management; process improvement; operational management; energy conservation initiatives; operational management of cooling equipment; operational management of pumps and fans; operational management of compressor systems; furnace combustion management; management of furnace operating efficiency; management of electrical receptors; management of electrical transformers; management of capacity and operation of electrical motors; and operational management of lighting.

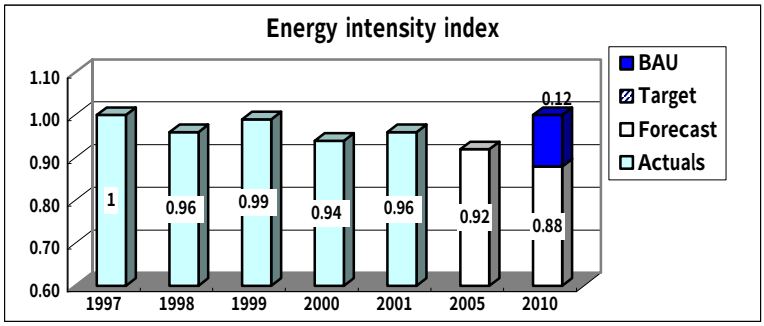
Total investment is estimated to have been ¥735 million, and the resulting reduction in carbon dioxide emissions is calculated at about 5,000 t-CO_2.

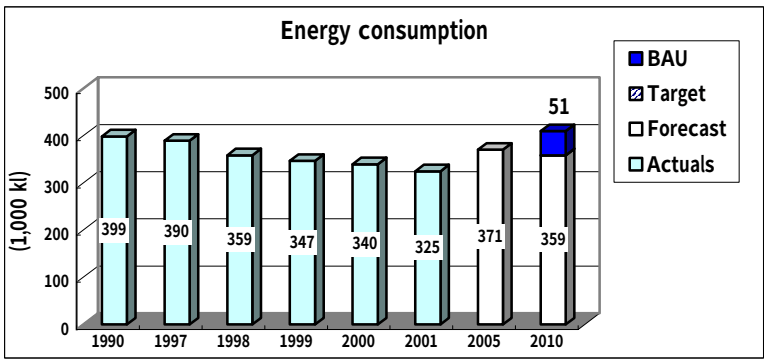
4. Factors accounting for increases or decreases between fiscal 1990 and 2001

Carbon dioxide emissions in fiscal 2001 were down 20% in comparison to fiscal 1990. They were also down 12% in comparison to fiscal 1997, the industry's benchmark year.

- Factors contributing to decreases: improvements in energy efficiency, improvements in production efficiency, etc.
- Factors contributing to worsening emission intensity: marked decline in production value

5. Reference data





Note: The fiscal 2005 value represents the median value of the range 360,000–382,000 kl.

Likewise, the value for fiscal 2010 is the median of 342,000–376,000 kl.

The fiscal 2010 forecast for the case that the voluntary action plans were not implemented is the median of 390,000–429,000 kl.

Assigning a value of one (1) to the energy intensity index in fiscal 1997 gave 0.96 in fiscal 1998, 0.99 in fiscal 1999, 0.94 in fiscal 2000, and 0.96 in fiscal 2001. Actual energy consumption was: 399,000 kl in fiscal 1990; 390,000 kl in fiscal 1997; 359,000 kl in fiscal 1998; 347,000 kl in fiscal 1999; 340,000 kl in fiscal 2000; and 325,000 kl in fiscal 2001. Consumption forecasts in fiscal 2005 are for between 360,000 and 382,00 kl, and between 342,000 and 376,000 kl in fiscal 2010. If voluntary action plans were not implemented, consumption of energy would be between 390,000 and 429,000 kl in fiscal 2010 (Secretariat's note: fiscal 2005 and 2010 forecasts in the graph are median values.)

6. Other global warming initiatives

- Emissions from offices and in-house distribution
  - Management of air conditioning temperature, turning off of unnecessary lights, and management of ON/OFF switches for office automation
  - Turning off of engines of fleet vehicles rather than leaving them to idle

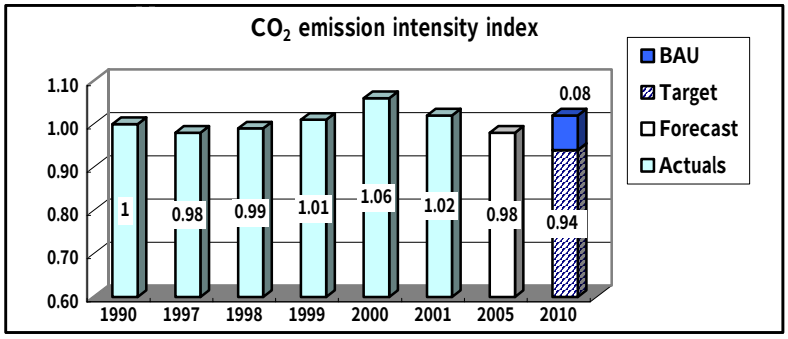
Note: The principal products of the industry are: boilers; engines; mining machinery; chemical machinery; environmental devices; tanks; plastic manufacturing equipment; wind and water power equipment (pumps, compressors, ventilators); transportation equipment; power transmission devices; steel-making equipment; and commercial washing machines. Also included is engineering related to industrial machinery. The association surveyed 202 member companies and received responses from 170 entities in 128 companies (including specialist engineering entities). The follow-up survey response represents 91.2% of fiscal 2001 production value.

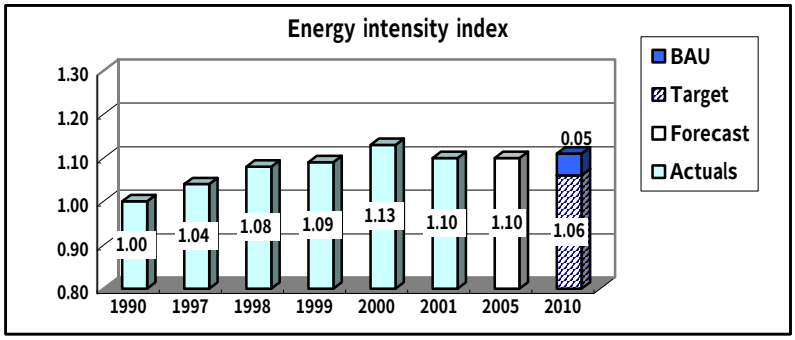
Forecasted production value in fiscal 2010 assumes that variation will be range upwards to 10% of fiscal 1997 levels. Energy consumption was calculated by applying the appropriate calorific coefficient to each substance, and summing the results. Forecast carbon dioxide emission intensity was calculated by assuming an annual improvement of 1% from the benchmark year (fiscal 1997). Carbon dioxide emissions were derived by multiplying the previously calculated carbon dioxide emission intensity forecast by the production value.

The Japan Soft Drinks Association

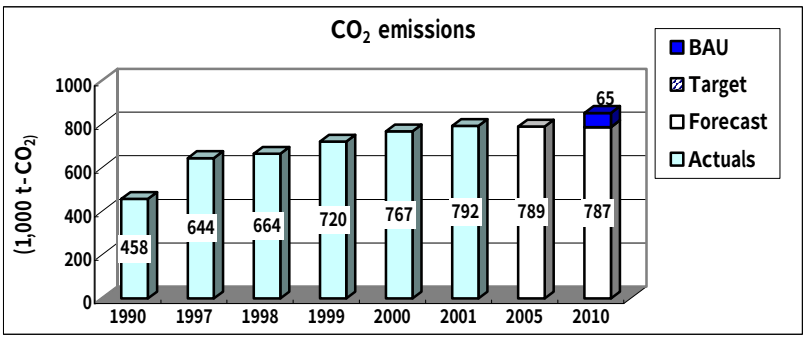
To reduce carbon dioxide emission intensity in 2010 by 6% compared with 1990, and to keep energy intensity in 2010 at the same level as in 1990.

1. Progress toward target





2. Carbon dioxide emissions



Assigning a value of one (1) to the fiscal 1990 carbon dioxide emission intensity index gives indices of 0.98 in fiscal 1997, 0.99 in fiscal 1998, 1.01 in fiscal 1999, 1.06 in fiscal 2000, and 1.02 in fiscal 2001. The industry is forecasting an index of 0.98 in fiscal 2005, and is targeting an index of 0.94 in fiscal 2010. Similarly, assigning a value of one (1) to the fiscal 1990 energy intensity index gives indices of 1.04 in fiscal 1997, 1.08 in fiscal 1998, 1.09 in fiscal 1999, 1.13 in fiscal 2000, and 1.10 in fiscal 2001. The industry is forecasting an index of

1.10 in fiscal 2005, and is targeting an index of 1.00 in fiscal 2010, but forecasting an index of 1.06.

The industry has emitted the following amounts of carbon dioxide: 458,000 t-CO_2 in fiscal 1990; 644,000 t-CO_2 in fiscal 1997; 664,000 t-CO_2 in fiscal 1998; 720,000 t-CO_2 in fiscal 1999; 767,000 t-CO_2 in fiscal 2000; and 792,000 t-CO_2 in fiscal 2001. Emission forecasts are for 789,000 t-CO_2 in fiscal 2005, and 787,000 t-CO_2 in fiscal 2010—increases of 72.2% and 71.8% respectively on fiscal 1990. If voluntary action plans were not implemented, emissions of carbon dioxide would be 852,000 t-CO_2 in fiscal 2010, which is 86% more than in fiscal 1990.

3. Steps taken to achieve targets

- Major
  - Using new energy sources (such as fuel cells, solar power, and wind power)
  - Cogeneration
  - Heat-transfer equipment
  - Recovering and using methane gas
  - High efficiency boilers
  - Using waste heat from steam
  - Promoting heat recovery initiatives
  - Converting to other types of fuel
  - Improving lighting and air conditioning
  - Improving freezing and chilling equipment
  - Improving waste water treatment
  - Recycling water

- Fiscal 2001 actual

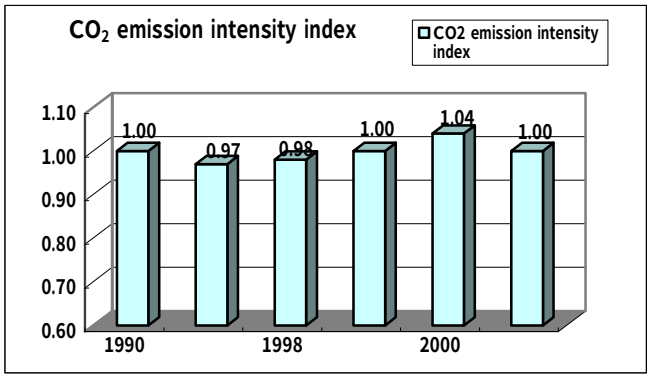
Examples	Investment	Effect (in kl crude oil equiv. pa)
Conversion of boilers to natural gas	¥40m	710 kl
Automatic temperature control, changes in plumbing, and insulation works for steam pipes	¥1.34m	173 kl
Leased power reduction systems	¥2m	175 kl
Steam drain recovery from heat transformers	¥10m	63 kl
Review of control and plumbing around energy and heat transformers	¥54.92m	374 kl
Control of number of compressors	¥1.8m	44 kl
Control of revolutions of boiler fans	¥1.9m	26 kl
Waste heat recovery devices	¥5.4m	39 kl

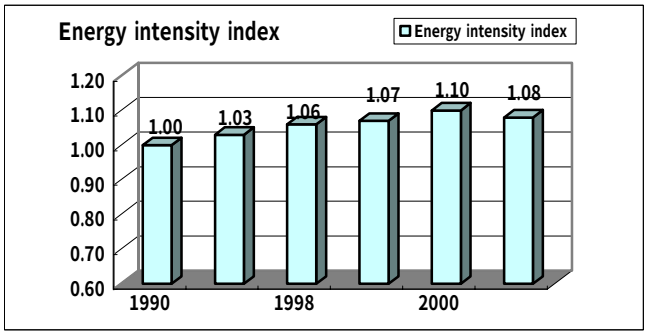
4. Factors accounting for increases or decreases between fiscal 1990 and 2001

- Factors accounting for increases

(1) A greater proportion of PET bottles are being manufactured internally (containers are being produced in-house)

(Ref.) Carbon dioxide intensity after excluding in-house manufacture of containers, Energy consumption intensity index



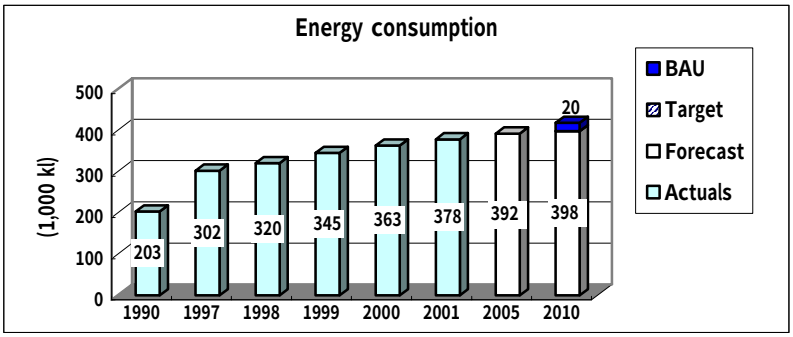


(2) Greater consumption of energy due to improvements in the production environment achieved through HACCP (Hazard Analysis Critical Control Point)

(3) Greater consumption of energy resulting from changes in soft drink product categories and changes in the structure of containers

(4) Greater consumption of energy resulting from production of more product categories in small lots

5. Reference data



The industry has consumed the following amounts of energy: 203,000 kl in fiscal 1990; 302,000 kl in fiscal 1997; 320,000 kl in fiscal 1998; 345,000 kl in fiscal 1999; 363,000 kl in fiscal 2000; and 378,000 kl in fiscal 2001.

6. Environmental management and conservation in overseas business activities

ISO14001 certification status of 32 companies that participated in the follow-up survey:

Certification acquired	24
Certification expected	8
Total	32

NB The status of ISO14001 certification is based on companies that have certification at either head office or factories

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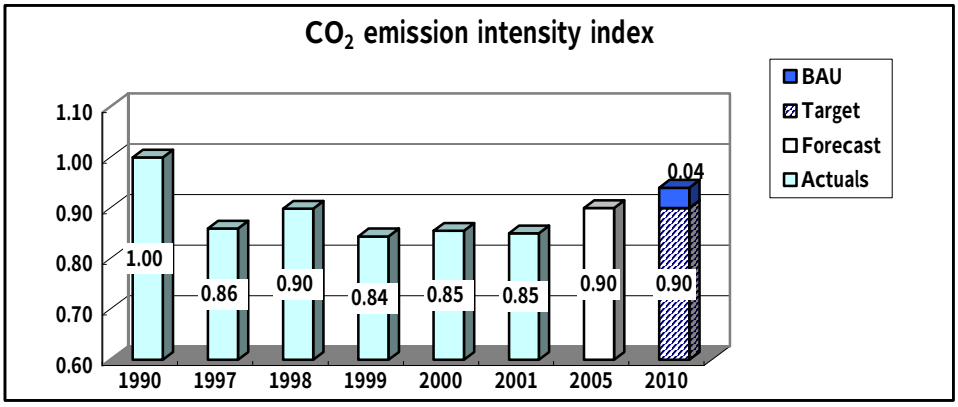
Note: The principal product of the industry is soft drinks. There were 32 respondent companies to the follow-up survey, representing 53.9% of production. Carbon dioxide emissions were calculated by aggregating data from the 32 member companies. The industry's forecasts for fiscal 2010 assume an annual increase in production of 1%.

* Energy consumption intensity targets are currently under review.

The Japanese Shipowners' Association

To reduce carbon dioxide emissions in 2010 on a per-unit transported basis by approximately 10% compared with 1990.

1. Progress toward target



Assigning a value of one (1) to the fiscal 1990 carbon dioxide emission intensity index gives 0.86 in fiscal 1997, 0.90 in fiscal 1998, 0.84 in fiscal 1999, and 0.85 in fiscal 2000 and 2001. The industry is forecasting an index of 0.90 in fiscal 2005, and is targeting an index of 0.90 in fiscal 2010. The unit of production on which carbon dioxide emissions are based is unit of cargo transported.

3. Steps taken to achieve targets

- Major
  - Conversion to new, more efficient ships, and use of energy-efficient equipment
  - Research into and use of navigational aid systems to facilitate optimum route plotting
  - Research into and implementation of shipboard energy-saving operating technology, and strict compliance with energy-saving initiatives
  - Initiatives to improve fuel consumption, including research into and implementation of effective use of waste energy, and more efficient propulsion
  - Ship design optimized for more efficient transport
  - Energy conservation initiatives in on-shore offices, including adjusting heating and cooling temperatures, running time, and use of energy-efficient office automation

- Fiscal 2001 actual
  - Measures to improve propulsion efficiency, such as regular ship cleaning and painting, and propeller grinding
  - Measures to improve main engine combustion efficiency, such as thorough maintenance of fuel and air bleed valves

- Selection of optimum routes to reduce higher fuel consumption from external disturbance, and where schedules permit, lowering cruising speed to reduce energy consumption

4. Factors accounting for increases or decreases between fiscal 1990 and 2001

Although carbon dioxide emissions have been increasing over the last decade due to expansion of freight volumes, the aforementioned initiatives are lowering the energy intensity as targeted. Freight volumes are up 38.3% since fiscal 1990, but the increase in carbon dioxide emissions over the same period was just 18.2%.

6. Other global warming initiatives

- Emissions from offices and in-house distribution

  Energy conservation initiatives in on-shore operational centers will be ongoing, including adjusting air conditioning and heater settings and running times, and installing energy conserving office automation**.**

- Greenhouse gases other than carbon dioxide
  - The industry will monitor development of refrigerants that have minimal global warming impact with a view to adopting them to replace chlorofluorocarbon substitutes such as HFCs used in air conditioning equipment, food warehouses, and reefer containers. It will also endeavor to prevent the escape of HFC gases into the atmosphere during servicing and repair work.

7. Environmental management and conservation in overseas business activities

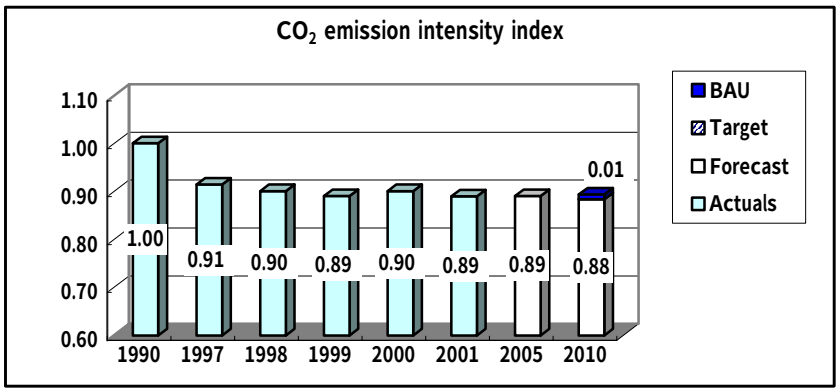
- Environmental management systems: the industry will continue in its endeavors to protect the environment, and will consider the introduction of environmental management systems, with a view to ISO14000 certification (environmental management standards).

Note: The industry is involved in ocean shipping generally, but the targets in this report apply only to overseas shipping. The number of companies participating in the follow-up survey was 37, representing 834.85 million tons of freight (in fiscal 2001). Carbon dioxide emission intensity is the figure derived by dividing the total volume of fuel consumed by the 37 companies that transported cargo by ocean liner, by the volume of cargo transported. Estimates of fiscal 2010 cargo volumes were drawn from the most recent five-year trends in freight volumes of Japanese mercantile fleet (Source: Ministry of Land, Infrastructure and Transport). Carbon dioxide emissions vary with the distance that freight is transported, but for purposes of the survey, carbon dioxide emission intensity was calculated using only freight volumes.

The Scheduled Airlines Association of Japan

To reduce carbon dioxide emissions generated from the use of aviation fuel by 10% per unit of production (available seat kilometers) by fiscal 2010 compared with fiscal 1990.

1. Progress toward target



Note: A value of one (1) has been assigned to the fiscal 1990 intensity index.

Assigning a value of one (1) to the fiscal 1990 carbon dioxide emission intensity index per available seat kilometers gives indices of 0.91 in fiscal 1997, 0.90 in fiscal 1998, 0.89 in fiscal 1999, 0.90 in fiscal 2000, and 0.89 in fiscal 2001. The airline industry is forecasting an index of 0.89 in fiscal 2005 and 0.88 in fiscal 2010.

3. Steps taken to achieve goals

- Major
  - Encouraging the introduction of new aircraft models with improved fuel efficiencies (12 new aircraft in service in fiscal 2001)
  - Establishing shorter routes and flying times, and more precise operation through communication, navigation, and surveillance/air traffic management (CNS/ATM)
  - Choosing optimum altitudes and speeds, and the shortest possible routes for daily services
  - Loading aircraft with optimum amounts of fuel, using lighter aircraft/cabin equipment and cabin servicing items, limiting use of Auxiliary Power Units, reducing in-flight crew training and JCAB check time using flight simulators, and implementing shorter engine test times

- Fiscal 2001 actual

In fiscal 2001, the industry took 12 older aircraft out of service, replacing them with 12 new or leased aircraft with improved fuel efficiency (the total cost including leasing costs and investment was ¥90 billion).

4. Factors accounting for increases or decreases between fiscal 1990 and 2001

Air transport demands have increased in the last 11 years, which has in turn caused carbon dioxide emissions to rise. The aforementioned initiatives have nevertheless reduced the target emission intensity, and in contrast to an 80% increase in available seat kilometers, carbon dioxide emissions have grown by only 57% (including cargo flights and non-member airlines).

6. Other global warming initiatives

- Emissions from offices and in-house distribution

Industry members have typically endeavored to conserve energy by managing air conditioner temperature settings and the timing and duration of supply, and by seeking to save electricity and water at operating centers. These activities are ongoing for further improvement. In relation to machinery and equipment, the industry has also made it a practice to introduce the most energy-efficient models available at the time, and will continue to do so.

- Greenhouse gases other than carbon dioxide

The industry is limiting emissions of substitute fluorocarbons by recovering and recycling them, and by preventing their leakage during servicing and repair of equipment that uses them (use of advanced gas recovery equipment has facilitated a recovery rate of almost 100%).

7. Environmental management and conservation in overseas business activities

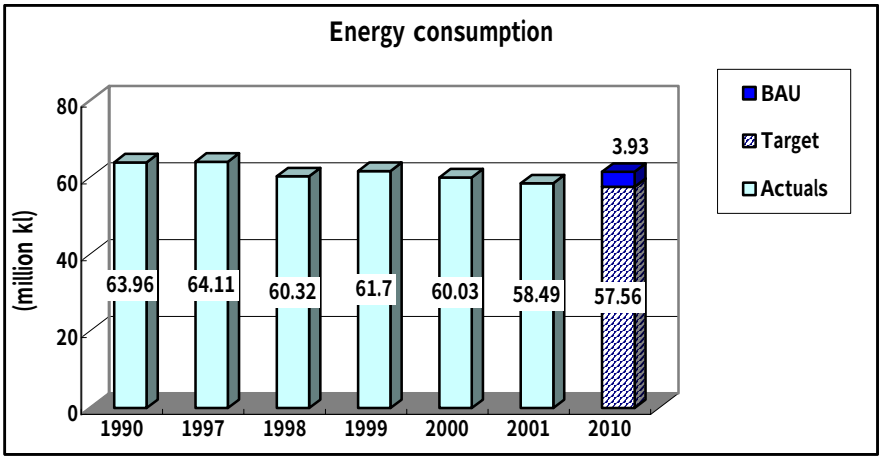
- Industry members are encouraged either to acquire ISO14001 certification, or establish environmental management systems based on ISO14001 requirements. Companies that are already certified are pursuing further improvements.
- Industry members abide by the rules and regulations applicable at overseas airports, and satisfy the environmental requirements of each airport.

Note: The principal business of the Scheduled Airlines Association of Japan is providing regular air transport services over domestic and international routes. The participation rate in the follow-up survey was almost 100 %; all 13 member companies responded.

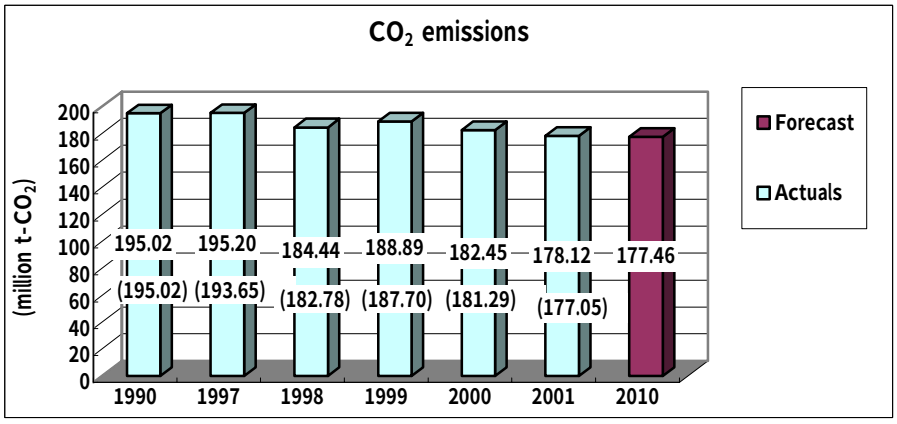
The Japan Iron and Steel Federation

Targets: To reduce the amount of energy consumed in 2010 by 10% from the fiscal 1990 base year. In an additional initiative, the industry will seek to recycle an amount of waste plastic equivalent to 1.5% of the energy consumed in fiscal 1990, in blast furnaces, etc. (assuming the establishment of a collection system).

1. Progress toward target



2. Carbon dioxide emissions



Note: The figures in parenthesis represent emissions reflecting carbon dioxide coefficients given by the electric power industry each year.

The steel industry has recorded the following energy consumption (in crude oil equivalents): 63.96 million kl in fiscal 1990; 64.11 million kl in fiscal 1997; 60.32 million kl in fiscal 1998; 61.70 million kl in fiscal 1999; 60.04 million kl in fiscal 2000; and 58.49 million kl in fiscal 2001. It has set a target of 57.56 million kl for fiscal 2010. Assuming the establishment of a waste collection system, if the industry is able to implement an additional initiative to make effective use of waste plastic in blast furnaces, coke ovens,

etc., the target for fiscal 2010 will be 56.60 million kl.

The steel industry has recorded the following carbon dioxide emissions (not including emissions from industrial processes): 195.02 million t-CO_2 in fiscal 1990; 195.20 million t-CO_2 in fiscal 1997; 184.44 million t-CO_2 in fiscal 1998; 188.89 million t-CO_2 in fiscal 1999; 182.45 million t-CO_2 in fiscal 2000; and 178.12 million t-CO_2 in fiscal 2001. It is forecasting emissions of 177.46 million t-CO_2 in fiscal 2010—9% less than in fiscal 1990.

Moreover, carbon dioxide emissions from limestone and dolomite, two non-energy sources of carbon dioxide, were 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; 10.3 million t-CO_2 in fiscal 2000; and 10.1 million t-CO_2 in fiscal 2001.

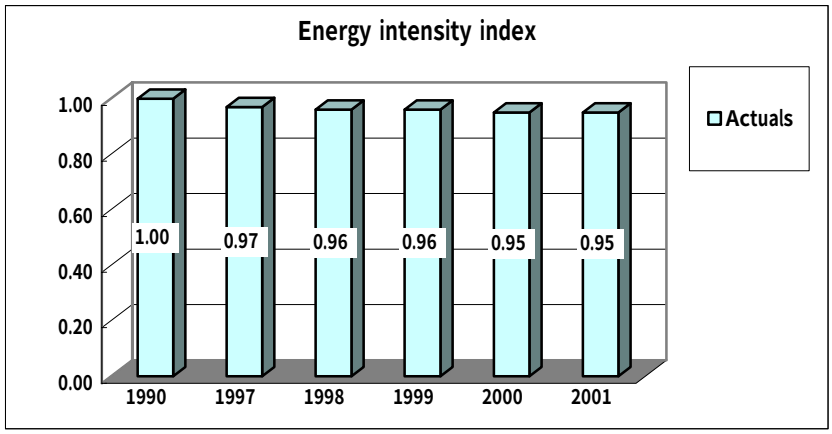
3. Steps taken to achieve goals

- Major
  - Initiatives to conserve energy in the steel production process (including making waste-energy recovery systems more common, promoting greater efficiency in production facilities, and encouraging the introduction of next-generation iron and steel-making technology)
  - Effective use of waste plastics
  - Making untapped energy available to local communities
  - Contributing to society's energy conservation through products and by-products
  - Contributing to energy conservation through international technical cooperation (including JI and CDMs)

- Fiscal 2001 actual

  The following are the key initiatives implemented in fiscal 2001.
  - Improving reheating furnace efficiency (including introducing regenerative burners)
  - More recovery of waste energy from CDQ, TRT, sintering machines, etc.
  - More efficient private power generation plants
  - Better control of motor revolutions in dust collectors
  - Consolidation of facilities
  - Improved hot charge ratio
  - Greater efficiency in coal moisture control equipment
  - Waste plastics recycling into blast furnaces, coke ovens, etc.

5. Reference data



Assigning a value of one (1) to the corrected fiscal 1990 energy intensity index gives 0.97 in fiscal 1997, 0.96 in fiscal 1998, 0.96 in fiscal 1999, 0.95 in fiscal 2000, and 0.95 in fiscal 2001.

6. Other global warming initiatives

- Contributions to the consumer goods and transport sectors (impact on products and services)

  The industry has been proactive in developing high-performance steel products that exploit steel's metallic attributes, such as high-strength steel sheets for automobiles, electrical steel sheets for transformers, and ultra-thin steel sheets for cans. Through their use, each is making a significant social contribution to energy conservation. In the period from fiscal 1990 to fiscal 2000, there were 6 typical high-performance steel products that were manufactured (wide-flange shapes for buildings construction, heat-resistant steel tubing for boilers, high-strength steel sheets for automobiles, high-strength steel plates for ships, electrical steel sheets for transformers, and stainless steel sheets for electric trains). It is estimated their social contribution during application as of fiscal 2000, in terms of limiting carbon dioxide emissions, has been approximately 6.5 million t-CO_2.

- Projects implemented with regard for the Kyoto Mechanism
  - Work has been completed on eleven "Green Aid Plan" model projects for the efficient use of energy in China and Thailand since 1995, and a further one is underway in India. Additionally, 4 of the model projects—2 each in China and Thailand—were agreed upon with the respective countries as Activities Implemented Jointly (AIJ), and therefore had official recognition at a national level. (The estimated annual energy saving effect achieved from completed model projects is 356,400 t-CO_2 per year.)
  - To explore the feasibility of future JI or CDMs, the industry has evaluated a number of national (NEDO) projects since fiscal 1998 (Basic Survey Project for Joint Implementation, etc.). The industry was commissioned to conduct 7 project studies

in fiscal 1998, 15 in fiscal 1999, 6 in fiscal 2000, and 8 in fiscal 2001. (The Basic Survey Project for Joint Implementation, etc. estimated that carbon dioxide reductions achieved were 10.78 million t-CO_2 in fiscal 1998, 4.624 million t- CO_2 in fiscal 1999, and 1.521 million t- CO_2 in fiscal 2000.)

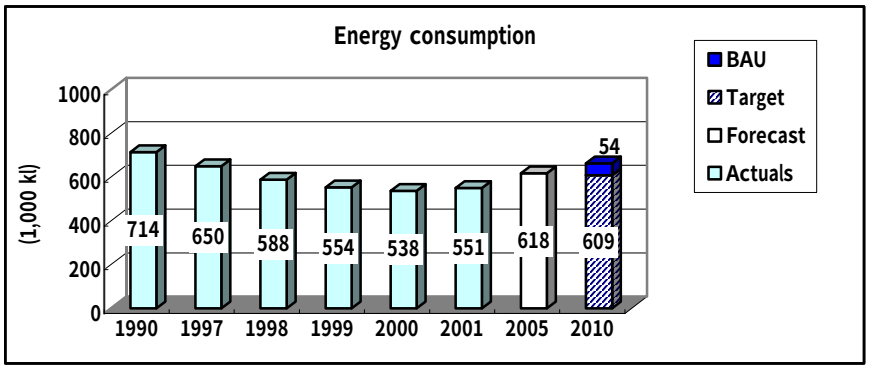
Note: The scope of voluntary action plans by the iron and steel industry includes not only the iron and steel sector, but in relation to energy consumption, extends also to some associated companies with organic links to industry, such as in the handling of coking coal. It therefore includes energy from sectors in which it can be difficult to extract information from national statistics. For that reason, original reports used by individual companies in reporting statistics to government were used to compile data. For non-participating companies (outsiders), designated statistics (The Current Survey of Energy Consumption) were used to calculate energy consumption volumes, to achieve 100% coverage from both participating and non-participating companies.

The fiscal 1990 carbon dioxide emission intensity figure for electricity, of 0.102 kg-C/kWh, has been used for the period fiscal 1997 to 2010. The forecast for crude steel production in fiscal 2010 has been assumed to be on the order of 100 million tons. In calculating the corrected energy intensity, crude steel production was deemed to be 100 million tons, and production conditions were corrected to fiscal 1990 levels.

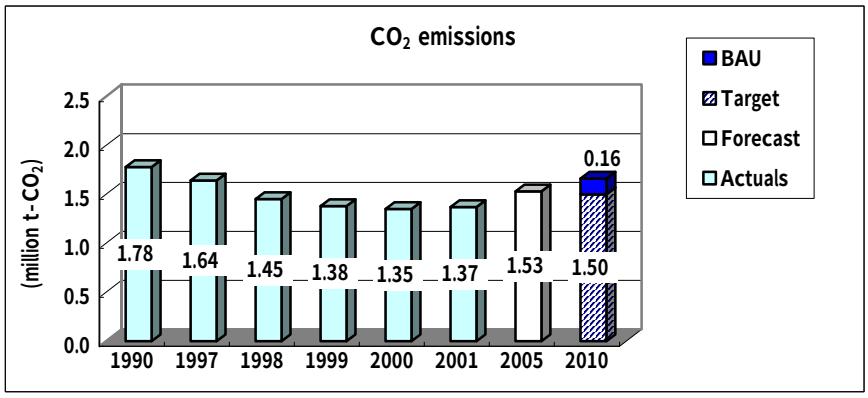
Flat Glass Manufacturers Association of Japan

To reduce the amount of energy used in the production process by 14% of the amount consumed in fiscal 1990 by fiscal 2005, and by 15% by fiscal 2010.

1. Progress toward goal



2. Carbon dioxide emissions



Note: The figures do not include emissions originating from raw materials.

The flat glass industry has consumed the following amounts of energy: 714,000 kl in fiscal 1990; 650,000 kl in fiscal 1997; 588,000 kl in fiscal 1998; 554,000 kl in fiscal 1999; 538,000 kl in fiscal 2000; and 551,000 kl in fiscal 2001—a reduction in fiscal 2001 of 22.8% on fiscal 1990 levels. It is forecasting consumption of 618,000 kl in fiscal 2005, and targeting 609,000 kl in fiscal 2010—14% and 15% declines, respectively, compared with fiscal 1990. If voluntary action plans were not implemented, energy consumption would be 663,000 kl in fiscal 2010—a 7% reduction on fiscal 1990 levels.

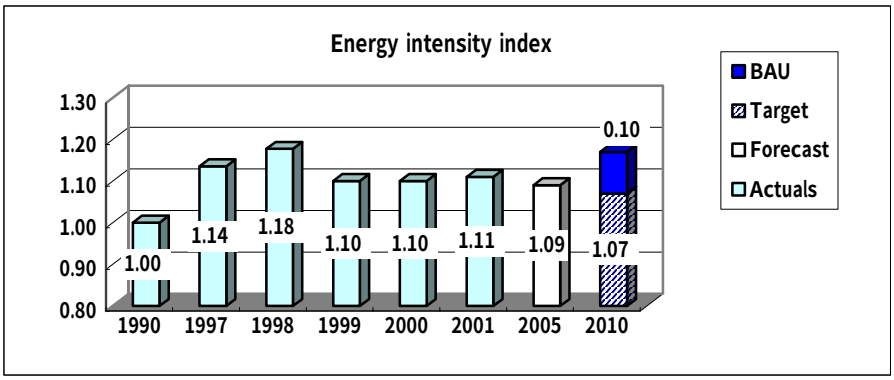
The industry has recorded the following carbon dioxide emissions: 1.784 million t-CO_2 in fiscal 1990; 1.452 million t-CO_2 in fiscal 1998; 1.379 million t-CO_2 in fiscal 1999; 1.347 million t-CO_2 in fiscal 2000; and 1.375 million t-CO_2 in fiscal 2001—a reduction in fiscal 2001 of 22.9% on fiscal 1990 levels. Reductions achieved are attributed to less

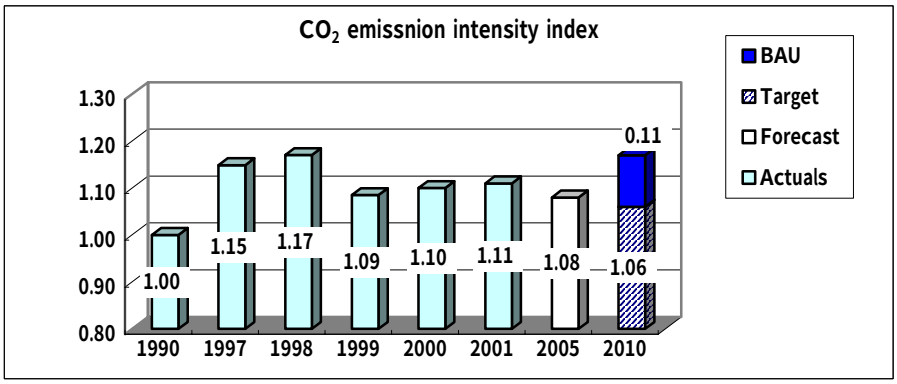
production and more efficient use of energy. Forecasts are for 1.528 million t-CO_2 in fiscal 2005 and 1.498 million t-CO_2 in fiscal 2010—14% and 16% less, respectively, than in fiscal 1990. If voluntary action plans were not implemented, emissions in fiscal 2010 would be 1.66 million t-CO_2—7% less than in fiscal 1990.

3. Steps taken to achieve goals

- Major
  - (1) Initiatives implemented, or ongoing
    - ① More efficient production achieved by scrapping and consolidating flat glass manufacturing plant and equipment (glass melting furnace)
    - ② More efficient heat recovery achieved through regular melting furnace maintenance (cold repair)
    - ③ Production consolidated to reduce losses per melting furnace from color and product changes
  - (2) Initiatives requiring long-term investigation
    - ① Development and introduction of new, energy-efficient combustion technology

5. Reference data





Assigning a value of one (1) to fiscal 1990 energy consumption intensity gives indices of 1.18 in fiscal 1998, 1.10 in both fiscal 1999 and 2000, and 1.11 in fiscal 2001. The industry is forecasting indices of 1.09 in fiscal 2005 and 1.07 in fiscal 2010.

Assigning a value of one (1) to fiscal 1990 carbon dioxide emission intensity gives indices of 1.17 in fiscal 1998, 1.09 in fiscal 1999, 1.10 in fiscal 2000, and 1.11 in fiscal 2001. The industry is forecasting indices of 1.08 in fiscal 2005 and 1.06 in fiscal 2010.

6. Other global warming initiatives

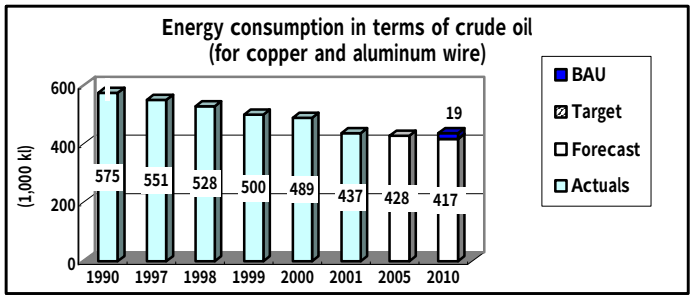
- Contributions to the consumer goods and transport sectors (impact on products and services)
  - Encouraging the use of sealed insulating glass, with the objective of promoting energy-saving, through improved insulation performance from openings in buildings

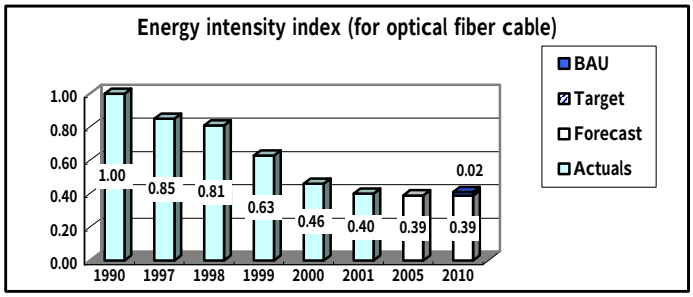
Note: The principal product of the industry is flat glass. The rate of participation in the follow-up survey was 100% (3 companies out of 3), representing 100% of the energy consumed by the industry (in production only). Carbon dioxide emissions were calculated by compiling fuel consumption values listed under 'Flat Glass' in the *Yearbook of Ceramics and Building Materials Statistics* (Ministry of Economy, Trade and Industry), and for each type of fuel, multiplying consumption by the carbon dioxide coefficient given as the standard by Keidanren, and summing the amounts. The forecast and target for fiscal 2010 were calculated based on the assumption that production in fiscal 2010 will remain at 1995 levels.

The Japanese Electric Wire & Cable Makers' Association

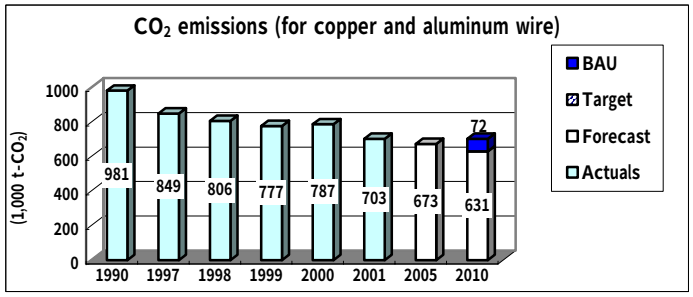
1. Energy-savings targets for copper and aluminum wire
   To keep energy consumed in copper and aluminum wire production plants in fiscal 2010 at fiscal 1990 levels.
2. Energy-savings targets for optical fiber cable
   To reduce the energy intensity per unit of length produced in optical fiber cable production plants in fiscal 2010 by 35% compared with fiscal 1990.

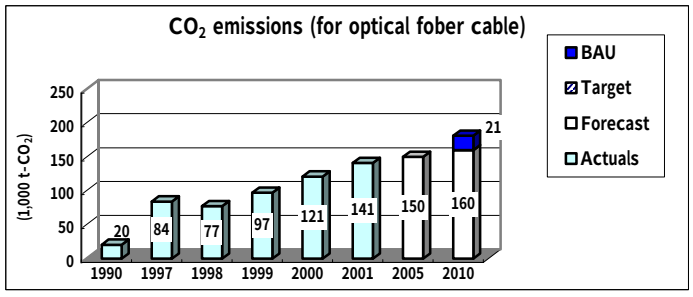
1. Progress toward goal





2. Carbon dioxide emissions





Energy consumption in copper and aluminum wire production plants was: 575,000 kl in fiscal 1990; 551,000 kl in fiscal 1997; 528,000 kl in fiscal 1998; 500,000 kl in fiscal 1999; 489,000 kl in fiscal 2000; and 437,000 kl in fiscal 2001. The decline in consumption in fiscal 2001 is attributed to lower production levels, and improvements in energy efficiency. The industry is forecasting consumption of 428,000 kl in fiscal 2005 and 417,000 kl in fiscal 2010—26% and 27% declines, respectively, compared with fiscal 1990. If voluntary action plans were not implemented, the forecast for consumption in fiscal 2010 would be 436,000 kl—24% less than in fiscal 1990.

Assigning a value of one (1) to the fiscal 1990 energy intensity index for optical fiber cable gives 0.85 in fiscal 1997, 0.81 in fiscal 1998, 0.63 in fiscal 1999, 0.46 in fiscal 2000, and 0.40 in fiscal 2001. The industry is forecasting indices of 0.39 in fiscal 2005 and 0.39 in fiscal 2010. If voluntary action plans were not implemented, the forecast would have been for an index of 0.41 in fiscal 2010.

Carbon dioxide emissions attributable to copper and aluminum wire production were: 981,000 t-CO_2 in fiscal 1990; 849,000 t-CO_2 in fiscal 1997; 806,000 t-CO_2 in fiscal 1998; 777,000 t-CO_2 in fiscal 1999; 787,000 t-CO_2 in fiscal 2000; and 703,000 t-CO_2 in fiscal 2001. The industry is forecasting emissions of 673,000 t-CO_2 in fiscal 2005 and 631,000 t-CO_2 in fiscal 2010, representing 31% and 36% reductions, respectively, compared with fiscal 1990. If voluntary action plans were not implemented, carbon dioxide emissions in fiscal 2010 would be 703,000 t-CO_2—a 28% decline compared with fiscal 1990.

Carbon dioxide emissions from optical fiber cable production were: 20,000 t-CO_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; 121,000 t-CO_2 in fiscal 2000; and 141,000 t-CO_2 in fiscal 2001. Forecasts are for emissions of 150,000 t-CO_2 in fiscal 2005 and 160,000 t-CO_2 in fiscal 2010, representing 650% and 700% increases, respectively, compared with fiscal 1990. If voluntary action plans were not implemented, carbon dioxide emissions in fiscal 2010 would be 181,000 t-CO_2—an 805% increase compared with fiscal 1990.

3. Steps taken to achieve goals

- Major
  - Increased energy efficiency (existing equipment upgraded to the newest and most up-to-date models)
  - Reduction in energy losses
  - Energy-saving improvements in wire manufacturing processes
  - Energy-saving initiatives applied to production of optical fiber cable

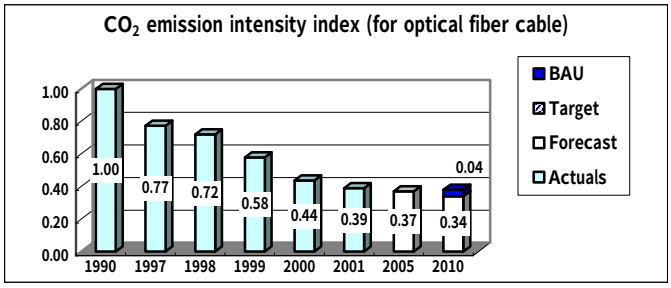
- Fiscal 2001 actual

The Association conducted three-monthly checks of energy consumption as part of its effort to promote global warming initiatives by member companies

4. Factors accounting for increases or decreases between fiscal 1990 and 2001

- Copper or aluminum wire production: Lower production levels and initiatives to improve energy efficiency in fiscal 2001 caused carbon dioxide emissions to drop
- Optical fiber cable production: Improvements were made in energy efficiency, and in the operational efficiency of facilities, but growth in production in fiscal 2001 resulted in a rise in carbon dioxide emissions

5. Reference data



Assigning a value of one (1) to the index of carbon dioxide emission intensity for optical fiber cable in fiscal 1990 gives 0.77 in fiscal 1997, 0.72 in fiscal 1998, 0.58 in fiscal 1999, 0.44 in fiscal 2000, and 0.39 in fiscal 2001. The industry is forecasting indices of 0.37 in fiscal 2005, and 0.33 in fiscal 2010.

6. Other global warming initiatives

- Emissions from offices and in-house distribution

Energy consumption associated with in-house distribution in the electrical wire and cable industry was 63,000 kl in fiscal 1996; 56,000 kl in fiscal 1997; 50,000 kl in fiscal 1998; 48,000 kl in fiscal 1999; 49,000 kl in fiscal 2000; and 43,000 kl in fiscal 2001. The goal for fiscal 2010 is 42,000 kl.

- Greenhouse gases other than carbon dioxide

The industry has implemented initiatives to prevent leakage of SF_6 and HFCs during servicing and repair, and to recover and recycle gases.

7. Environmental management and conservation in overseas business activities

To ensure member commitment to voluntary action and continuous improvement in relation to environmental problems, companies are endeavoring to either introduce or configure environmental management systems. As of August 2001, 53 of the Association's

143 member companies had obtained ISO14001 certification.

As a matter of course, companies strive to comply with local environmental standards applicable to their overseas business activity, in addition to meeting the requirements of the "Ten-Points-Environmental Guidelines for the Japanese Enterprises Operating Abroad," in the Keidanren Global Environmental Charter. Japanese environmental and other standards provide further guidelines for initiatives to protect the environment.

Note: The principal products of this industry are copper, aluminum, and optical fiber cable. The participation in the follow-up survey was 93% (133 companies).

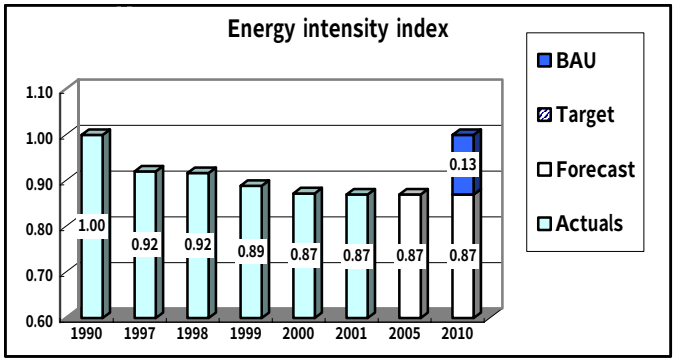
It has been assumed that production of copper and aluminum wire to fiscal 2001 will remain steady thereafter, and that the annual rate of improvement in energy intensity will be 0.5%. Production of optical fiber cable has been assumed to increase at an annual rate of 2.8% from fiscal 2001, and its energy intensity will improve at a rate of 0.5% per annum.

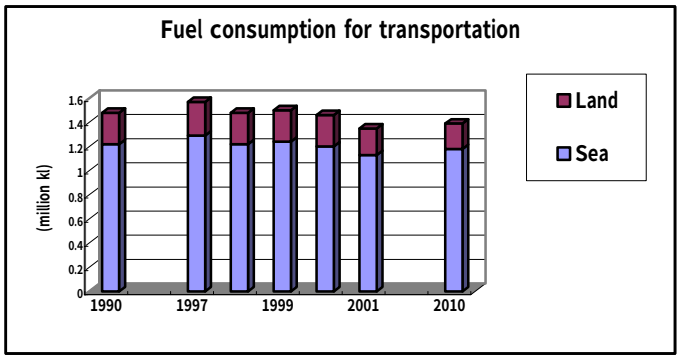
Petroleum Association of Japan

<Production and distribution>
Targets for energy conservation in fiscal 2010 compared with fiscal 1990:
- A 10% reduction in energy consumption intensity at oil refineries
- A 9% reduction in fuel used to transport petroleum products

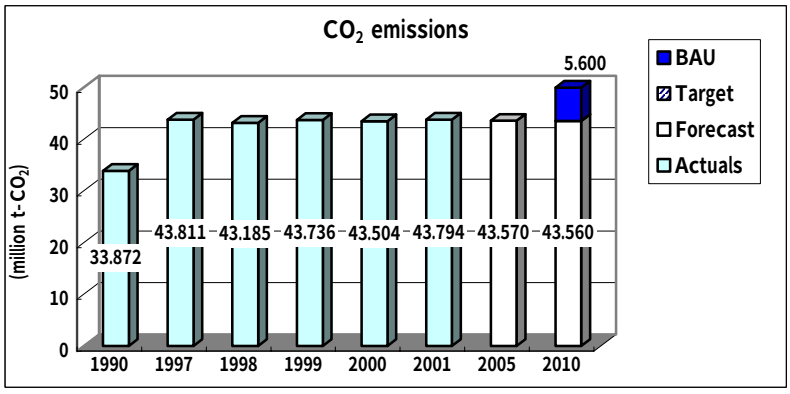
<Consumption>
- An annual energy saving of 1.4 million kl through greater use of cogeneration

1. Progress toward target





2. Carbon dioxide emissions



Assigning a value of one (1) to the energy intensity index of oil refineries in fiscal 1990 gave 0.92 in fiscal 1997, 0.92 in fiscal 1998, 0.89 in fiscal 1999, 0.87 in fiscal 2000, and 0.87 in fiscal 2001. The industry is forecasting an index of 0.87 in fiscal 2005, and has set a target of 0.90 for fiscal 2010. In transport by both land and sea, the industry has consumed the following amounts of energy: 1.51 million kl in fiscal 1990; 1.56 million kl in fiscal 1997; 1.47 million kl in fiscal 1998; 1.50 million kl in fiscal 1999; 1.45 million kl in fiscal 2000; and 1.35 million kl in fiscal 2001. The fiscal 2010 target is 1.37 million kl—a 9% reduction compared with fiscal 1990.

Oil refineries have emitted the following amounts of carbon dioxide: 33.87million t-CO_2 in fiscal 1990; 43.81 million t-CO_2 in fiscal 1997; 43.19 million t-CO_2 in fiscal 1998; 43.74 million t-CO_2 in fiscal 1999; 43.50 million t-CO_2 in fiscal 2000; and 43.79 million t-CO_2 in fiscal 2001. Production volumes and energy consumed by secondary processing equipment are both increasing due to a shift toward demand for lighter products as well as environmental and quality initiatives, but carbon dioxide emissions fell in fiscal 2000. The factors contributing to that drop were efforts to conserve energy and the integration and closure of oil refineries. The forecasts are for 43.57 million t-CO_2 in fiscal 2005, and 43.56 million t-CO_2 in fiscal 2010—increases of 29% on fiscal 1990. If voluntary action plans were not implemented, carbon dioxide emissions in fiscal 2010 would be 49.16 million t-CO_2—a 45% increase compared with fiscal 1990.

3. Steps taken to achieve targets

- Major
  - Energy conservation initiatives at oil refineries (sophisticated management of energy conservation; less steam; recovering waste heat; development and introduction of new technology)
  - More efficient land transport (larger lorries; better fuel efficiency; larger loads)
  - More efficient sea transport (less loads transported; larger ships; shorter distances)
  - Conservation initiatives in the consumption sector (promotion of petroleum cogeneration)

- Fiscal 2001 actual

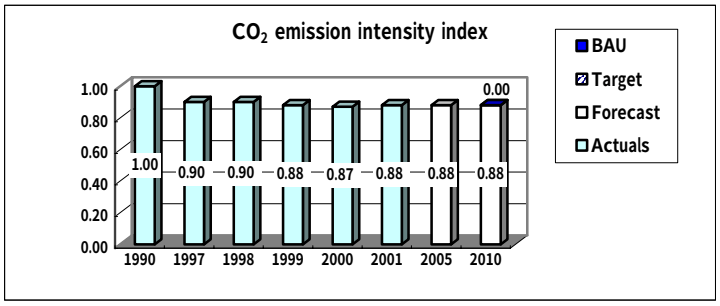
  Energy consumption intensity at oil refineries was improved 0.17 points year-on-year by the implementation of comprehensive energy-saving initiatives, including the following:

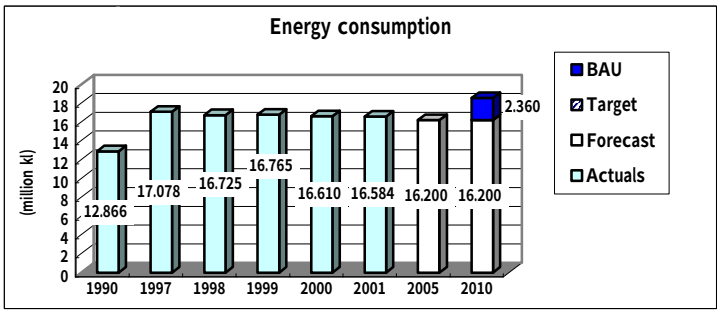
  - Sophisticated management of energy conservation (highly optimized machinery operation achieved through computerized control)

- Less steam (amount used, better management of pressure)
- Recovery of waste heat

* No data is available on the specific effect of each initiative or the scale of the investments.

5. Reference data





Assigning a value of one (1) to the index of carbon dioxide emission intensity in fiscal 1990 gives 0.90 in fiscal 1997, 0.90 in fiscal 1998, 0.88 in fiscal 1999, 0.87 in fiscal 2000, and 0.88 in fiscal 2001. The industry is forecasting indices of 0.88 in both fiscal 2005 and fiscal 2010, and if voluntary action plans were not implemented, an index of 0.88 in fiscal 2010. It has recorded the following levels of energy consumption (in 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; 16.61 million kl in fiscal 2000; and 16.58 million kl in fiscal 2001. The industry is forecasting energy consumption of 16.57 million kl in both fiscal 2005 and 2010—increases of 29% compared with fiscal 1990. If voluntary action plans were not implemented, consumption would be 19.05 million kl in 2010—48% more than in fiscal 1990.

6. Other global warming initiatives

- Contributions to the consumer goods and transport sectors (impact on products and services)

  By promoting the uptake of petroleum cogeneration, the industry expects to achieve annual energy savings of 1.4 million kl (in fuel-oil equivalents) each year through to fiscal 2010.

- Greenhouse gases other than carbon dioxide
  - The industry does not use HFCs or PFCs
  - SF_6 is used in breakers found in power receiving equipment, and when released, it is recovered in a closed environment
  - Approximately 7 tons of CH_4 is emitted annually through evaporation from tanks
  - 507 tons of N_2O is emitted annually from oil refining equipment

- Kyoto Mechanism projects

  Finalization of contracts for options on carbon dioxide emission rights in Australia

7. Environmental management and conservation in overseas business activities
   - As of the end of March 2002, 67 plants and other operational sites had obtained either ISO14001 certification or recognition for an equivalent system of environmental management.
   - Through the Petroleum Energy Center, NEDO, JICA, and other similar organizations, the industry is engaged in a number of overseas projects, including solar power development and energy conservation training.

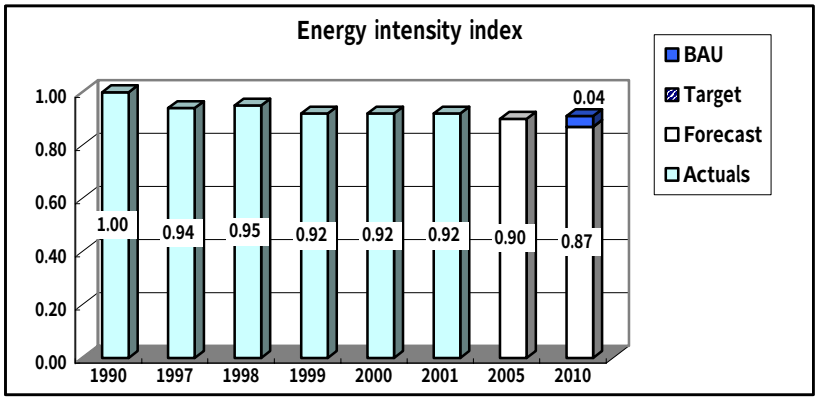
Note: The industry's principal products are gasoline, gas oil, LPG, jet fuel, naphtha, kerosene, fuel oil, asphalt, and others. All of the companies in the industry, including non-members of the Association, participated in the survey (22 companies out of 22), representing 100% of oil refining companies (excepting lubricant manufacture). Carbon dioxide emissions and energy consumption were calculated by aggregating the consumption of fuel by type, the energy consumption intensity at oil refineries, and the production volume of oil refineries (35), which are required under the Law concerning the Rational Use of Energy to submit regular reports. The fiscal 2010 targets and forecasts were calculated based on the target value for the energy consumption intensity at oil refineries after implementation of initiatives, and the BAU value was calculated based on the fiscal 1990 energy consumption intensity. The volume of crude oil processed, production volumes, and the proportion of purchased electricity in energy consumed are actuals for the most recent fiscal year.

Energy consumption intensity at oil refineries: Oil refinery operating rates for desulfurization and cracking units vary with type of crude oil and the nature of demand for products. To enable comparison of energy intensities, the figures must be adjusted to reflect the same operating conditions. The resulting revised values are known as the energy consumption intensity of oil refineries.

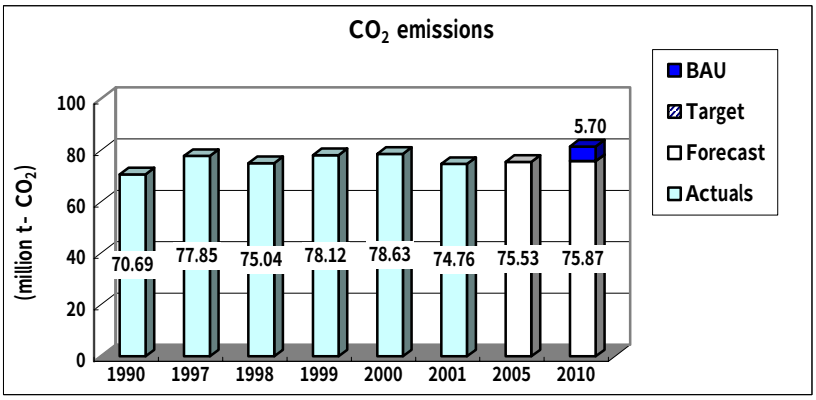
Japan Chemical Industry Association

(1) To endeavor to reduce energy intensity by 2010 to 90% of 1990 levels.
(2) To endeavor to develop the chemical industry's own unique catalytic technology, biotechnology, and environmentally responsible process technology.
(3) To contribute to initiatives to limit emission of carbonic gas in developing nations, in conjunction with transferring environmental conservation technology and energy-saving technology developed within the chemical industry in the course of expanding the industry's offshore business.

1. Progress toward target



2. Carbon dioxide emissions



Assigning a value of one (1) for fiscal 1990 energy intensity gives 0.94 in fiscal 1997, 0.95 in fiscal 1998, 0.92 in fiscal 1999, 0.92 in fiscal 2000, and 0.92 in fiscal 2001. The forecast is for indices in fiscal 2005 and 2010 of 0.90 and 0.87, respectively. From fiscal 2001, if voluntary action plans were not implemented, the forecast in fiscal 2010 would be for an index of 0.91.

Carbon dioxide emissions were: 70.69 million t-CO_2 in fiscal 1990; 77.85 million t-CO_2 in fiscal 1997; 75.04 million t-CO_2 in fiscal 1998; 78.12 million t-CO_2 in fiscal 1999;

and 78.63 million t-CO_2 in fiscal 2000. The forecasts for fiscal 2005 and 2010 are for 75.53 million t-CO_2 and 75.87 million t-CO_2, respectively, up 6.8% and 7.3%, respectively, on fiscal 1990. For the period after fiscal 2001, if voluntary action plans were not implemented the forecast for fiscal 2010 would be 81.57 million t-CO_2, up 15.4% on fiscal 1990. Carbon dioxide emissions in fiscal 2001 were down 3.864 million t-CO_2 compared with fiscal 2000. The result is attributed primarily to a decline in energy consumption, due to a significant fall in production (production index down 6 points). Compared with fiscal 1990, production was up 18%, but by improving energy intensity by 8%, carbon dioxide emissions were limited to an increase of 6%.

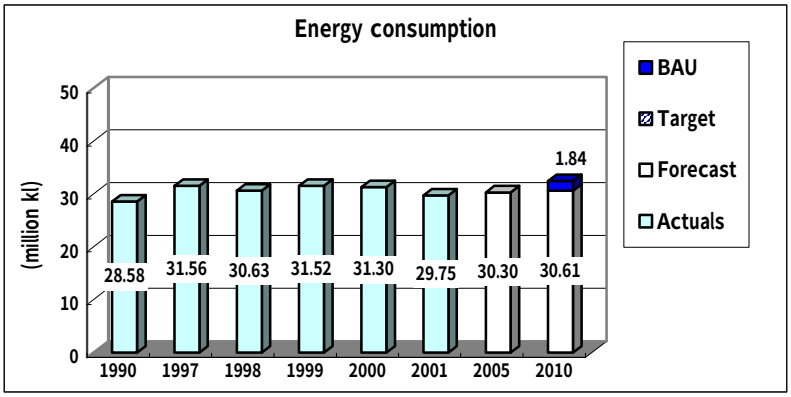
3. Steps taken to achieve goals

- Major
  - Improvements in operating methods
  - Recovery of waste energy
  - Process rationalization
  - Improvements in plant and machinery efficiency

- Fiscal 2001 actual

  Some 533 reports were received on energy-saving initiatives implemented in fiscal 2001, as part of the follow up survey on voluntary action plans. Of those, 42% related to improvements in the efficiency of plant and machinery, 29% to improvements in operating methods, 16% to recovery of waste energy, and 10% to process rationalization. Main investments were: (i) ¥1.2 billion for the construction of a waste plastic fuel plant, resulting in a reduction of 26,000 tons (in crude oil equivalents); (ii) ¥900 million for installing cogeneration boilers, resulting in a reduction of 4,000 tons; and (iii) ¥2 billion for changes to electrolytic manufacturing methods, resulting in a reduction of 3,500 tons.

5. Reference data



- Energy consumption in fiscal 2001

① Energy consumption fell 1.555 million kl year-on-year.

② The decline in energy consumption is attributed to a significant decline in production

(production index down 6 points), energy-saving initiatives, and changes in product mix.

③ Energy intensity did not change from last year, due to the effects of energy savings being offset by a decline in energy efficiency as a result of declining production.

- Fiscal 2010 forecasts

① Energy consumption is expected to increase by 7% compared with fiscal 1990.

② Carbon dioxide emissions are expected to increase by 7% compared with fiscal 1990.

③ The production index is expected to increase by 24% compared with fiscal 1990.

④ Energy intensity is expected to clear the targeted 90%, reaching 87% compared with fiscal 1990.

⑤ Working against the prediction that energy intensity will achieve 87% compared with fiscal 1990, however, are the following uncertainties, which suggest the fact that very stringent circumstances are anticipated, and the fact that considerable effort will be needed:

- For two years, in fiscal 2000 and fiscal 2001, energy intensity has hit a ceiling at 91% compared with fiscal 1990, suggesting that companies must be assuming a buildup of targets requiring considerable effort if the 2010 target of better than 90% is to be achieved.
- The production index is 124 compared with fiscal 1990, which incorporates a significant increase, and this may also be expected to have a considerable contributory effect on any improvement in intensity.

6. Other global warming initiatives

- Emissions from offices and in-house distribution

It has not been possible to quantify carbon dioxide emissions associated with office use and with distribution-associated transport, but reports have been received from many chemical companies about their efforts in furthering energy savings. For example, in the office-related area, (i) companies have converted to energy-efficient fluorescent lights from incandescent lights, (ii) management of cooling and heating is being optimized, (iii) companies are buying in energy-efficient office automation equipment, and (iv) lighting and exhaust fans are being automatically turned on and off after fitting automatic sensors. In the distribution sector, (i) companies are converting from transport by truck to trains and shipping, (ii) truck load efficiency is being improved, (iii) there is less use of external warehouses as internal storage space is being expanded, (iv) companies are joining with other companies in joint deliveries, and (v) companies are purchasing fuel-efficient hybrid vehicles.

- Contributions to the consumer goods and transport sectors

Many chemical products are making a contribution to reducing carbon dioxide emissions in other industries and in consumer goods applications. Examples include: (i)

sweat-absorbing and fast drying characteristics that create a comfortable environment even in weak air conditioning and make the wearer feel dry and cool; (ii) clothing materials made of hollow yarn, which trap a large quantity of air and therefore protect from the cold of winter, even in low heating; and (iii) the fact that many chemical companies are engaged in development of fuel cells, which it is anticipated will in the future make a significant contribution to reducing carbon dioxide.

- Green house gases other than carbon dioxide

  The industry has set voluntary targets for and is implementing voluntary action plans to reduce greenhouse gases in the PFC and SF_6 manufacturing sector. Progress in fiscal 2001 was steady. The emission intensity of PFCs was reduced 21% against the benchmark year (fiscal 2010 target: -30%), while that for SF_6 was similarly reduced 76% (target: -75%). The major initiatives were (i) preventing leakage by sealing manufacturing facilities, (ii) preventing leakage during the filling of gas bottles for shipment, and (iii) emphasizing the recovery and re-use of residual gas in recovered gas bottles.

7. Environmental management and conservation in overseas business activities

Of the 298 companies that participated in the follow-up survey, 92 publish environmental reports announcing their energy consumption and carbon dioxide emissions, and a further 46 have plans to do so. This equates to over 90% of the industry's energy use. Many chemical companies are also proactive through their offshore affiliates in energy saving activities. Examples of initiatives include (i) providing appropriate guidance with reference to reports received on energy consumption and carbon dioxide emissions, (ii) promoting introduction of heat-efficient equipment, (iii) introducing waste heat recovery equipment and effluent combustion equipment, and (iv) obtaining ISO14000 certification.

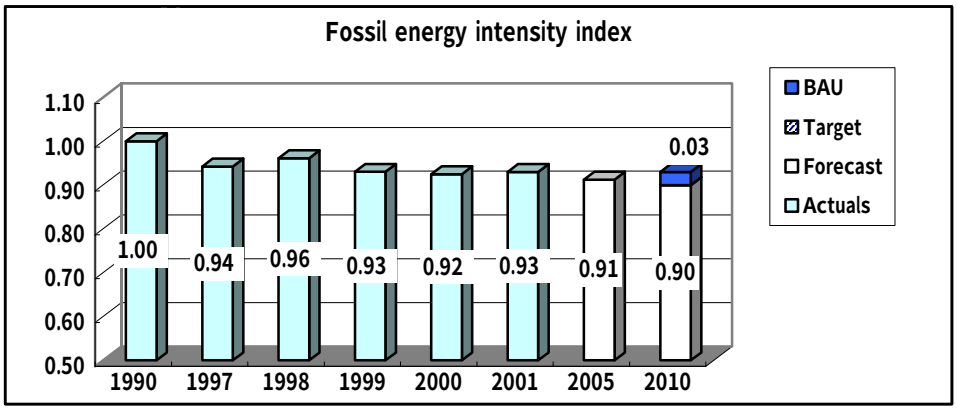
Note: The principal products of the industry are inorganic chemicals, organic chemicals, chemical fibers, and processed oils and fats. The latest follow-up survey covered 298 companies, representing 90% of the energy used by the industry.

Method of deriving data: Individual company fuel consumption data was compiled (by type of fuel), and consumption was multiplied by the carbon dioxide coefficient for each fuel type.

Japan Paper Association

To reduce fossil energy intensity per product by 10% of 1990 levels, by 2010.

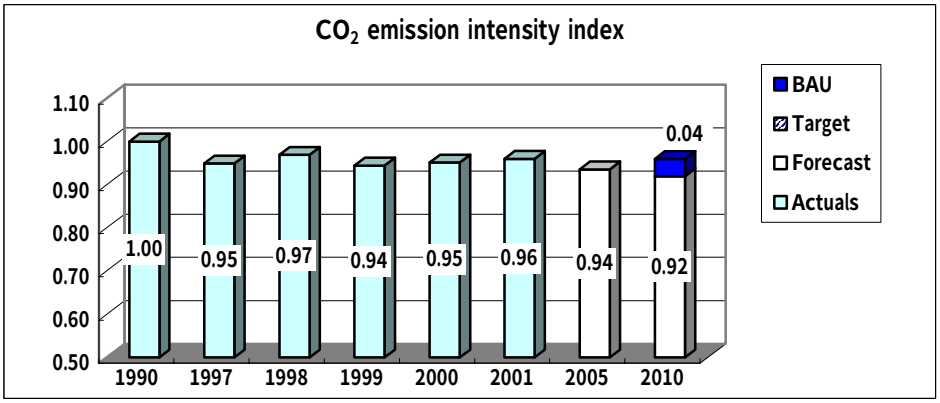
1. Progress toward target



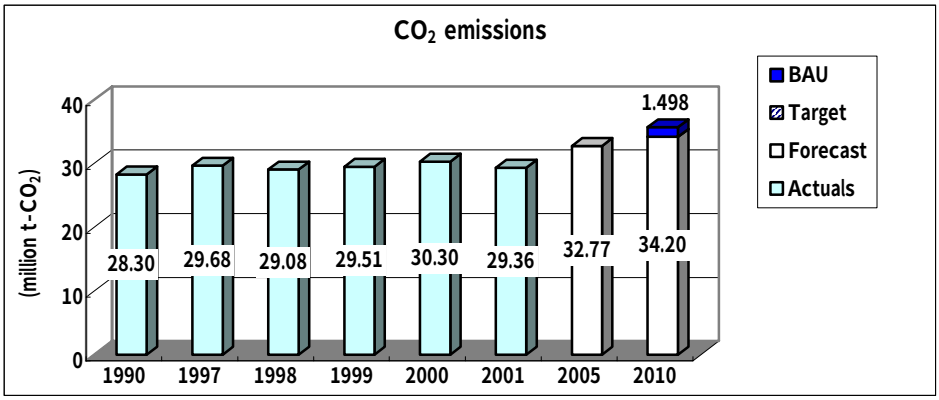
Note: A value of one (1) has been assigned to the fiscal 1990 intensity index.

Assigning a value of one (1) to the fiscal 1990 index of fossil energy intensity gives 0.93 in fiscal 2001. The intensity in fiscal 2001 increased year-on-year, reflecting reduced production levels in a sluggish economic climate, and environmental and product quality initiatives. The forecast for the index of fossil energy intensity is for 0.91 in fiscal 2005, and the fiscal 2010 target is 0.90.

2. Carbon dioxide emissions



Fossil energy intensity has steadily been reduced, but reductions in carbon dioxide intensity are lagging behind. The cause is the growing proportion of cheap coal being used.



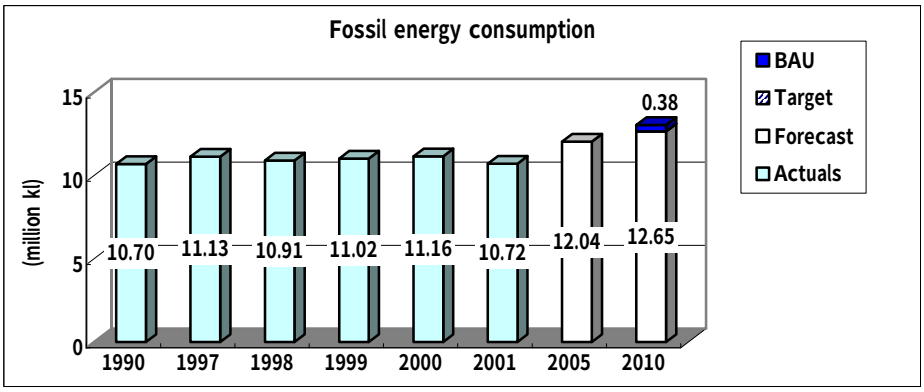
Production in fiscal 2001 was up 8.1% on 1990 levels, but carbon dioxide emissions were 29.36 million tons, staying within an increase of 3.7% compared with 1990.

3. Steps taken to achieve targets

- Major
  - Using pulp effluent and energy from waste
  - Actively introducing cogeneration
  - Actively introducing energy-efficient production facilities
  - Preventing heat loss and recovering and using waste heat
  - Conserving electricity consumed by pumps, fans, and agitators
  - Undertaking initiatives to conserve water and resources
  - Preventing leakage of gas from coolers

- Fiscal 2001 actual
  - Responses from 27 member companies indicated that 450 initiatives (including construction) were implemented in fiscal 2001, representing a total investment of ¥16.9 billion. Energy savings amounted to 193,000 kl in crude oil equivalents.
  - There were 76 separate investments over ¥10 million each, 22 in excess of ¥100 million each, and four in excess of ¥1 billion each.
  - In 28 cases, energy savings exceeded 500 kl per year (in crude oil equivalents), 28 cases achieved savings of over 1,000 kl per year, and three achieved savings of over 10,000 kl per year.
  - 60% of the investments involved process reform, or installation of very efficient equipment.

5. Reference data



Production in fiscal 2001 was up 8.1% on 1990, and improvements in intensity have kept consumption of fossil energy to an increase of 0.2% compared with 1990.

6. Other global warming initiatives

- Emissions from offices and in-house distribution
  - ① The industry is using larger trucks to transport products, and changing to freight trains or cargo vessels in its attempts to reduce carbon dioxide emissions.
  - ② Carbon dioxide emissions were reduced 13% by upgrading the centralized air conditioning and heating equipment in the research institute building (eight stories), improving efficiency, and converting to gas for fuel.
  - ③ Air conditioning and heating temperatures are being carefully managed, and lights are being turned off during the lunch hour.

- Contributions to the consumer goods and transport sectors
  - ① Transport efficiency has been improved by making tissue boxes more compact. Boxes were reduced in size from a thickness of 83 mm to 65 and 50 mm, resulting ultimately in estimated 35% improvement in carbon dioxide emission intensity.
  - ② The industry is working to make packaging lighter, and to recover and recycle pallets.

- Greenhouse gases other than carbon dioxide
  - ① The industry worked to prevent gas leakage and to recover gases when removing machinery from closing factories.
  - ② The industry has sought to prevent gas leakage when upgrading or installing coolers (in product facilities) and air conditioners.

- Kyoto mechanism projects
  - ① Paper manufacturers are extremely active in offshore plantations, and as of the end of 2001, such projects had achieved coverage of 300,000 hectares. The relevant locations are Brazil, Australia, Chile, New Zealand, Papua New Guinea, Vietnam,

South Africa, China, and Ecuador.

② The Association participated in the Feasibility Study on Reduction of CO_2 Emissions by Introducing Energy-saving Equipment in a Pulp & Paper Mill in Myanmar, set up by NEDO as a public subscription project. It submitted a report in which it estimated the annual reduction in carbon dioxide emissions that could be achieved would be 36,530 t-CO_2.

7. Environmental management and conservation in overseas business activities

① Of the 93 factories that responded to the survey, 62 (67%) have already acquired ISO14001 certification, and 10 (11%) intend acquiring certification. 74 plants (80%, including those already certified) manage their operations in accordance with ISO14001 guidelines, which indicates the high environmental awareness within the industry.

② The industry is a vigorous promoter of international afforestation projects, and some companies have gained international recognition, having received awards for their achievements from the countries in which they are operating such projects.

Note:

Basic data

The principal products of the industry are paper and paperboard. Participants in the follow-up survey numbered 40 companies (99 factories), representing 86% of national production.

Method of arriving at data

Fossil energy consumption was calculated using primary energy inputs into product categories designated by the Ministry of Economy, Industry and Trade in its Current Survey of Energy Consumption (pulp, paper, and paperboard). Carbon dioxide emissions values were arrived at by multiplying the fuel consumption figures (by type of fuel) by the carbon dioxide coefficient.

Assumptions underlying fiscal 2010 forecasts and targets

- Production

  The fiscal 2010 internal demand was estimated based on the forecast for GDP from fiscal 1995 to 2010 and the fiscal 1995 internal demand, using the elasticity of internal demand for paper and paperboard in relation to GDP from fiscal 1990 to 1995. These figures were then amended to allow for trade volumes to arrive at production levels (estimated in 1997).

- Consumption of fossil energy

  Fossil energy consumption was estimated from production forecasts, assuming that fossil energy intensity would improve by 10% on 1990 levels. The mix of fuel types was assumed to be the same as in fiscal 2001.

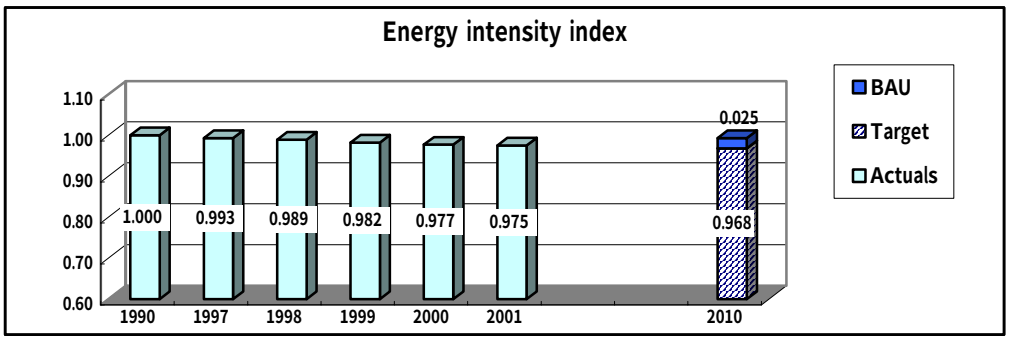
- Carbon dioxide emissions

  The aforementioned fuel consumption data (by fuel type) was multiplied by the carbon dioxide coefficient to calculate carbon dioxide emissions.

Japan Cement Association

To reduce energy intensity in cement manufacturing (regarding fossil fuels and purchased power) in fiscal 2010 by about 3% of the fiscal 1990 level.

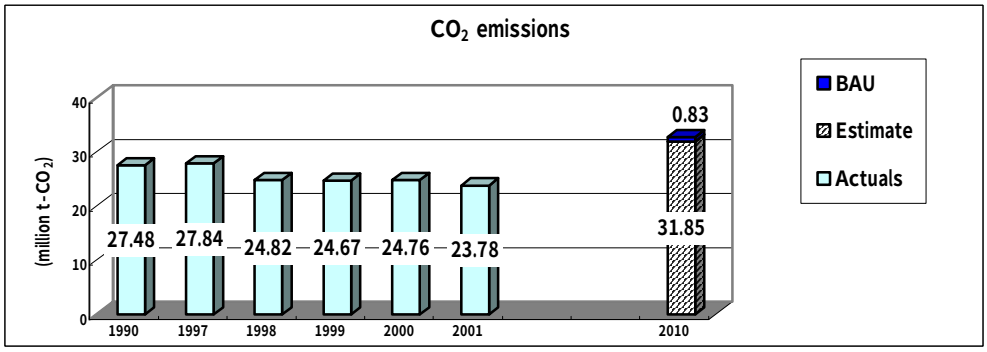
1. Progress toward target



Assigning a value of one (1) for the fiscal 1990 index of energy intensity in cement manufacturing gives 0.993 in fiscal 1997, 0.989 in fiscal 1998, 0.982 in fiscal 1999, 0.977 in fiscal 2000, and 0.975 in fiscal 2001, and the target for fiscal 2010 is 0.968.

2. Carbon dioxide emissions

(1) Energy-based sources (fossil fuels and purchased power)



Note: 1. The above figures do not include emissions from waste fuel.

2. Refer to footnote 3.

The cement industry has recorded the following carbon dioxide emissions: 27.48 million t-CO_2 in fiscal 1990; 27.84 million t-CO_2 in fiscal 1997; 24.82 million t-CO_2 in fiscal 1998; 24.67 million t-CO_2 in fiscal 1999; 24.76 million t-CO_2 in fiscal 2000; and 23.78 million t-CO_2 in fiscal 2001. The decline in fiscal 2001 emissions is attributed to a decline in production (down 4.0% on fiscal 2000). The industry is forecasting emissions of 31.85 million t-CO_2 in fiscal 2010— a 15.9% increase over fiscal 1990. If voluntary action plans were not implemented, emissions would be 32.68 million t-CO_2 in fiscal 2010—19% higher than in

fiscal 1990.

(2) Non-energy sources

Carbon dioxide emissions from limestone (a raw material) were 41.42 million t-CO_2 in fiscal 1990, 40.56 million t-CO_2 in fiscal 1997, 35.99 million t-CO_2 in fiscal 1998, 35.51 million t-CO_2 in fiscal 1999, 35.6 million t-CO_2 in fiscal 2000, and 34.73 million t-CO_2 in fiscal 2001.

3. Steps taken to achieve goals

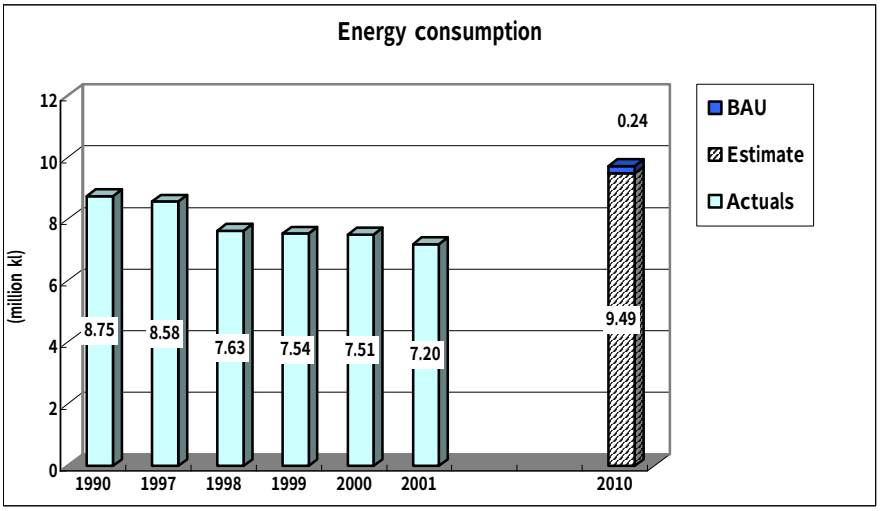
- Major
  - Promotion of the uptake of energy-efficient equipment
  - Greater use of industrial wastes as fuel
  - Greater use of other industrial waste materials
  - Use of a higher proportion of blended cement in production

- Fiscal 2001 actual

The Association received 92 reports of initiatives against global warming implemented in fiscal 2001, representing an investment of approximately ¥10 billion. The hoped-for reduction in energy use deriving from the investment is 153,000 kl in crude oil equivalents.

Initiative	Investment (¥billion)
• Promotion of the uptake of energy-efficient equipment	1.8
• Greater use of waste as fuel	3.0
• Greater use of waste in general	4.8
• Use of a higher proportion of blended cement production	0.3

5. Reference data



Energy consumption in cement manufacturing (in crude oil equivalents) was 8.75 million kl in fiscal 1990, 8.58 million kl in fiscal 1997, 7.63 million kl in fiscal 1998, 7.54

million kl in fiscal 1999, 7.51 million kl in fiscal 2000, and 7.20 million kl in fiscal 2001. The industry is forecasting consumption of 9.49 million kl in fiscal 2010—an 8.4% increase over fiscal 1990. If voluntary action plans were not implemented, consumption in fiscal 2010 would be 9.73 million kl—11.1% higher than in fiscal 1990.

6. Environmental management and conservation in overseas business activities

As of end March 2001, 27 of the 36 factories operating in Japan had acquired ISO14001 certification.

Note

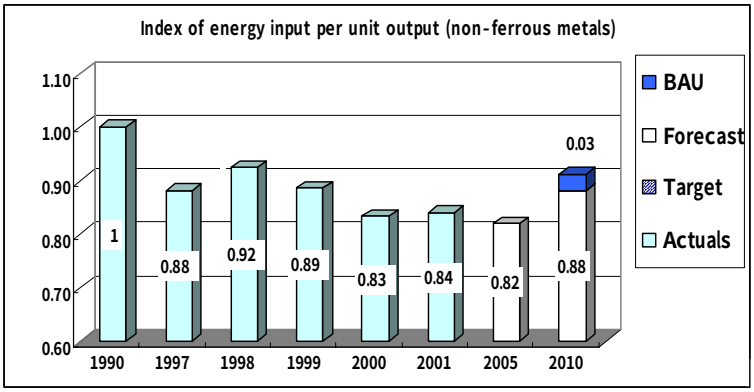
1. Basic data: The principal product of the industry is cement. The participation rate in the follow-up survey was 100% (20 companies out of 20), representing 100% of both production levels and energy consumed by the industry.
2. Method of arriving at data: Carbon dioxide emissions (other than for purchased power) were calculated by aggregating the fuel consumption of individual companies (by fuel type), and multiplying consumption by the carbon dioxide coefficient by type of fuel.
3. The estimate and targets for fiscal 2010 are based on the assumption that cement production will be 105 million tons in that year—11.9% higher than in fiscal 1990.

Japan Mining Industry Association

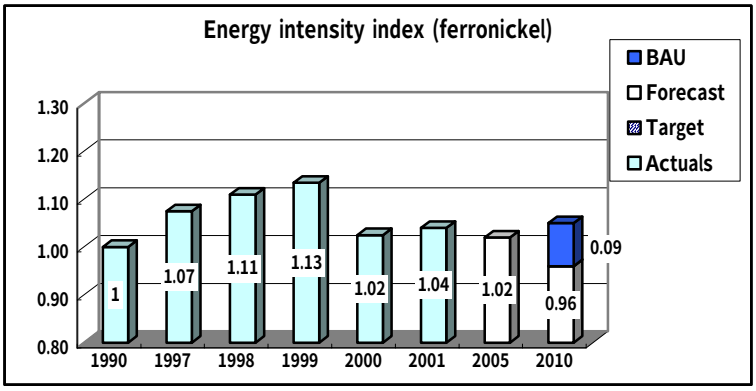
Compared with fiscal 1990, to reduce fiscal 2010 energy intensity as follows:

- By 12% in non-ferrous metals (copper, lead, zinc, nickel)
- By 5% in ferronickel

1. Progress toward target

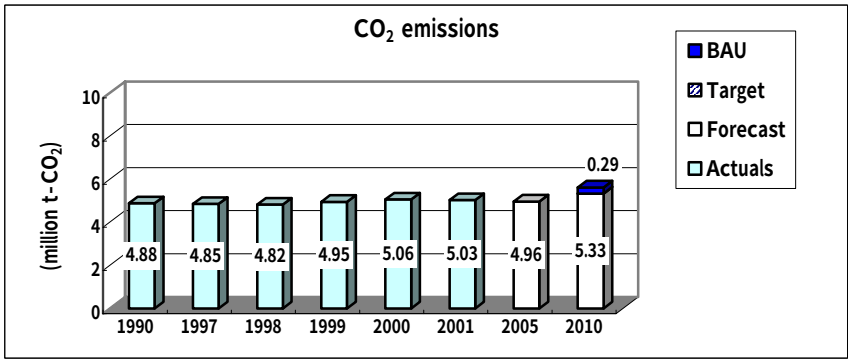


Non-ferrous metals



Ferronickel

2. Carbon dioxide emissions



Assigning a value of one (1) to the fiscal 1990 energy intensity index for production of non-ferrous metals (copper, lead, zinc, nickel) gives indices of 0.83 in fiscal 2000 and 0.84 in

fiscal 2001. The industry forecast is for 0.82 in fiscal 2005, and as the fiscal 2010 target is 0.88, performance this fiscal year is already ahead of target. Again, assigning a value of one (1) to the fiscal 1990 energy intensity index for ferronickel production gives 1.02 in fiscal 2000 and 1.04 in fiscal 2001. The industry is forecasting an index of 1.02 in fiscal 2005, and is aiming for a target of 0.95 in fiscal 2010, indicating that the target was again not achieved this fiscal year.

The energy intensity index for production of non-ferrous metals in fiscal 2001 was virtually level with the fiscal 2000 figure due to the effect of a similar level of production, and while basic energy saving efforts are being made, they have been insufficient to achieve a change in the index. The intensity index in ferronickel production was up slightly on fiscal 2000, as a portion of fuel was excluded from fiscal 2000 fuel for process-related reasons, and was consistently returned by the industry to fuel in fiscal 2001.

Declining ore grade continues to have a negative impact on energy intensity.

The industry has emitted the following amounts of carbon dioxide: 4.88 million t-CO_2 in fiscal 1990; 5.06 million t-CO_2 in fiscal 2000; and roughly level with fiscal 2000, 5.03 million t-CO_2 in fiscal 2001. Compared with fiscal 1990, carbon dioxide emissions in fiscal 2001 have increased, but the increase is attributable to greater production levels. Total production volume in fiscal 1990 was 2.325 million tons, and in fiscal 2001, in contrast to an increase in production volume of 16% to 2.699 million tons, carbon dioxide emissions rose 2.3%. The fact that this increase was less than the increase in production level is attributable to efforts to save energy. The forecast is for emissions of 4.95 million t-CO_2 in fiscal 2005, and 5.33 million t-CO_2 in fiscal 2010—1.4% and 9% more, respectively, than in fiscal 1990. If voluntary action plans were not implemented, carbon dioxide emissions would be 5.62 million t-CO_2 in fiscal 2010—15% more than in fiscal 1990.

3. Steps taken to achieve targets

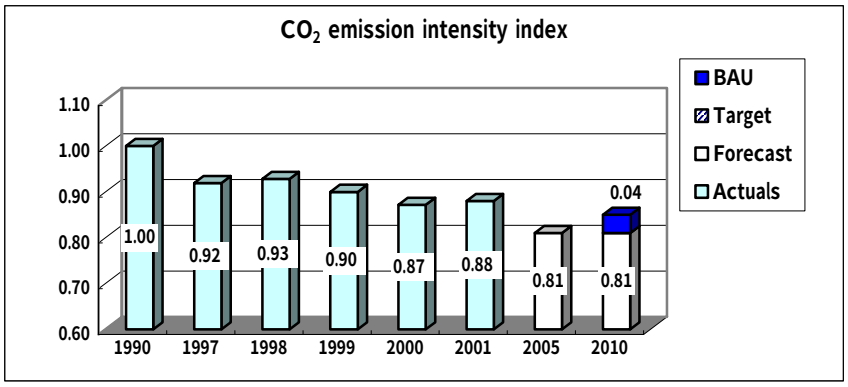
- Major
  - Less power intensity in electrolysis process
  - Less power consumed through optimizing operation of smoke absorbers
  - Less power consumed by reducing loss of pressure through upgrades in the gas purification system in sulfuric acid plants
  - Recovery of heat from converters in the sulfuric acid process
  - Less consumption of power by the distilling furnaces through better operational management
  - More in-house power generation capacity using excess steam

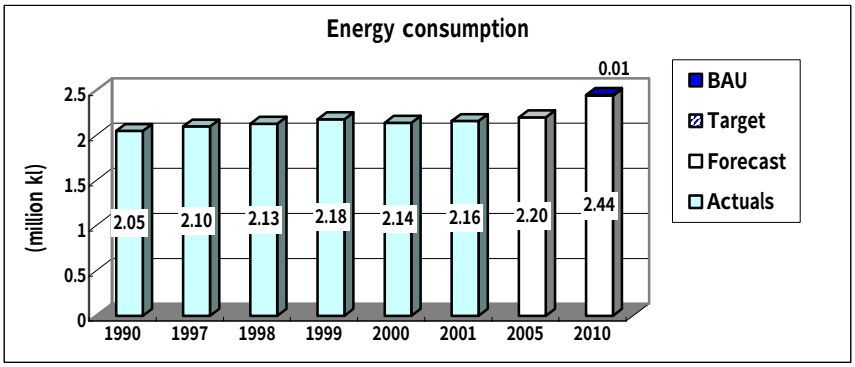
- Fiscal 2001 actual

Reports were received regarding 55 energy conservation initiatives implemented in fiscal 2001, equating to a total investment of ¥1.35 billion. The initiatives have resulted in energy savings of 48,000 kl in crude oil equivalents.

Initiative	Investment (millions of yen)	Energy saved (kl/year; crude oil equiv.)
Greater fuel efficiency in converter boilers driven by waste heat	230	300
Less coal, achieved by processing shredder dust	0	18,600
Improvement in coking coal intensity, achieved through more stable operation of smelting furnaces	0	2,700
Less coking coal, achieved through improvements in sinter properties	160	800
Greater in-house generation capacity, achieved through better recovery of waste heat from smelting furnace through heat exchanger	350	3,500
More efficient combustion, achieved through intermediate injection of coal to rotary kilns	233	2,500
Other	377	20,000

5. Reference data





Assigning a value of one (1) to the fiscal 1990 carbon dioxide intensity index gives an index of 0.88 in fiscal 2001, indicating a decline. The drop reflects the efforts made by the mining industry and the power generation sector. The industry is forecasting indices of 0.81 in both fiscal 2005 and 2010.

The non-ferrous metal processing industry has consumed the following amounts of energy (in crude oil equivalents): 2.05 million kl of energy in fiscal 1990; and 2.16 million kl in

fiscal 2001. The increase equates to 5.4%, which is lower than the increase in production level, as shown in paragraph 2 above. The industry is forecasting consumption of 2.20 million kl in fiscal 2005, and 2.44 million kl in fiscal 2010—7% and 18% more, respectively, than in fiscal 1990. If voluntary action plans were not implemented, consumption would be 2.45 million kl in fiscal 2010—20% more than in fiscal 1990.

7. Environmental management and conservation in overseas business activities

- The environmental protection technology and expertise amassed over many years by member companies is the basis for industry efforts to put in place and enhance a system of voluntary environmental management, which will improve the industry's level of environmental management (for example, publishing an annual environmental report or acquiring ISO14001 certification).
- The industry has put in place environmental management systems in its overseas operations that replicate those in Japan. The intent is to undertake the best possible measures to protect the environment, and to provide technology and expertise amassed in Japan for transfer and acceptance overseas.

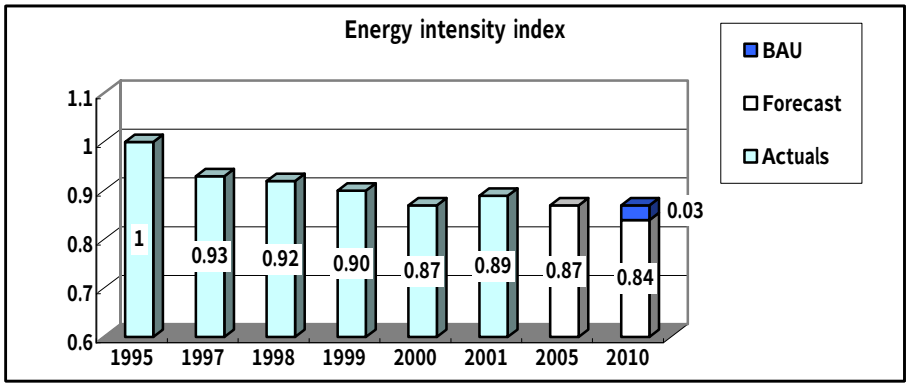
Note: The principal products of the industry are copper, lead, zinc, nickel, ferronickel ingots, and others. The follow-up survey represented almost 100% of the energy index of companies manufacturing the principal products above. (Energy consumption levels of participating companies divided by total energy consumption of companies manufacturing the principal products).

Energy consumption was calculated by aggregating data for the non-ferrous metals sector from designated product categories in the Monthly of the Current Survey of Energy Consumption (issued by the Ministry of Economy, Trade and Industry), and data for the ferronickel and nickel sectors from respondent companies.

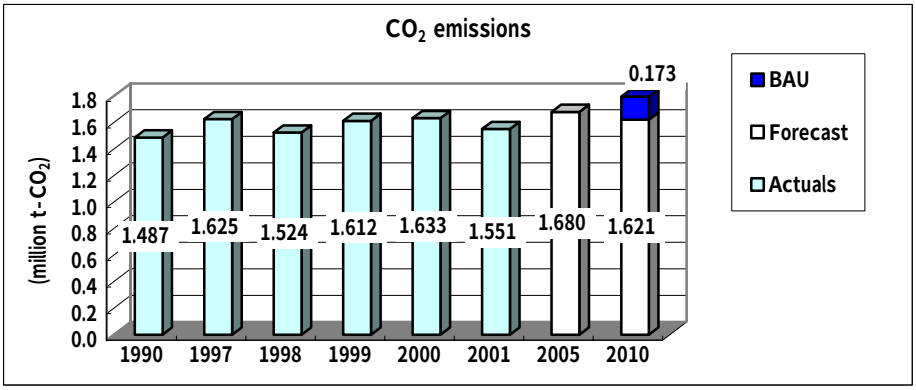
Japan Aluminium Association

Target: To achieve a 10% improvement in energy intensity in fiscal 2010 compared with fiscal 1995 (an expected 16% improvement on fiscal 1995, and a 20% improvement on fiscal 1990).

1. Progress toward target



2. Carbon dioxide emissions



Assigning a value of one (1) to the fiscal 1995 energy intensity index gives 0.93 in fiscal 1997, 0.92 in fiscal 1998, 0.90 in fiscal 1999, 0.87 in fiscal 2000, and 0.89 in fiscal 2001. The aluminum industry is forecasting indices of 0.87 in fiscal 2005 and 0.84 in fiscal 2010, and has set a target of 0.90 for fiscal 2010.

The industry has emitted the following amounts of carbon dioxide: 1.487 million t-CO_2 in fiscal 1990; 1.625 million t-CO_2 in fiscal 1997; 1.524 million t-CO_2 in fiscal 1998; 1.612 million t-CO_2 in fiscal 1999; 1.633 million t-CO_2 in fiscal 2000; and 1.551 million t-CO_2 in fiscal 2001. Aluminum production levels in fiscal 2001 fell by 7.9% year-on-year, and carbon dioxide emission intensity worsened by 2.9% year-on-year; however, emissions fell 5%. The forecast, due to higher production, is for 1.68 million t-CO_2 in fiscal 2005, and 1.621 million t-CO_2 in fiscal 2010—increases of 13% and 9% respectively, compared with fiscal 1990. If voluntary action plans were not implemented, carbon dioxide emissions in fiscal 2010 would be 1.794 million t-CO_2—a 21% increase on fiscal 1990.

3. Steps taken to achieve targets

- Major
  - Achieving more efficient energy use through energy-saving operation and process improvements (including better yields)
  - Promoting improvements in equipment that increase energy recovery and efficiency
  - Publicly airing successful case studies in energy conservation, and encouraging their emulation across the industry

  The industry also expects the following initiatives to contribute to curbing global warming.
  - Encouraging a proactive approach to aluminum recycling (on a global scale)
  - Supporting moves toward lighter-weight automobiles and rolling stock through the use of aluminum (within Japan)

- Fiscal 2001 actual

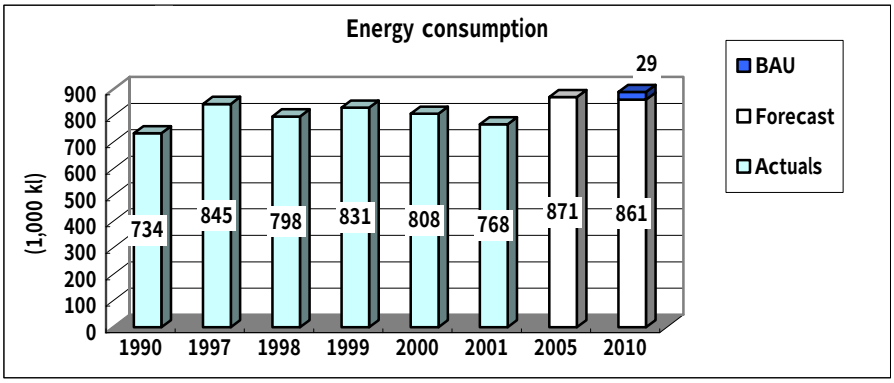
There were 65 energy conservation initiatives undertaken in fiscal 2001, representing a total investment of ¥2,052 million. The resulting reduction in energy consumption was 8,000 kl in crude oil equivalents. The principal initiatives were:

Initiative	Investment (millions of yen)	Energy saved (kl/year; crude oil equiv.)
Adjusting the air/fuel ratio in melting furnaces (10 furnaces)	1.9	1,216
Recovering hot water drained from boilers	1.0	614
Installing regeneration burners	72	600
Optimizing the coil annealing process	0	590
Installing dedicated boilers	2.32	423
Recovering waste heat from waste oil incinerators	22	371
Changing the process of scrap melting	33	347
Inverterization of coolant pumps	47	318

- Publication of lists of examples of improved energy saving for members of the Japan Aluminum Association

The Association’s voluntary action plans have been posted on its website. In the future, a list of examples of improved energy saving achieved by the seven major rolled aluminum producers will also be posted on the Association’s website, to encourage all Association members’ awareness.

5. Reference data



The industry has recorded the following energy consumption (in crude oil equivalents): 734,000 kl in fiscal 1990; 845,000 kl in fiscal 1997; 798,000 kl in fiscal 1998; 831,000 kl in fiscal 1999; 808,000 in fiscal 2000; and 768,000 in fiscal 2001. It is forecasting consumption of 871,000 kl in fiscal 2005, and 861,000 kl in fiscal 2010—19% and 17% more, respectively, than in fiscal 1990. If voluntary action plans were not implemented, the forecast for energy consumption in fiscal 2010 would be 890,000 kl—a 21% increase compared with fiscal 1990.

6. Other global warming initiatives

- Emissions from offices and in-house distribution
  - Energy savings were achieved by substituting double 40W fluorescent tubes in office lighting with single 40W tubes, and by setting up sharper reflectors to ensure light levels would not decline (representing a saving of 11 kWh per month per light).
  - Energy savings were achieved by fitting office air conditioners with misting units (representing a saving of 100 kWh per month per unit).

- Contributions to the consumer goods and transport sectors (impact on products and services)
  - Better fuel consumption in automobiles through the greater use of aluminum to reduce vehicle weight (representing an annual reduction of approximately 1.8 million t-CO_2 since fiscal 1990)
  - Energy savings through use of aluminum in rail cars such as bullet trains and subways (representing a reduction of approximately 1.2 million t-CO_2, calculated as 100 t-CO_2 per car for life of car multiplied by 12,000 cars).

7. Environmental management and conservation in overseas business activities

Of the 16 operating plants for seven companies participating in the survey to the end of fiscal 2001, six operating plants had acquired ISO14001 certification, and another four are scheduled to acquire certification by the end of fiscal 2002. By the end of fiscal 2003, almost all operating plants are expected to have certification. Although the industry has few offshore aluminum

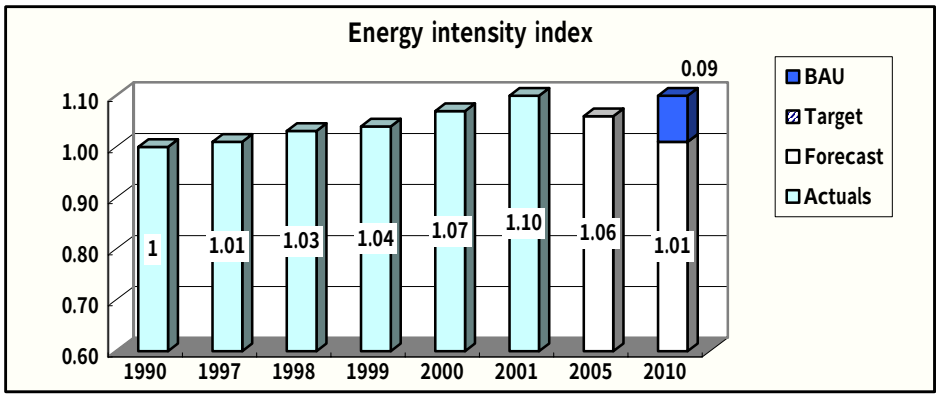
rolling operations, and only some finished product operations overseas, it advises these businesses on environmental management.

Note: The principal products of the industry are rolled aluminum (sheets and extrusions). The proportion of companies participating in the follow-up survey was 12% (7 companies out of 60), representing 57.6% of energy consumed by the entire industry. In this context, energy intensity refers not simply to the amount of energy consumed per unit of production output, but to the amount of energy consumed per unit volume of rolled product, a concept that takes account of energy loads required for the rolling process. The forecast for production in fiscal 2010 assumes an annual rate of growth of 1% for the 20-year period from fiscal 1990 to fiscal 2010 (based on demand forecasts made by the Nonferrous Metals Division of the Ministry of Economy, Trade and Industry at the time of drafting the fiscal 1998 report on a survey of strategic technology measures in the nonferrous metals industry). Carbon dioxide emissions were calculated using energy consumption data from the seven major rolled aluminum manufacturers.

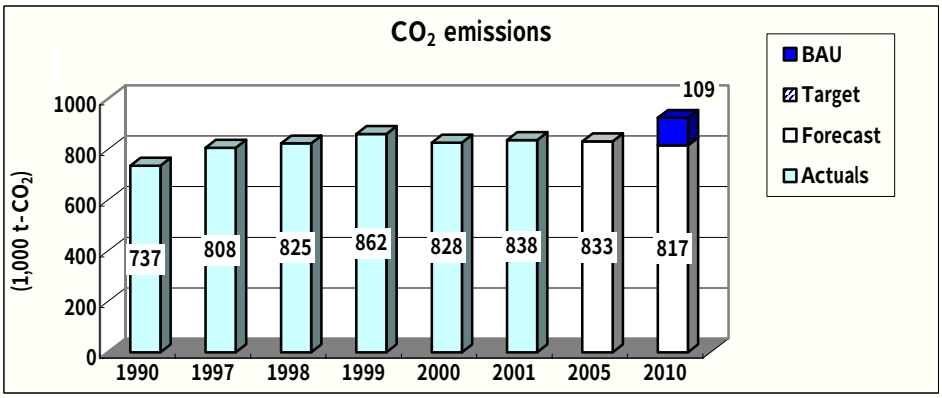
Japan Dairy Industry Association

To reduce energy intensity by 0.5% annually on the fiscal 1997 base year in the five years to fiscal 2002, and by 1.0% per year over the eight-year period from fiscal 2003 to fiscal 2010 (assuming annual growth in production of 1.0%).

1. Progress toward target



2. Carbon dioxide emissions



Assigning a value of one (1) for the fiscal 1990 energy intensity index gives indices of 1.01 in fiscal 1997, 1.03 in 1998, 1.04 in fiscal 1999, 1.07 in fiscal 2000, and 1.10 in fiscal 2001. The forecast is for indices of 1.06 in fiscal 2005 and 1.01 in fiscal 2010.

The industry has emitted the following amounts of carbon dioxide: 737,000 t-CO_2 in fiscal 1990; 808,000 t-CO_2 in fiscal 1997; 825,000 t-CO_2 in fiscal 1998; 862,000 t-CO_2 in fiscal 1999; 828,000 t-CO_2 in fiscal 2000; and 838,000 t-CO_2 in fiscal 2001. It is forecasting emissions of 833,000 t-CO_2 in fiscal 2005, and 817,000 t-CO_2 in fiscal 2010—13% and 11% increases, respectively, over fiscal 1990. If voluntary action plans were not implemented, emissions would be 926,000 t-CO_2 in fiscal 2010—26% higher than in fiscal 1990.

3. Steps taken to achieve targets

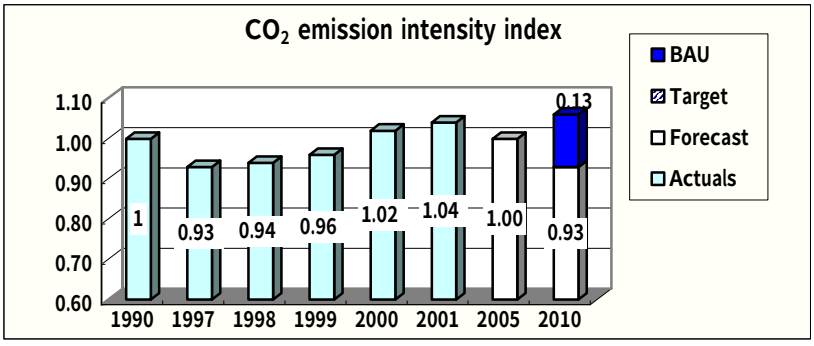
- Major

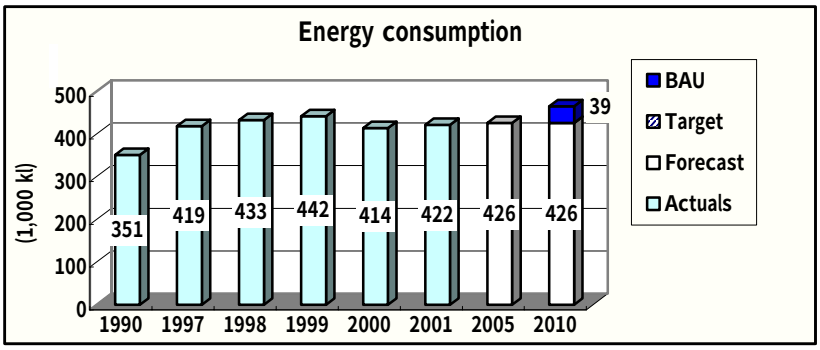
The following principal initiatives have been implemented in order to achieve targets: industry-level restructuring and integration of milk processing plants; restructuring transportation methods for raw milk and processed products; introducing energy-efficient equipment such as boilers and cogeneration systems; installing solar power generators; regulating air conditioner compressors to achieve optimum pressure; adopting energy-conserving measures and replacing chlorofluorocarbons in refrigeration equipment; reducing rates of product spoilage and disposal through quality control and management of distribution systems; and reassessing high-frequency, small-volume deliveries.

- Fiscal 2001 actual

① Introducing cogeneration
② Adopting inverter facilities
③ Introducing ice storage equipment using supercooled ice
④ Optimizing air compressor pressure
⑤ Washing condenser fins in refrigerators (improving freezing efficiency)
⑥ Adopting inverter fluorescent lights (approx. 100 lights)
⑦ Installing more static capacitors
⑧ Repairing steam leaks, replacing valves, fitting steam traps, implementing retrofitting and thermal insulation for steam pipes, and recovering steam drainage
⑨ Reviewing the temperature of clean-in-place (CIP) units
⑩ Installing more in-house refrigerators (rationalization of distribution)
⑪ Operating refrigerator fans only when required, instead of leaving them on constantly
⑫ Controlling bottom-blowing of boilers
⑬ Recovering spent liquid nitrogen previously released into the atmosphere and applying it to external air conditioners, and improving cooling efficiency
⑭ Converting fuels (investment: ¥10 million, effect: carbon dioxide reduction of 294 tons)
⑮ Introducing energy-efficient transformers

5. Reference data





Assigning a value of one (1) to the fiscal 1990 carbon dioxide emission intensity index gives 0.93 in fiscal 1997, 0.94 in fiscal 1998, 0.96 in fiscal 1999, 1.02 in fiscal 2000, and 1.04 in fiscal 2001. The industry is forecasting indices of 1.00 in fiscal 2005 and 0.93 in fiscal 2010. It has recorded the following energy consumption (in crude oil equivalents): 351,000 kl in fiscal 1990; 419,000 kl in fiscal 1997; 433,000 kl in fiscal 1998; 442,000 kl in fiscal 1999; 414,000 kl in fiscal 2000; and 422,000 kl in fiscal 2001. The forecast for consumption is 426,000 kl in both 2005 and 2010, which represents a 21% increase over fiscal 1990. If voluntary action plans were not implemented, energy consumption would be 465,000 kl in fiscal 2010, or 32% higher than in fiscal 1990.

6. Other global warming initiatives

- Emissions from offices and in-house distribution

① Efficient operation of company sales vehicles
② Efficient operation and management of delivery vehicles, turning engines off rather than idling them, and reducing the size of the company fleet
③ Day-to-day energy saving activities related to offices, and reviewing air conditioning and heating temperatures
④ Introduction of low-emission company vehicles

- Contributions to the consumer goods and transport sectors (impact on products and services)

① Using less cardboard in packaging (introducing reusable plastic boxes)
② Encouraging the reuse of bottles
③ Adopting lighter bottles (200 ml bottles 26% lighter, 180 ml bottles 31% lighter)
④ Encouraging recycling (paper packaging)

7. Environmental management and conservation in overseas business activities

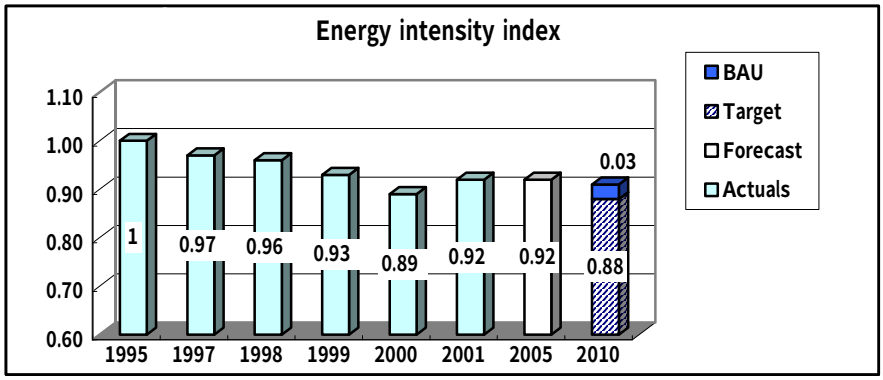
① Acquiring ISO14001 (nine operating centers, including affiliate companies), and implementing environmental management systems (EMS) based on ISO14001

Note: The principal activity of the industry is the manufacture and sale of foodstuffs for which milk and milk-related products are the basic ingredients. A total of 7 industry companies participated in the follow-up survey, representing 50.84% of total industry sales. Carbon dioxide emissions were calculated by aggregating the fuel consumption of individual companies (by fuel type), and then multiplying consumption by the carbon dioxide coefficient for each fuel type. Assumptions for the fiscal 2010 forecast were that annual production growth would be 1%, and that energy intensity of production would improve 0.5% per annum through to 2002, and 1% per annum from 2003.

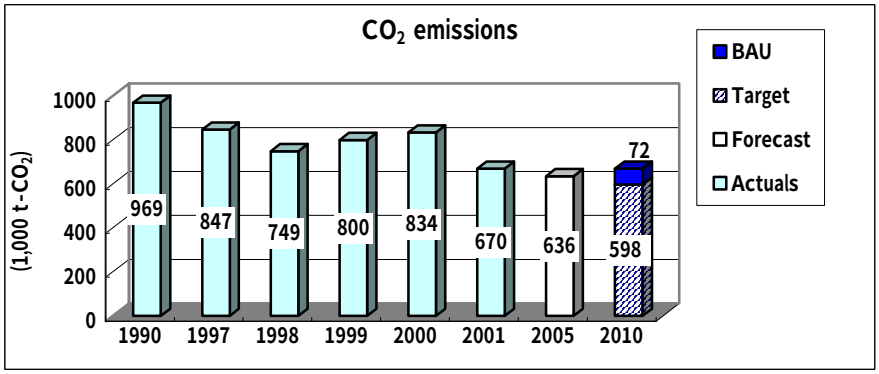
Japan Copper and Brass Association

To reduce the energy intensity of manufacturing by 7.5% compared with fiscal 1995, by fiscal 2010.

1. Progress toward target



2. Carbon dioxide emissions



Assigning a value of one (1) to the energy intensity of manufacturing in fiscal 1995 gives 1.01 in both fiscal 1997 and 1998, 0.97 in fiscal 1999, 0.93 in fiscal 2000, and 0.97 in fiscal 2001. The industry is forecasting 0.97 in fiscal 2005, and targeting 0.92 in fiscal 2010.

The brass industry has emitted the following amounts of carbon dioxide: 969,000 t-CO_2 in fiscal 1990; 847,000 t-CO_2 in fiscal 1997; 749,000 t-CO_2 in fiscal 1998; 800,000 t-CO_2 in fiscal 1999; 834,000 t-CO_2 in fiscal 2000; and 670,000 t-CO_2 in fiscal 2001. It is forecasting emissions of 636,000 t-CO_2 in fiscal 2005, and 598,000 t-CO_2 in fiscal 2010—34.4% and 38.3% declines, respectively, compared with fiscal 1990. If voluntary action plans were not implemented, emissions in fiscal 2010 would decline 30.9% compared with fiscal 1990.

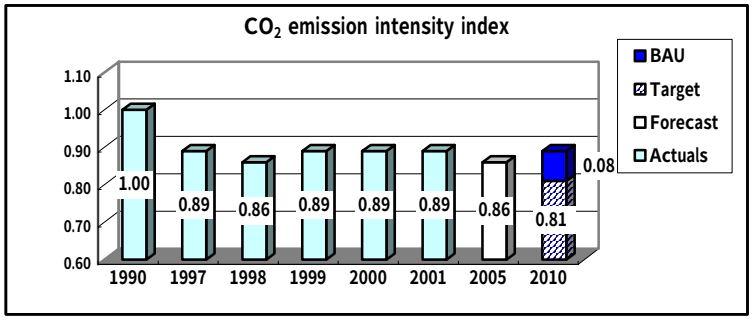
3. Steps taken to achieve targets

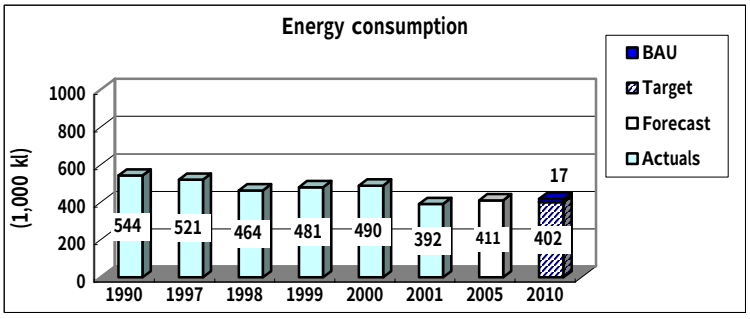
- Major
  - Promoting uniform action at all operational sites (introducing energy-efficient lighting and initiatives to stop air leaks from air compressors)
  - Installing, upgrading, and improving plant and equipment (upgrading dust collecting fans to very efficient models in the casting process, upgrading to regeneration burners, saving energy by installing recuperators, and replacing cooling air compressors by blowers)
  - Undertaking improvements in process and production controls and operational management (improving furnace wall radiation rates inside the furnace, preventing no-load running of air compressors, fitting inverters to exhaust fan motors, controlling the revolutions of motors in roll coolant systems, implementing more efficient operation of in-line hydraulic pumps, and not permitting production lines to be running empty when down or idling)
  - Integrating equipment and installing larger equipment (integrated operation of air compressors)

- Fiscal 2001 actual

The industry implemented 67 initiatives that had a relatively significant impact, in which principal investments were aimed at better control over power supply systems on production lines. The total investment was ¥279 million, which resulted in an annual reduction of 1,562 kl of crude oil equivalents.

5. Reference data





6. Other global warming initiatives

Through the activities of the Promotion of Energy-Saving Committee, members exchange information about examples of energy-saving initiatives, and seek to improve the level of energy saving across industry. It is this work that provides the motive force for reducing carbon dioxide.

7. Environmental management and conservation in overseas business activities

Four additional operational sites obtained ISO14000 certification in fiscal 2001, bringing the number of operation sites with ISO14000 certification to a total of 12.

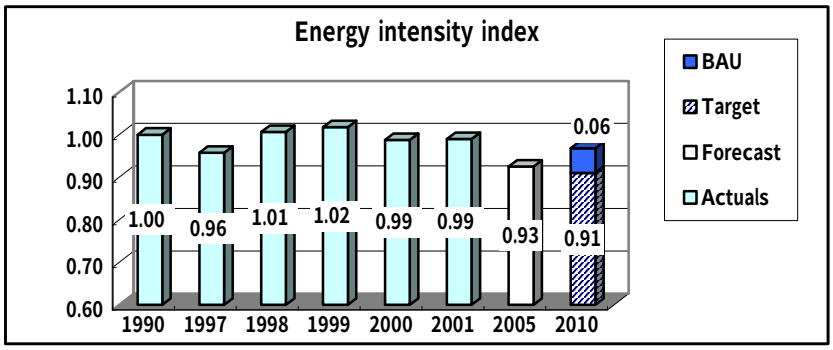
Note: The principal products of the industry are sheets, strips, rods, wire, and pipes made of copper and copper alloys. The proportion of respondents to the follow-up survey represented 19% of the industry (12 companies), accounting for 67% of production levels.

Carbon dioxide emissions were calculated by aggregating energy consumption by type of energy for the 12 companies, and extrapolating those figures on the basis of share of production, to arrive at an industry total. Designated indices were used to derive carbon dioxide equivalents. Assumptions underlying fiscal 2010 forecasts and targets were that production in fiscal 2005 would be up 4.5% on fiscal 2001, and up 7.6% in fiscal 2010.

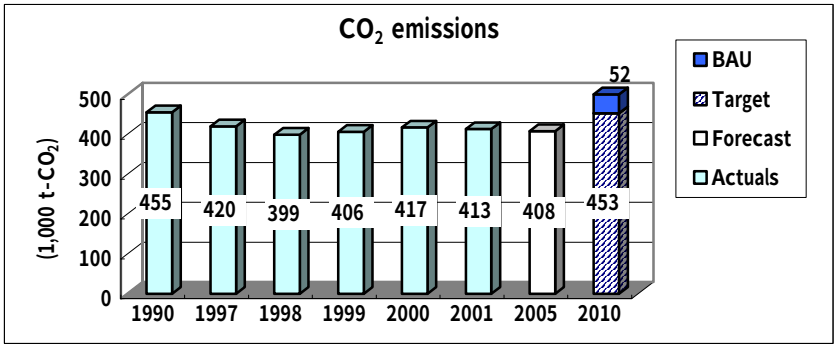
Limestone Association of Japan

To reduce the energy intensity of gas oil and electricity consumed in the limestone production process by 6% compared with fiscal 1990, by fiscal 2010. The forecast reduction in the energy intensity of gas oil and electricity consumed in the limestone production process in fiscal 2005 is for a figure that is 4.5% less than that of fiscal 1990.

1. Progress toward target



2. Carbon dioxide emissions



Assigning a value of one (1) to the fiscal 1990 energy intensity index (for gas oil and electric power), gives 0.96 in fiscal 1997, 1.01 in fiscal 1998, 1.02 in fiscal 1999, 0.99 in fiscal 2000, and 0.99 in fiscal 2001. The limestone industry is forecasting an index of 0.93 in fiscal 2005, and is targeting 0.91 in fiscal 2010.

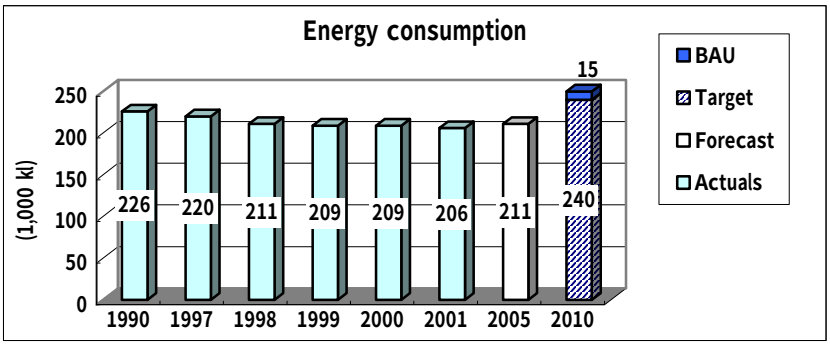
The industry has emitted the following amounts of carbon dioxide: 455,000 t-CO_2 in fiscal 1990; 420,000 t-CO_2 in fiscal 1997; 399,000 t-CO_2 in fiscal 1998; 406,000 t-CO_2 in fiscal 1999; 417,000 t-CO_2 in fiscal 2000; and 413,000 t-CO_2 in fiscal 2001. The decline in emissions in fiscal 2001 is attributable to lower limestone production and improved energy efficiency. The forecast is for emissions of 408,000 t-CO_2 in fiscal 2005—10% lower than in fiscal 1990. The target in fiscal 2010 is for 453,000 t-CO_2—unchanged vis-à-vis fiscal 1990. If voluntary action plans were not implemented, emissions would be 505,000 t-CO_2 in fiscal 2010—an 11% increase on fiscal 1990.

3. Steps taken to achieve targets

- Major
  - Promoting carbon dioxide absorption (implementation of greening projects)
  - Conducting waste disposal initiatives (ongoing zero emission policy)
  - Reducing gas oil consumption (encouraging use of efficiency-enhancing additives, developing and introducing environmentally-friendly diesel engines, using heavy equipment that is larger and matched to its task, and carrying out innovations in mining technology)
  - Reducing electricity consumption (developing energy-efficient production equipment and shortening production processes)
  - Introducing cogeneration
  - Implementing more effective mine site cost councils (debate on energy conservation)

- Fiscal 2001 actual
  - Initiatives against global warming are ongoing, but there were no new initiatives in fiscal 2001, and therefore no estimate of investment or effect.

5. Reference data



The limestone industry has recorded the following energy consumption (in 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; 209,000 kl in fiscal 2000; and 206,000 kl in fiscal 2001. It is forecasting consumption of 211,000 kl in fiscal 2005, and the target for fiscal 2010 is 240,000 kl—a 7% decline and a 6% increase, respectively, compared with fiscal 1990. If voluntary action plans were not implemented, energy consumption in fiscal 2010 would be 255,000 kl, or 13% higher than in fiscal 1990.

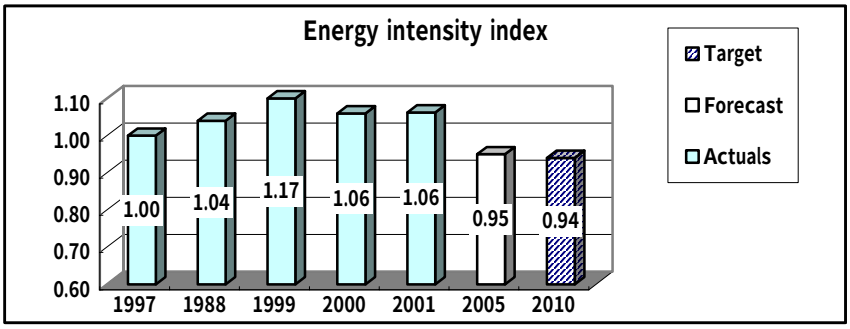
Note: The principal product of the industry is limestone. The rate of participation in the follow-up survey was 40.8% (97 companies), representing 86% of industry production.

Forecasts for limestone production in 2010 are based on the report of the panel on the limestone industry, published by the Agency for Natural Resources and Energy. Forecast production of limestone in fiscal 2005 is estimated based on the current production trend and the volume of limestone produced by the Association's member companies.

Japan Machine Tool Builder's Association

To reduce the amount of energy consumed in 2010 on a value-of-production basis (liters per million yen in crude oil equivalents) by 6% compared with 1997.

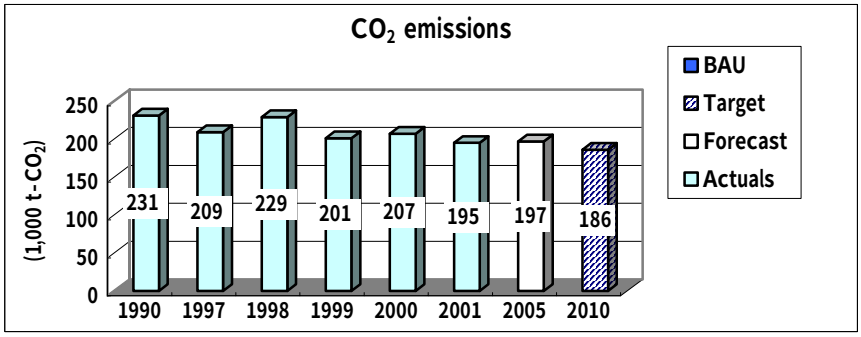
1. Progress toward target



Note: A value of one (1) has been assigned to the fiscal 1997 intensity index.

Assigning a value of one (1) to the index of energy intensity in 1997 (139.5 l/¥ million) gives 1.04 in 1998, 1.17 in 1999, 1.06 in 2000, and 1.06 in 2001 (147.4 l/¥ million). The forecast for 2005 is 0.95. The target for 2010 is 0.94 (131.1 l/¥ million). Total volumes are declining, but as the value of production is down 13% on 1997, the 2000 intensity index has risen 0.06.

2. Carbon dioxide emissions



The industry has emitted the following amounts of carbon dioxide: 231,000 t-CO_2 in 1990; 209,000 t-CO_2 in 1997; 229,000 t-CO_2 in 1998; 201,000 t-CO_2 in 1999; and 207,000 t-CO_2 in 2000. Carbon dioxide emissions in 2001 were recorded at 195,000 t-CO_2—a 7% reduction compared with 1997. The result is attributable to efforts by corporate members of the Association to conserve energy, and a drop in the value of production caused by the sluggish economy. The forecast for 2005 is 197,000 t-CO_2 and the target for 2010 is 186,000 t-CO_2—declines of 5.7% and 11%, respectively, compared with 1997.

3. Steps taken to achieve targets

① Introducing energy monitoring and control systems, and stringent management of energy measurements

② Adjusting supply and demand for electric power (cooperating with electric power companies and working Saturdays, for example)

③ Adopting very efficient machinery (lighting, special high-voltage transformers, and finishing machinery and equipment)

④ Optimization of temperature settings within factories (air conditioning)

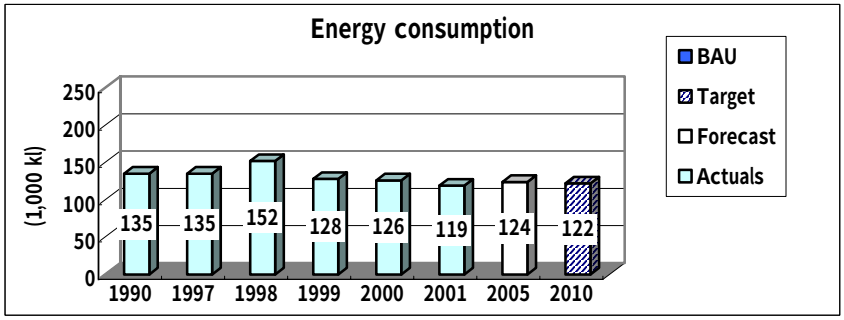
⑤ Expanding the use of inverter motors (air conditioners, ventilation fans, compressors, etc.)

⑥ Limiting the number of compressors

⑦ Restricting overtime work on certain days and enforcing days off

⑧ Acquiring ISO14001 certification

5. Reference data



The industry has consumed the following amounts of energy: 135,000 kl in 1990; 135,000 kl in 1997; 152,000 kl in 1998; 128,000 in 1999; and 126,000 kl in 2000. Energy consumption in 2001 was 119,000 kl—down 12% on 1997. The forecast for 2005 is 124,000 kl, and the 2010 target is 122,000 kl—reductions of 8.1% and 9.6%, respectively, on 1997.

7. Environmental management and conservation in overseas business activities

- The number of companies that obtained ISO14001 certification increased from 23 in 2000 to 33 in 2001.
-

Note: The principal products of the industry are metal machine tools. The number of companies participating in the follow-up survey was 70, representing approximately 90% of industry's value of production. The figures for energy use are summations of energy used in the manufacture of machine tools.

Forecasts for 2010 were calculated using the following methods.

① Assuming that there will be no change in the value of machine tool production from 1997 levels, and that industry will attain its energy use target (a 6% decline compared with 1997)

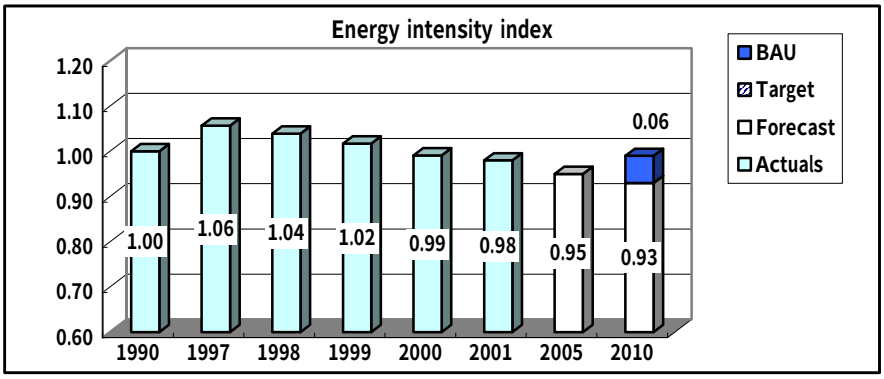
② Assuming that the fuel mix for energy consumed in 2010 will remain unchanged from 1997 (electricity 84.3%, C fuel oil 11%, LPG 1%, city gas 3.7%)

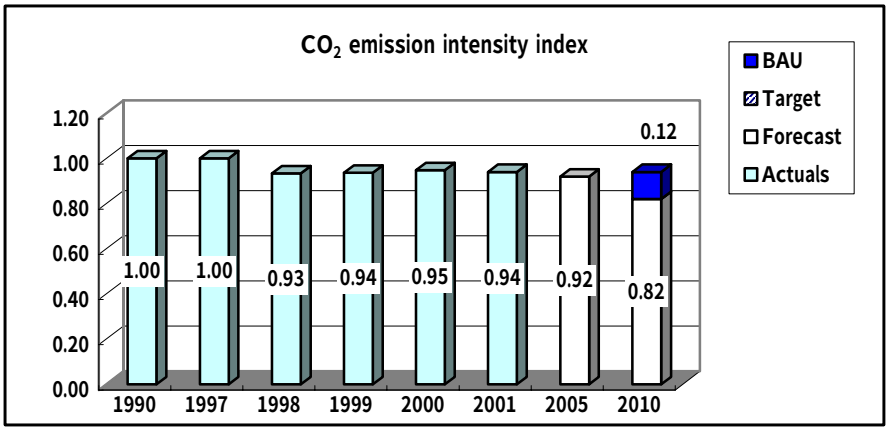
③ The foregoing was used to aggregate figures by fuel type, and carbon dioxide emissions in 2010 were calculated.

Flour Millers Association

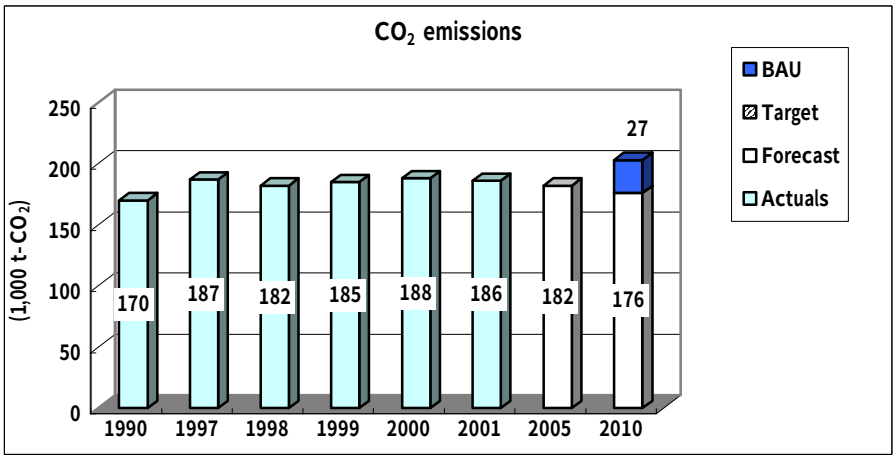
On a 1990 base year, by fiscal 2010:
(1) To reduce the energy consumption intensity by more than 2%.
(2) To reduce carbon dioxide emission intensity by more than 5%.

1. Progress toward target





2. Carbon dioxide emissions



Assigning a value of one (1) to the index of energy intensity in fiscal 1990 gives: 1.06

in fiscal 1997; 1.04 in fiscal 1998; 1.02 in fiscal 1999; 0.99 in fiscal 2000; and 0.98 in fiscal 2001. The flour industry is forecasting 0.95 and 0.93 respectively, in fiscal 2005 and 2010. Assigning a value of one (1) to the index of carbon dioxide emission intensity in fiscal 1990 gives 1.00 in fiscal 1997, 0.93 in fiscal 1998, 0.94 in fiscal 1999, 0.95 in fiscal 2000, and 0.94 in fiscal 2001. The forecasts for fiscal 2005 and 2010 are 0.92 and 0.82, respectively.

The industry has emitted the following amounts of carbon dioxide: 170,000 t-CO_2 in fiscal 1990; 187,000 t-CO_2 in fiscal 1997; 182,000 t-CO_2 in fiscal 1998; 185,000 t-CO_2 in fiscal 1999, 188,000 t-CO_2 in fiscal 2000; and 186,000 t-CO_2 in fiscal 2001. It is forecasting emissions of 182,000 t-CO_2 in fiscal 2005, and 176,000 t-CO_2 in fiscal 2010—7% and 4% increases, respectively, over 1990. If voluntary action plans were not implemented, emissions would be 203,000 t-CO_2 in fiscal 2010—19% higher than in fiscal 1990.

3. Steps taken to achieve targets

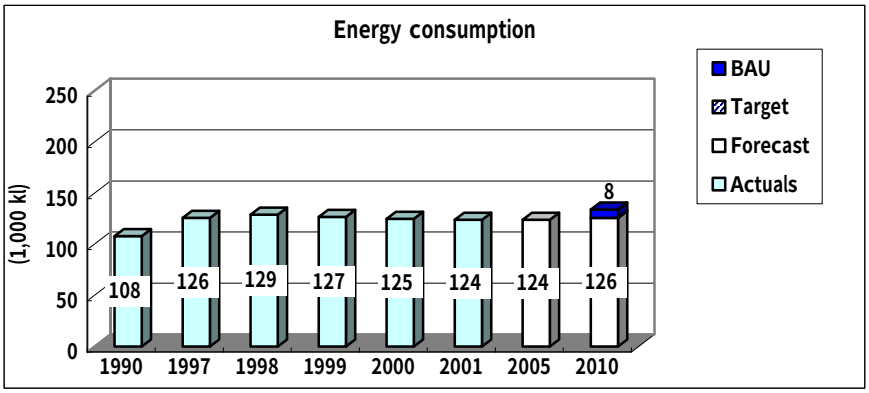
- Major
  - Integrating factories to achieve high rates of operation
  - Introducing cogeneration systems
  - Using high-efficiency electric motors
  - Introducing speed controllers and high-efficiency ventilators
  - Introducing pressure-optimizing systems for air compressors, and systems to control the number of compressors running
  - Introducing new forms of energy

- Fiscal 2001 actual

Nearly 90% of the energy used by the industry is electricity. Companies have therefore concentrated primarily on electricity-saving initiatives. The following are the more widely implemented.

- Introducing high-efficiency transformers
- Introducing high-efficiency compressors
- Using high-efficiency motors and inverters
- Introducing energy-efficient air conditioners
- Conducting improvements in pneumatic conveying systems
- Adjusting summer operating schedules, which is made possible by the achievement of high rates of operation
- Carrying out basic initiatives such as turning off lights

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; 125,000 kl in fiscal 2000; and 124,000 kl in fiscal 2001. It is forecasting consumption of 124,000 kl in fiscal 2005, and 126,000 kl in fiscal 2010—representing 15% and 17% increases, respectively, over fiscal 1990. If voluntary action plans were not implemented, consumption would be 134,000 kl in fiscal 2010—a 24% increase over fiscal 1990.

6. Environmental management and conservation measures

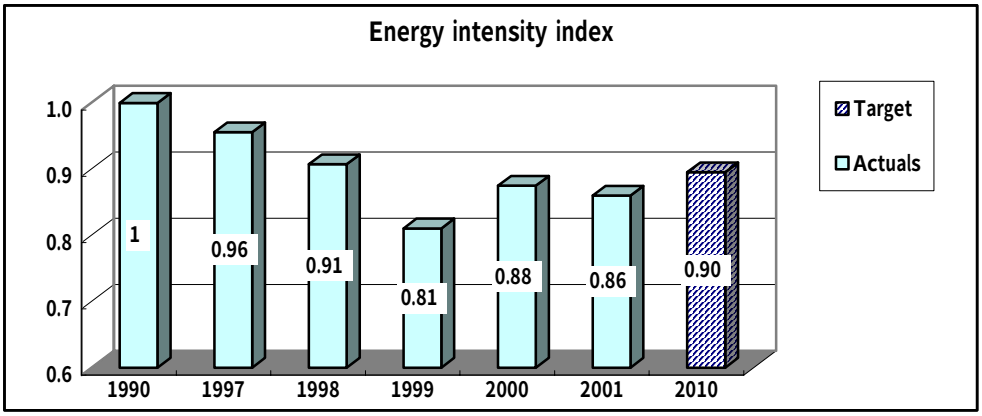
A large number of companies have either established in-house environmental conservation groups or are considering the establishment thereof. As they work towards obtaining ISO14001 certification, all are working to conserve energy. Some companies are also publishing environmental reports.

Note: The principal product of the industry is flour. The participation rate in the current follow-up survey was 26% (32 companies out of 124), representing 90% of industry production. Carbon dioxide emissions were calculated by summing per-source energy consumption data provided by the 32 member companies surveyed (100% response). Forecasts for fiscal 2010 assume annual growth of 1%.

The Shipbuilders' Association of Japan

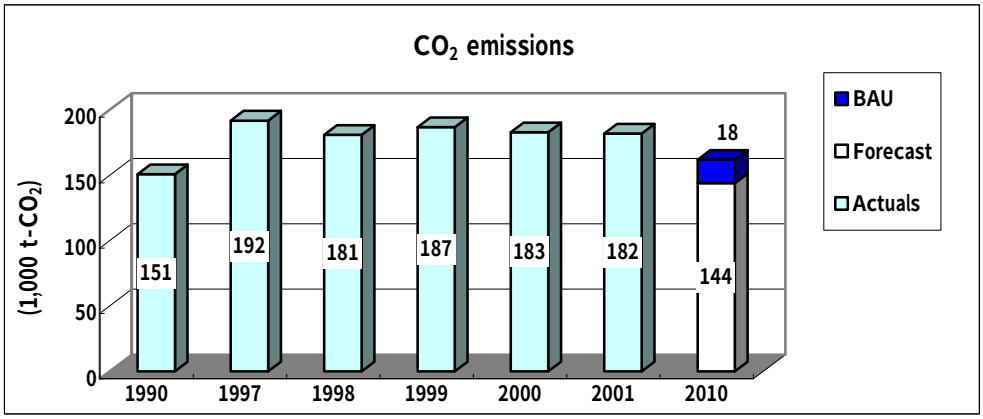
To reduce the energy intensity by approximately 10% of the 1990 base year level, by 2010.

1. Progress toward target



Note: A value of one (1) has been assigned to the fiscal 1990 intensity index.

2. Carbon dioxide emissions



Note: The figures for fiscal 2000 and fiscal 2001 represent the total of the actual emission amounts of members of the Shipbuilders' Association of Japan and members of the Cooperative Association of Japan Shipbuilders.

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.

Assigning a value of one (1) to the index of energy intensity in fiscal 1990 gives 0.96 in fiscal 1997, 0.91 in fiscal 1998, 0.81 in fiscal 1999, 0.88 in fiscal 2000, and 0.86 in fiscal 2001. The fiscal 2010 target is 0.90. The primary industry initiative is investment in automated equipment, with the aim of achieving greater production efficiency and sophistication.

The shipbuilding industry has emitted the following amounts of carbon dioxide: 151,000 t-CO_2 in fiscal 1990; 192,000 t-CO_2 in fiscal 1997; 181,000 t-CO_2 in fiscal 1998; 187,000 t-CO_2 in fiscal 1999; 183,000 t-CO_2 in fiscal 2000; and 182,000 t-CO_2 in fiscal 2001. The forecast is for emissions of 144,000 t-CO_2 in fiscal 2010—5% less than in fiscal 1990.

Note 1: The fiscal 2000 and 2001 figures are the totals of actual emissions generated by members of the Shipbuilders' Association of Japan (SAJ) and the Cooperative Association of Japan Shipbuilders. Together the two associations represent almost the entire shipbuilding industry.

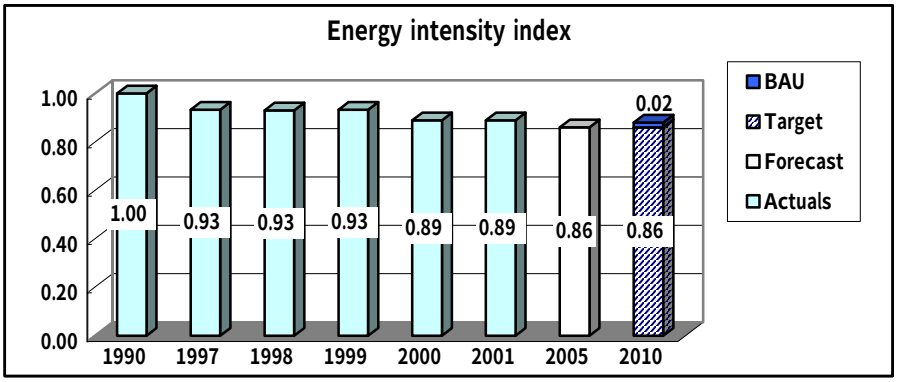
Note 2: The figures for fiscal 1990-1999 and fiscal 2010 are estimates for the entire shipbuilding industry, including the Cooperative Association of Japan Shipbuilders.

Note 3: The fiscal 2010 forecast assumes that the tonnage produced by Japan in that year will be similar to the fiscal 2000 level.

Japan Association of Refrigerated Warehouses

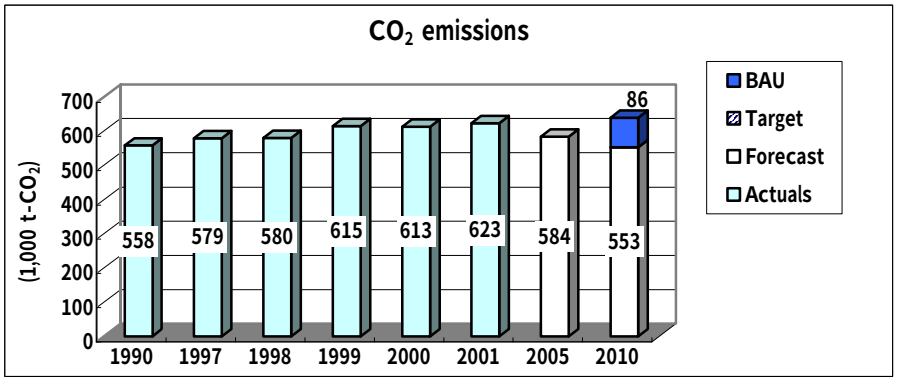
To reduce annual electric power consumption per ton of facility capacity (kWh/facility-ton) by 8% of fiscal 1990 levels, by fiscal 2010.

1. Progress toward target



Note: A value of one (1) has been assigned to the fiscal 1990 intensity index.

2. Carbon dioxide emissions



Assigning a value of one (1) to the index of energy consumption intensity in fiscal 1990 gives 0.93 in fiscal 1997, 0.93 in fiscal 1998, 0.93 in fiscal 1999, 0.89 in fiscal 2000, and 0.89 in fiscal 2001. The industry is forecasting indices of 0.86 in both fiscal 2005 and 2010.

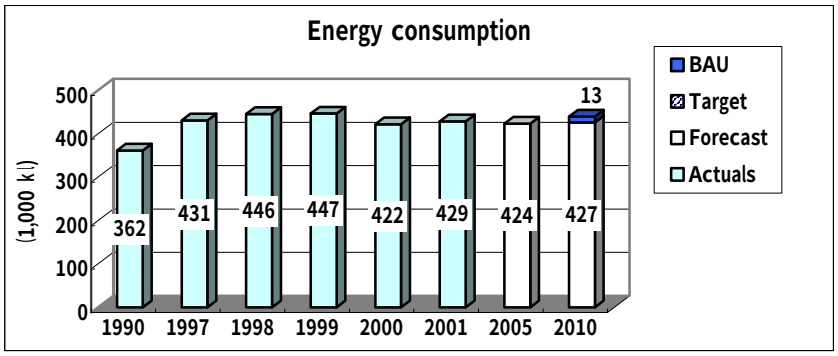
The refrigerated warehouse industry has emitted the following amounts of carbon dioxide: 558,000 t-CO_2 in fiscal 1990; 579,000 t-CO_2 in fiscal 1997; 580,000 t-CO_2 in fiscal 1998; 615,000 t-CO_2 in fiscal 1999; 613,000 t-CO_2 in fiscal 2000; and 623,000 t-CO_2 in fiscal 2001. It is forecasting emissions of 584,000 t-CO_2 in fiscal 2005, and 553,000 t-CO_2 in fiscal 2010—representing a 4.7% gain and 0.9% decline, respectively, compared with fiscal 1990. If voluntary action plans were not implemented, carbon dioxide emissions in fiscal 2010 would be 639,000 t-CO_2—a 14.5% increase compared with fiscal 1990.

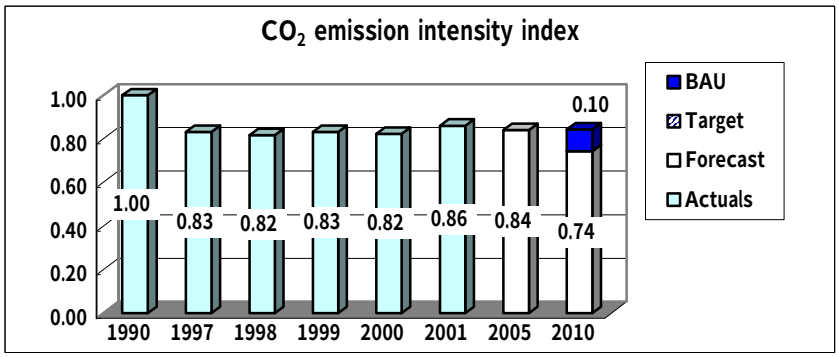
3. Steps taken to achieve targets

● Major

- Installing energy-efficient equipment (static capacitors to improve motor power rates; improving the rate of take-up of electronic expansion valves; improving the rate of take-up of demand control devices; promoting use of energy-efficient lighting; promoting use of highly efficient compressors and heat-exchangers)
- Energy-conservation measures arising from improvements in plant and equipment (enclosing loading platforms; preventing incursion of external heat through greater use of insulation; preventing leakage of cold air through heat-proof doors)
- Energy-conservation achieved through daily operational management practices (maintaining refrigerators at temperatures appropriate to items being stored; ensuring cleanliness of heat-transfer tubing in condensers)
- Other initiatives (making known the existence of an energy conservation manual, and encouraging comprehensive compliance by members; convening seminars and workshops on energy conservation)

5. Reference data





The industry has consumed the following amounts of energy (in crude oil equivalents): 362,000 kl in fiscal 1990; 431,000 in fiscal 1997; 446,000 kl in fiscal 1998; 447,000 kl in fiscal 1999; 422,000 kl in fiscal 2000; and 429,000 kl in fiscal 2001. It is forecasting consumption of 424,000 kl in fiscal 2005, and 427,000 kl in fiscal 2010—17.1% and 18.0% higher, respectively, than in fiscal 1990. If voluntary action plans were not implemented, the industry forecasts that it would use 440,000 kl in fiscal 2010—21.5% more than in fiscal 1990.

Assigning a value of one (1) to the index of carbon dioxide emission intensity in fiscal 1990 gives 0.83 in fiscal 1997, 0.82 in fiscal 1998, 0.83 in fiscal 1999, 0.82 in fiscal 2000, and 0.86 in fiscal 2001. The industry is forecasting indices of 0.84 in fiscal 2005 and 0.74 in fiscal 2010. If voluntary action plans were not implemented, the forecast for fiscal 2010 would be 0.84—a decline of 16.0% on fiscal 1990.

6. Other global warming initiatives

- Greenhouse gases other than carbon dioxide

  Approximately 80% of industry warehouses use HCFC22 as a refrigerant. Maximum care is therefore being taken to prevent leakage during operations and maintenance.

- Emissions from offices and in-house distribution

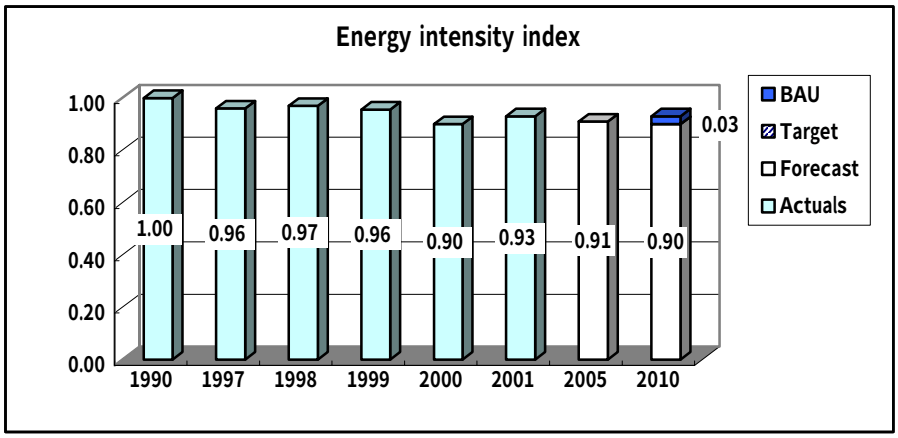
  In conjunction with consignment agents and trucking companies, the industry is using computerized systems, among other means, to improve the efficiency of distribution in general.

Note: The industry's principal business is providing storage in refrigerated warehouses. The participation rate in the follow-up survey was approximately 54% (650 companies out of 1,200), and findings were extrapolated to the entire industry. A power consumption survey was conducted of 830 of 1,800 sites operated by member companies (46%), and results were extrapolated to give carbon dioxide emissions for the industry as a whole. The forecast for carbon dioxide emissions in fiscal 2010 assumes that the rate of growth in plant and equipment capacity will be 1% between fiscal 2000 and 2005, and 0.5% between fiscal 2005 and 2010. The emissions coefficient for demand-end electricity was used to calculate carbon dioxide emissions from electricity consumption.

Japan LP Gas Association

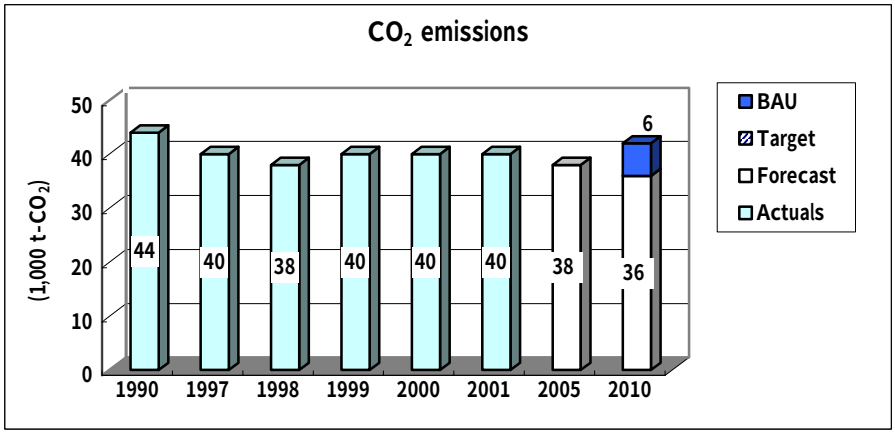
To reduce energy consumption intensity (kWh/LPG-ton) at LPG storage and distribution facilities (import terminals, secondary terminals) in fiscal 2010 by more than 7% compared with the fiscal 1990 level. (Relevant terminals are those owned by importers and primary distributors of LPG, and the terminals of users in other industry sectors are specifically excluded.)

1. Progress toward target



Note: A value of one (1) has been assigned to the fiscal 1990 intensity index.

2. Carbon dioxide emissions



Assigning a value of one (1) to the index of energy consumption intensity in fiscal 1990 gives indices of 0.96 in fiscal 1997, 0.97 in fiscal 1998, 0.96 in fiscal 1999, 0.90 in fiscal 2000, and 0.93 in fiscal 2001. The fiscal 2010 target of less than 0.93 has already been substantially achieved, but the industry will continue to integrate and shut down LPG terminals and rationalize manufacturing processes, to ensure the achievement and seek to better it.

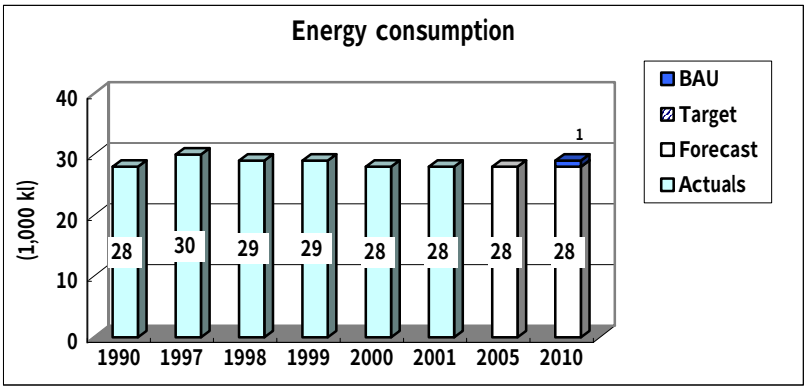
The industry has recorded the following carbon dioxide emissions: 43,600 t-CO_2 in fiscal 1990; 39,900 t-CO_2 in fiscal 1997; 38,100 t-CO_2 in fiscal 1998; 40,100 t-CO_2 in fiscal 1999; 40,400 t-CO_2 in fiscal 2000; and 40,300 t-CO_2 in fiscal 2001. It is forecasting emissions of 38,100 t-CO_2 in fiscal 2005 and 36,000 t-CO_2 in fiscal 2010—12.5% and 17.5% reductions,

respectively, compared with fiscal 1990. If voluntary action plans were not implemented, emissions in fiscal 2010 would be 41,500 t-CO_2—a reduction of only 4.8% compared with fiscal 1990.

3. Steps taken to achieve targets

- Major
  - Reducing total consumed energy (electricity) intensity in LPG terminals through rationalization; integrating and closing down LPG terminals across the country (including rationalizing distribution and engaging in joint deliveries and shipments among LPG firms.)
  - Reducing total consumed energy (electricity) intensity through rationalization of manufacturing processes at LPG terminals

5. Reference data



The industry has recorded the following energy consumption: 28,300 kl in fiscal 1990; 29,700 kl in fiscal 1997; 29,300 kl in fiscal 1998; 29,200 kl in fiscal 1999; 27,800 kl in fiscal 2000; and 27,700 kl in fiscal 2001. It is forecasting consumption of 27,700 kl in both fiscal 2005 and fiscal 2010—2.1% less than in fiscal 1990. If voluntary action plans were not implemented, emissions in fiscal 2010 would be 28,600 kl, up only 300 kl on fiscal 1990, and therefore virtually unchanged.

6. Other global warming initiatives

- Emissions from offices and in-house distribution

Energy consumed at a terminal includes that consumed at the offices associated with a given terminal. Data on energy consumption at head or branch offices or at sales outlets is presently not available.

- Contributions to the consumer goods and transport sectors (impact on products and services)

Joint shipments among LPG firms, as well as the scrapping of secondary terminals have reduced cargo volumes on coastwise tankers. Reductions in the relevant transport sector should be reported by the freight industry, and no specific data is therefore recorded here, but it is apparent that the sector is contributing to energy savings and carbon dioxide reductions.

7. Environmental management and conservation in overseas business activities

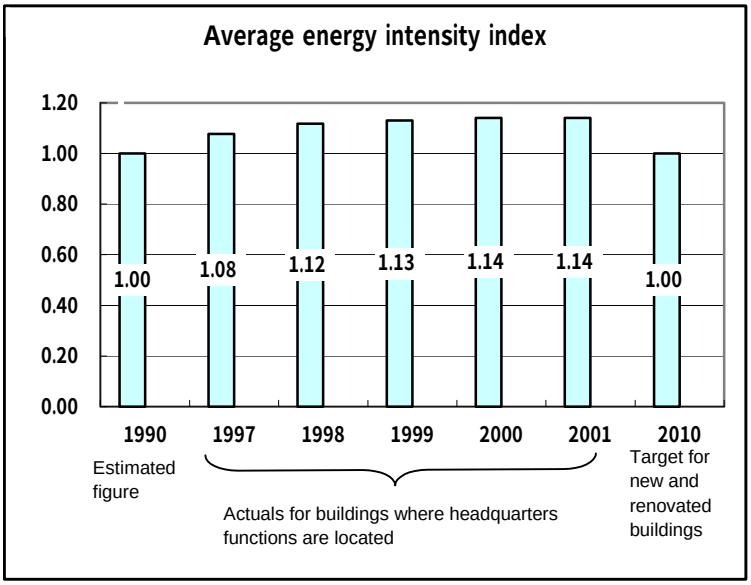
The four LPG distributor organizations have engaged in activity to educate about and promote awareness of the environment, in the form of their publication and distribution of "The LPG Book," and their cooperation in the production of side readers on energy issues for students issued by the Japan Productivity Center for Socio-Economic Development. The Association is also engaged in a variety of activities to promote the adoption of LPG motor vehicles, which embody a level of environmental friendliness equivalent to that of natural gas. The Association has also taken opportunities to exchange technology and information about LPG with the nations of Asia, and to advise on and support environmental initiatives using LPG.

Note: The industry is engaged principally in the import and distribution of LPG (liquefied petroleum gas). The participation rate in the follow-up survey was 71% (15 LPG terminal owners out of a total 21 member companies), but the survey was aimed at covering 100% of terminals. Carbon dioxide emissions were calculated from the average emission intensity of all sources of electricity, based on the results of monitoring electricity consumption intensity at some 72% of respondent import terminals and 62% of respondent secondary terminals, having determined overall power use from total LPG imports. The fiscal 2010 forecast assumes that the amount of LPG handled at terminals will rise by 1.15% of fiscal 2001 volume by fiscal 2005, and by 3% by fiscal 2010.

The Real Estate Companies Association of Japan

As of 2001, member companies of the Real Estate Companies Association will seek to offer renovated, rebuilt, or new buildings for which energy consumption per unit of floor area (energy consumption intensity) does not exceed fiscal 1990 levels, by promoting energy-saving and long-life design, and by introducing energy-efficient equipment and machinery, and will encourage tenants in energy-efficient behavior.

1. Progress toward target (actuals for existing buildings; targets for renovated, rebuilt, or new buildings)



Assigning a value of one (1) to the fiscal 1990 energy intensity index gives 1.08 in fiscal 1997, 1.12 in fiscal 1998, 1.13 in fiscal 1999, and 1.14 in fiscal 2000 and 2001. The fiscal 2010 target for renovated, rebuilt, or newly constructed buildings is 1.00—the same as in fiscal 1990.

Factors that may contribute to changes in actuals are climatic effects and changes in vacancy rates.

3. Steps taken to achieve targets

- Reduction in carbon dioxide emissions from owner-occupied and rental buildings
  - ① Undertaking energy saving and carbon dioxide initiatives in constructing and renovating owner-occupied and rental buildings
  - ② Selecting construction materials and air conditioning systems with due regard for the reduction of HFCs
  - ③ Promoting energy conservation in the management and maintenance of rental buildings and properties
  - ④ Promoting energy conservation in day-to-day in-house office activities

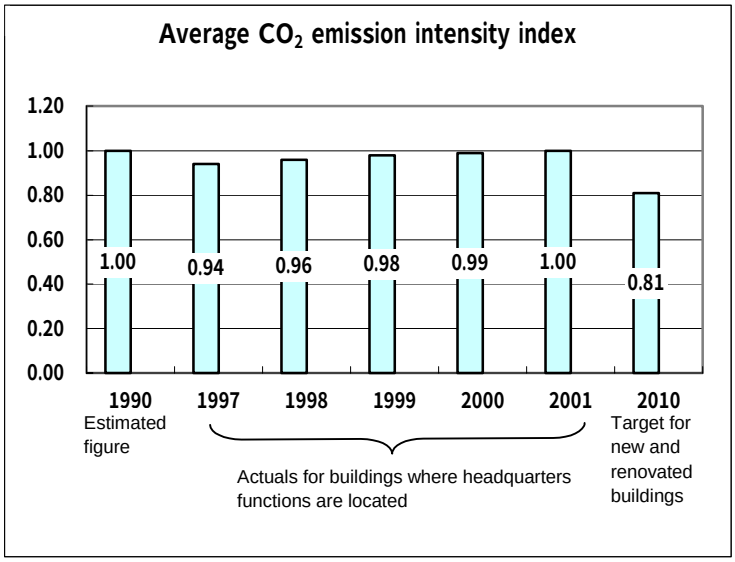
Reference: Energy conservation initiatives in residential subdivisions

① Energy-efficient and low-carbon dioxide emission design and machinery
② Design of long-life buildings (ensuring freedom of choice in renovations and upgrades, and implementing countermeasures against structural deterioration)
③ Design that takes account of re-use of construction waste (e.g., using eco materials)

4. Factors accounting for increases or decreases between fiscal 1990 and 2001

Like changes in the index of energy consumption intensity, carbon dioxide emission intensity has changed very little. Principle causes of variation are changes in energy mix or in emission intensity for electricity.

5. Reference data (actuals for existing buildings; targets for renovated, rebuilt, or new buildings)



Assigning a value of one (1) to the index of carbon dioxide emission intensity in fiscal 1990 gives 0.94 in fiscal 1997, 0.96 in fiscal 1998, 0.98 in fiscal 1999, 0.99 in fiscal 2000, and 1.00 in fiscal 2001. The fiscal 2010 forecast for renovated, rebuilt, or new buildings is 0.81.

7. Environmental management and conservation in overseas business activities

Initiatives relating to ISO14001

Mitsubishi Estate, Mitsui Fudosan, Tokyo Tatemono, Tokyu Land Corporation, Meiho Enterprise, Tokyo Gas Urban Development, Hitachi Life, Isuzu Estate, and Marubeni Real Estate and others have acquired or are in the process of acquiring ISO14001.

Note. The principal activities of members of the Real Estate Companies Association of Japan are the leasing, management, and maintenance of buildings and other properties, and subdivision development. A total of 71 companies participated in the follow-up survey (the association has 240 members, 169 of which deal primarily in real estate), and energy consumption data referenced was supplied by 11% of the real estate companies (19 companies out of 169). The total floor area of the

buildings of the 19 respondent companies (approx. 1.71 million m^2) represents 0.2% of total office building floor area in Japan[1] (764 million m^2). Figures for energy intensity and carbon dioxide emission intensity were determined from annual data from the 19 companies for the period fiscal 1997 to 2001. The energy source mix in fiscal 2010, the target year, is assumed to be the same as for fiscal 2001. The fiscal 1990 energy source mix was estimated from trends in the data between fiscal 1997 and 2001. Intensity of district heating and cooling was derived from data supplied by the Environment Agency (now the Ministry of the Environment).

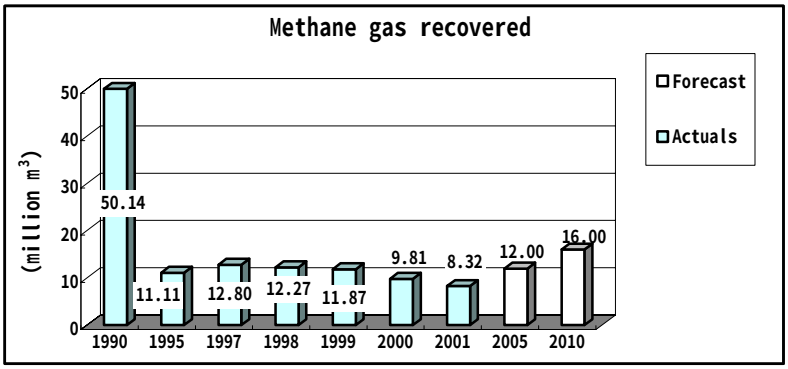
[1] As of 1 January, 2001, "Summary Report on Prices, etc. of Fixed Assets," Ministry of Public Management, Home Affairs, Posts and Telecommunications

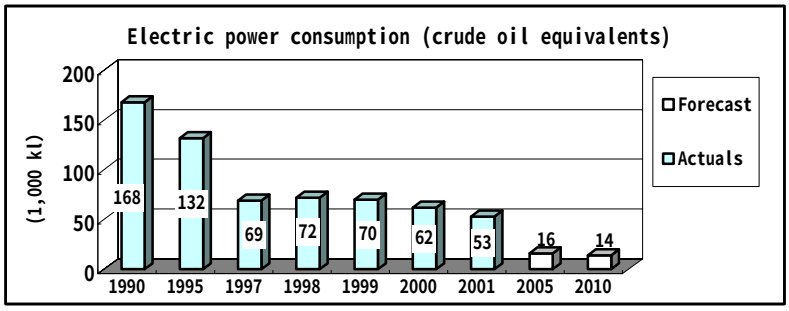
Japan Coal Energy Center

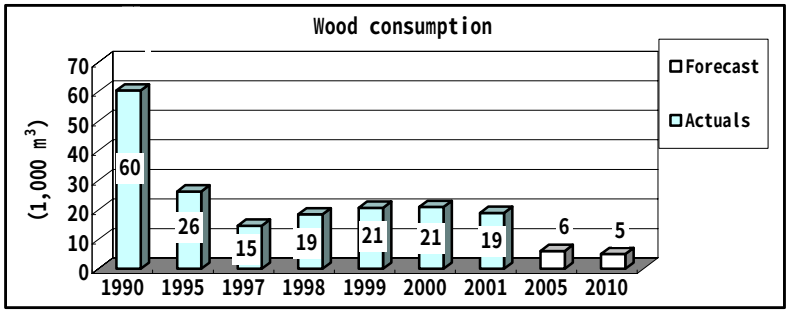
The industry's targets for fiscal 2010, compared with fiscal 1995, are as follows:

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

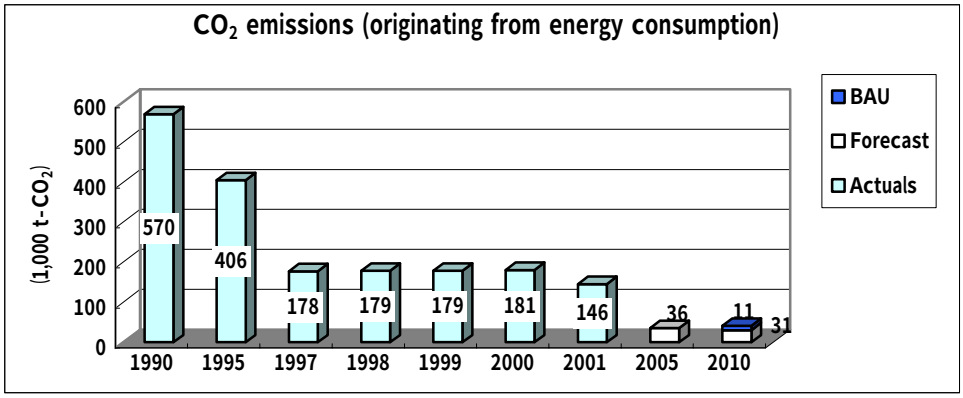
1. Progress toward target







2. Carbon dioxide 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; 9.81 million m^3 in fiscal 2000; and 8.32 million m^3 in fiscal 2001. It is forecasting recovery of 12 million m^3 in fiscal 2005, and 16 million m^3 in fiscal 2010—8% and 44% more, respectively, than in fiscal 1995.

The industry has consumed the following amounts of electric power (in crude oil equivalents): 168,000 kl in fiscal 1990; 132,000 kl in fiscal 1995; 69,000 kl in fiscal 1997; 72,000 kl in fiscal 1998; 70,000 kl in fiscal 1999; 62,000 kl in fiscal 2000; and 53,000 kl in fiscal 2001. It is forecasting consumption of 16,000 kl in fiscal 2005, and 14,000 kl in fiscal 2010—88% and 89% less, respectively, than in fiscal 1995.

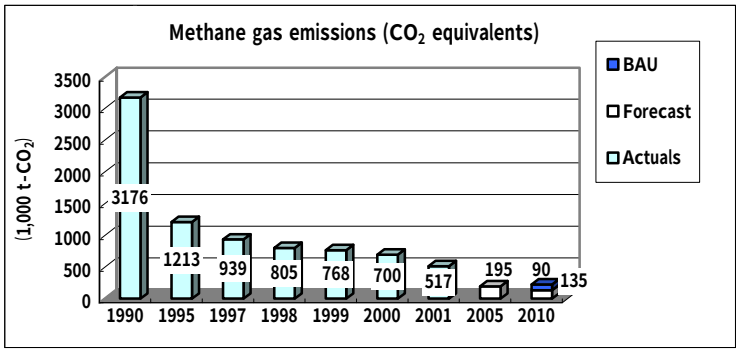
The industry has consumed the following amounts of wood: 60,000 m^3 in fiscal 1990; 26,000 m^3 in fiscal 1995; 15,000 m^3 in fiscal 1997; 19,000 m^3 in fiscal 1998; 21,000 m^3 in both fiscal 1999 and 2000; and 19,000 m^3 in fiscal 2001. The industry is forecasting usage of 6,000 m^3 in fiscal 2005, and 5,000 m^3 in fiscal 2010—77% and 81% less, respectively, than in fiscal 1995.

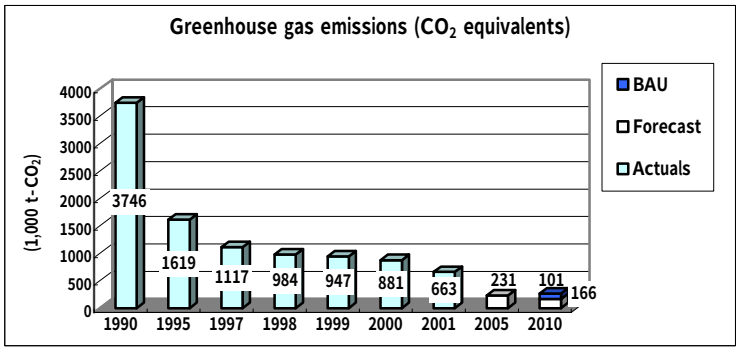
The industry has emitted the following amounts of carbon dioxide in association with its consumption of energy: 570,000 t-CO_2 in fiscal 1990; 406,000 t-CO_2 in fiscal 1995; 178,000 t-CO_2 in fiscal 1997; 179,000 t-CO_2 in fiscal 1998; 179,000 t-CO_2 in fiscal 1999; 181,000 t-CO_2 in fiscal 2000; and 146,000 t-CO_2 in fiscal 2001. It is forecasting emissions of 36,000 t-CO_2 in fiscal 2005, and 31,000 t-CO_2 in fiscal 2010—94% and 95% less, respectively, than in fiscal 1990. If voluntary action plans were not implemented, emissions in fiscal 2010 would be 42,000 t-CO_2—93% less than in fiscal 1990.

3. Steps taken to achieve targets

- Major
  - Methane: Promoting methane recovery through gas drainage drilling (introduction of ultra-long hole drilling machines), and making effective use of recovered methane; undertaking transfer of methane-recovery technology to other coal-producing countries
  - Electricity: Reducing the scale of and integrating operating sites; achieving greater efficiency from technical development and improvements in mining equipment
  - Wood: Reducing use of wood through improved mining methods, including replacing wooden tunnel supports with steel, and making more general use of concrete shafts

5. Reference data





Note: The figures (CO_2 equivalents) represent the total CO_2 emissions originating from energy consumption and methane gas emissions.

Through its coal production activities, the industry has emitted the following amounts of methane gas (in carbon dioxide equivalents): 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 t-CO_2 in fiscal 1999; 700,000 t-CO_2 in fiscal 2000; and 517,000 t-CO_2 in fiscal 2001. It is forecasting emissions of 195,000 t-CO_2 in fiscal 2005, and 135,000 t-CO_2 in fiscal 2010—94% and 95% less, respectively, than in fiscal 1990.

Total greenhouse gas emissions, comprising methane gas and carbon dioxide emissions from energy consumption, were: 3.746 million t-CO_2 in fiscal 1990; 1.619 million t-CO_2 in fiscal 1995; 1.117 million t-CO_2 in fiscal 1997; 984,000 t-CO_2 in fiscal 1998; 947,000

t-CO_2 in fiscal 1999; 881,000 t-CO_2 in fiscal 2000; and 663,000 t-CO_2 in fiscal 2001. Emissions of greenhouse gases generated inside mining shafts remained more or less unchanged year-on-year in fiscal 2001, but a decline in energy consumption saw a decline in global warming gases in total. The industry is forecasting greenhouse gas emissions of 231,000 t-CO_2 in fiscal 2005, and 166,000 t-CO_2 in fiscal 2010—94% and 96% less, respectively, than in fiscal 1990. If voluntary action plans were not implemented, the industry forecasts that emissions of greenhouse gases in 2010 would be 267,000 t-CO_2—93% less than in fiscal 1990.

Note: The principal product of the industry is coal. Two major mines participated in the follow-up survey, representing 100% of the energy consumed by the industry. Compared with the 21 mines that were in operation as at the end of fiscal 1990, only 13 remained in production at the end of fiscal 2001. Between fiscal 1990 and fiscal 2001, the number of major mines also declined, from 6 to 2. The industry is forecasting annual production of 700,000 tons for the period from fiscal 2005 to fiscal 2010. Carbon dioxide emissions are a summation of the data provided by the participating companies.