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8-3 Energy Efficiency & Conservation in Transportation

運輸部門の省エネルギー政策

Mr. Satoshi OSHIMA
大島　聡

Chief of Section
Environment Division
Policy Bureau
Ministry of Land, Infrastructure and Transport

国土交通省
総合政策局　環境・海洋課
地球温暖化対策係長

The Nippon Foundation Subsidized Project

Transport Sector

Environmental Annual Report

— Creation of environment-friendly transport —

2001–2002

Transport Ecology Mobility Foundation
(Abb.: EcoMo Foundation)

Contents

I. Developments Concerning Environment in the Transport Sector

■ Developments concerning the problem of global warming

<Agreements at the resumed 6th Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change and the 7th Session>

In recent years, the problem of global warming due to greenhouse gases is receiving a lot of attention around the world and moves to take active measures for reducing greenhouse gases are gaining momentum.

In December 1997, at the third Session of the Conference of the Parties to the U.N. Framework Convention on Climate Change (COP3), the Kyoto Protocol was adopted and Japan promised to reduce greenhouse gases emissions by 6% around 2010, down from 1990. To attain this goal, the transport sector set its goal to restrain an increase to 17% vs. a 40% increase in greenhouse gases emissions from 1990 that may result if no measure is taken by cutting CO_2 by 46 million tons.

In the meantime, in July 2001, the resumed session of COP6 was held in Bonn, Germany. At this session, a basic agreement was reached (the Bonn Agreements) on crystallization of the Kyoto mechanism (clean development mechanism, joint implementation and emissions trading), which had not been reached at COP6. This agreement had a great significance in increasing the momentum towards the entry into force of the Kyoto Protocol in 2002.

Furthermore, at COP7 held in November 2001, legal documents based on the Bonn Agreements were adopted, thereby detailed rules on implementation of the Kyoto Protocol were decided, providing a prospect to ratification of the Protocol by developed countries. And rules on the Kyoto mechanism were made more flexible and to be widely used so that they would allow effective and sustainable global measures against global warming.

History of negotiations concerning global warming

December 1990, United Nations General Assembly resolves preparation of the Framework Convention on Climate Change;
March 1994, the Framework Convention on Climate Change enters into force;
March 1995, the 1st Conference of the Parties (COP1) starts preparation work for the Kyoto Protocol;
December 1997, the 3rd Conference of the Parties (COP3) adopts the Kyoto Protocol;
November 1998, the 4th Conference of the Parties (COP4) resolves that implementation rules for the Kyoto Protocol should be decided at COP6;
November 2000, the 6th Conference of the Parties (COP6) fails to reach agreement on implementation rules for the Kyoto Protocol;

July 2001, the resumed 6th Conference of the Parties establishes political agreement (the Bonn agreements) on the Kyoto Protocol; and
October to November 2001, the 7th Conference of the Parties establishes detail agreement (the Marrakech Agreements).

Upon the agreement at COP7, the Global Warming Prevention Headquarters with the Prime Minister as its Chief held a meeting on November 12, 2001, and decided to (1) review the current "Outline for Global Warming Prevention" and (2) do full-scale preparation for the adjustment or establishment of domestic systems necessary for the acceptance and ratification of the Kyoto Protocol.

At the meeting held on February 13, the Headquarters decided the following: (1) in promoting measures for preventing global warming, we will aim to create a scheme that will contribute to both the environment and the economy, leading also to revitalization of our economy, utilizing the creative ingenuity of the business community; (2) the combined forces of the central government, local governments, businesses and the general public will be utilized to implement the necessary policies; and (3) the decade from 2002 to 2012 will be divided into three terms and the state of progress of measures being taken and the status of emissions will be assessed before the start of the next term, and based on the results of that assessment necessary revision will be made in order to ensure that all additional measures are taken in each term, if necessary.

Responding to this, related government ministries and agencies discussed specific measures for achieving the goals. On March 19, these measures to implement the commitment of the Kyoto Protocol in Japan were summed up, and a new Outline for Global Warming Prevention was decided at the Headquarters.

Furthermore on March 29, the Kyoto Protocol and amendments to "Law on Promotion of Global Warming Prevention" were decided by the Cabinet and submitted to the Diet.

Global Warming Prevention Headquarters Meeting (Feb. 13, 2002)

■ Developments concerning problems on road traffic environment

On January 31, 2000, the Kobe District Court gave a decision on the first trial on the Amagasaki pollution litigation and approved suspension of emission for the first time in pollution trials in Japan. The claim for damage was partially recognized. Upon the decision, the case was settled on December 8 of the same year. Following this, on November 27, the

Nagoya District Court gave a decision about the first trial on a litigation against pollution in the southern part of Nagoya. As with the case of the litigation against pollution in Amagasaki, suspension of emission was approved. Upon the decision, the case was settled on August 8, 2001. The national government promised to promote actively environmental measures for the areas along National Roads No.43 and No.23.

On December 18, the Tokyo District Court concluded a hearing of the Tokyo air pollution litigation, which is different from previous air pollution litigations in that it does not limit the subject to a particular road but covers all national and metropolitan roads within the 23 Wards. The Court is expected to give judgment as early as the end of this year.

On May 8, 2001, the Prime Minister indicated a guideline that "in principle, general official vehicles should be all replaced with low emission vehicles within about 3 years from FY2002." Based on this, a Cabinet meeting (June 22, 2001) decided a partial change on the basic guideline for procurement of environmental goods, etc. based on the provisions of the Green Procurement Law, and designated CNG-powered automobiles, hybrid automobiles, electric automobiles, Methanol-powered automobiles, low-fuel-consumption vehicles and ultra-low-emission vehicles as eligible for introduction of general official vehicles.

Local governments are also increasingly active in movement toward reduction of NOx and PMs emissions from automobiles, such as seen in Tokyo's "Illegal Light-Oil Eradication Campaign", Osaka Prefecture's "Low Emission Vehicle Promotion Project", and other local authorities' measures for diesel vehicles.

■ Developments concerning waste problems

As a result of mass production, mass consumption and mass disposal, Japanese society is generating a huge amount of waste and many problems such as dioxin emissions from incineration facilities, increased illegal dumping, and shortened life of final disposal sites.

In this circumstances, attempts have been made in recent years to deal with these problems, including several times of amendment to the law on waste treatment and cleaning (the Waste Management Law) and establishment of laws for promotion of recycling.

· Zero Garbage Conference

As one of the first decisions of Urban Renewal Project by the Government toward reconstruction of zero garbage cities in the metropolitan area, after clarifying the role sharing among the national government, local public bodies and private sectors in Tokyo metropolis area, a "Zero Garbage Conference" was established as a forum for consultation among related ministries and seven prefectures/cities. The Conference

decided to take a leading role in the effort to form a set of waste treatment/recycling bases in the Tokyo/Keihin/Chiba coastal area. In doing so, it is necessary to reduce environmental load of the venous system for physical distribution such as transportation of waste materials. Therefore it is important to reflect in the planning stage of the bases how the venous distribution system should be like, and to prepare the related infrastructure accordingly.

· Enforcement of the Food Recycling Law

"Law for Promotion of Recycling Food Resources (Food Recycling Law)" was enforced in May of 2001, requiring the hotels, inns and other businesses that handle food to promote garbage recycling, etc.

■ Reorganization of District Transport Bureaus

In July 2002, while aiming at:

(1) "comprehensive deployment of transport software administration of the 21st century type" in land, sea, sky and tourism;

(2) promotion of public transport and tourism administration which are integrated in the local area;

(3) comprehensive responses to the challenges in the 21st century, such as global environmental problems and the progressively aging society; and

(4) establishment of administration of an after-the-fact check type which corresponds to deregulation and emphasizes safety,

District Transport Bureaus were reorganized as follows:

(1) Planning Department was reorganized to Planning and Promotion Department, and the system was reinforced;

(2) Transport Environment Department and Environment Division were created; and

(3) Divisions for railroads, automobiles and marine affairs were reorganized.

With this reorganization, District Transport Bureaus also are going to vigorously promote measures to respond environmental problems, such as dissemination of low emission vehicles and realization of environment-friendly transport systems.

More specifically, we will promote the following measures on environmental issues related to transport in local areas:

(1) In order to promote comprehensive and planned efforts on transport environmental problems in local areas, District Transport Bureaus formulate a

"Local Area Transport Environment Measure Action Plan", report the results of implementation, and do policy assessment.

(2) In order to promote wider use of low emission vehicles that are fit for actual conditions of the area, we establish a "Low Emission Vehicle Introduction Promotion Conference" consisting of local concerned parties, call for planned introduction of low emission vehicles to local public bodies, transport business operators and industrial circles, and raise awareness of people through events and symposiums. Dissemination of low emission vehicles in local areas will be advanced in close coordination with District Business and Industry Bureaus and District Environment Measure Inspector Offices.

(3) As measures against air pollution caused by automobiles, which is severer in large cities, we will guide transport business operators to voluntarily inspect their buses and trucks, conduct on-the-spot inspections for trucks, and promote detour transport, in cooperation with District Maintenance Bureaus and Prefectural Police Departments.

II. Present Conditions of Main Environmental Problems in the Transport Sector

1. Present condition of global environmental problems

The earth where we live is faced with serious environmental problems such as global warming, depletion of the ozone layer or the like. In order to hand down the planet where the generation following us may be able to lead a safe life, it is important for our generation to immediately implement measures.

(1) Current Situation of Global Warming

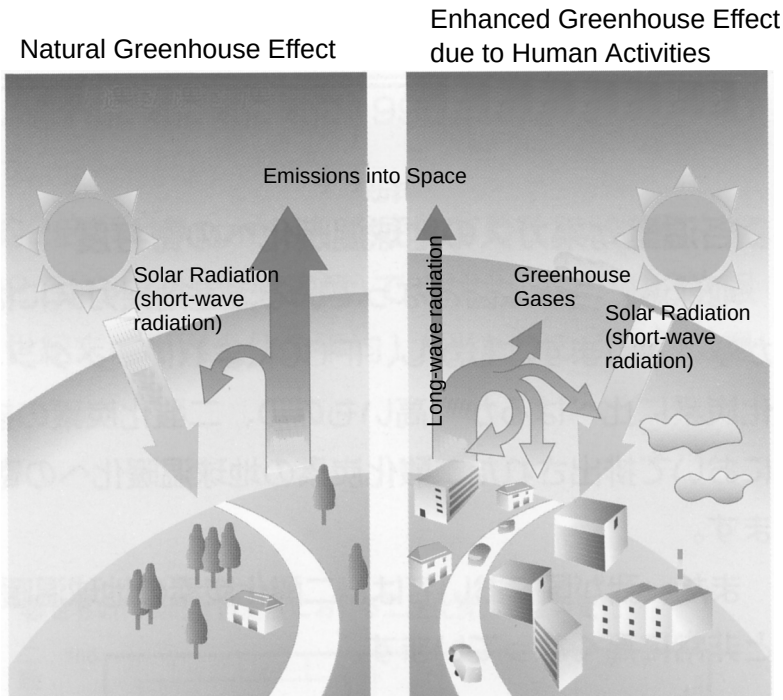
■ The Mechanism and Effects of Global Warming

We have been burning oil, coal, natural gas and other fossil fuels to acquire energy, and releasing the resulting carbon dioxide (CO_2) and other gases into the atmosphere.

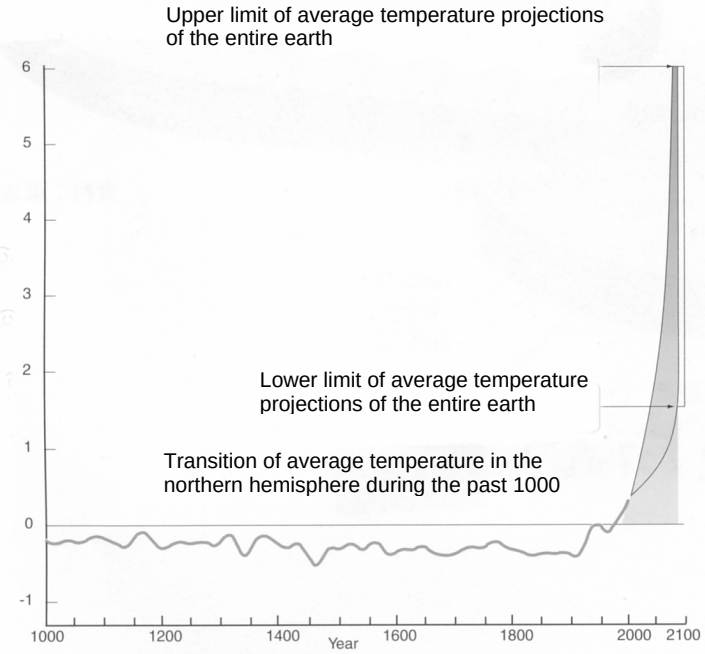
Gaseous constituents such as water vapor and carbon dioxide existing in the atmosphere warm the atmosphere by transiting most of the short-wave radiation from the sun while absorbing the long-wave radiation emitted from the earth's surface. These gases are known as greenhouse gasses as they work just like the glass of a greenhouse to warm up the earth and provide a suitable temperature environment for the existence of life.

However, due to the rapid increase in human activities through the development of industry, greenhouse gases emissions into the atmosphere have risen greatly. This would enhance the greenhouse effect existing naturally in origin and would rise global temperature, which is known as global warming.

With the global expansion of consumption of fossil fuels such as oil, unless measures for preventing global warming are implemented, the atmospheric concentration of greenhouse gases will increase, accelerating global warming. A report of the Intergovernmental Panel on Climate Change (IPCC) points out that at the end of the 21st century, damage including an increase in the temperature of the entire globe of about 1.4 to 5.8℃, a rise in the sea level of about 9 to 88 cm, as compared with 1990, an increase in the frequencies of torrential rain or water shortages, a decrease in food production in tropical and subtropical regions, an increase in malaria patients, existing plant species having difficulty in growing in one-third of all forests on the earth will increase.

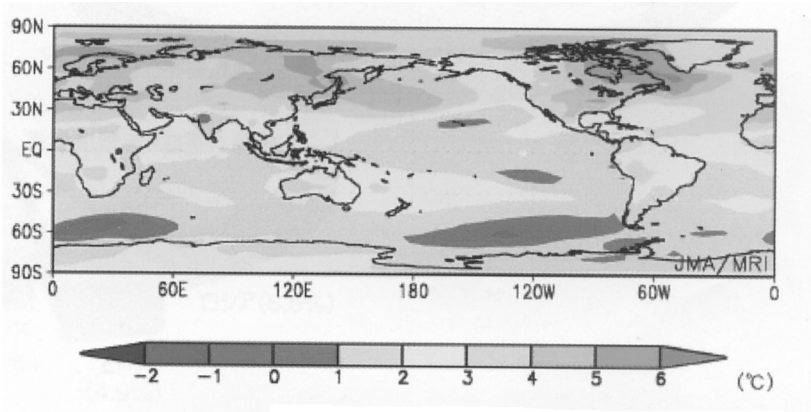


Mechanism of the Greenhouse Effect



Source: Made by the Ministry of Land, Infrastructure and Transport based on IPCC data

Outlook of Climate Change in the 21st Century



Data: Japan Meteorological Agency-"Global Warming Projection, Vol. 1"

Project of Temperature Changes due to Global warming (around 2100)

Column:

If global warming advances as it is, reportedly the average temperature will rise by 1.4 to 5.8℃ at the end of this century. Even in 1994 summer when record hotness was observed in may parts of Japan, the average temperature (June to August) in the Kanto area in that year was only 1.9℃ higher than average years. Even in the ice period 20,000 years ago when the sea level greatly withdrew, the average temperature was only 5℃ lower than today. Effects of a rise in average temperature due to global warming would never be small.

■ The Relative Contribution of Major Greenhouse Gases to Global Warming

Greenhouse gases contributing to global warming include methane, nitrogen suboxide, fluorocarbons in addition to carbon dioxide. However, According to IPCC, in a unit mass basis, radiative effect of major greenhouse gases except CO_2, that is methane, nitrous oxide, chlorofluorocarbons, etc., is greater than that of carbon counts for 64% of accumulated radiative forcing by all the greenhouse gases since the pre-industrial period. In Japan, contribution of carbon dioxide to total radiative forcing by greenhouse gases is extremely high at about 94% (in 1993).

Global Warming Potentials Following the Instantaneous Injection of a Unit Mass of Major Greenhouse Gases (*1)

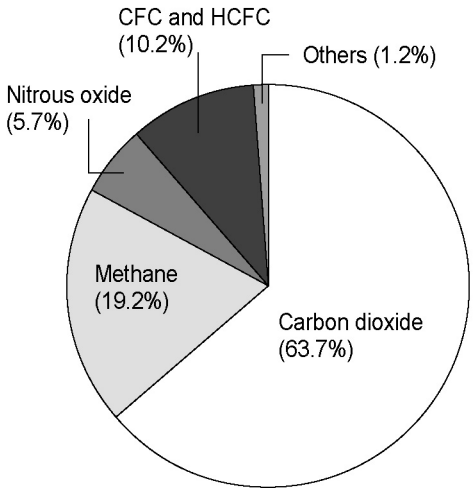
	Carton Dioxide	Methane	Nitrous Oxide	HFC (*2)	PFC(*3)	SF6
Global Warming Potential (100-year time horizon)	1	21	310	1,300	7,400	23,900

*1 Global Warming Potential ... the effect of warming of greenhouse gases in a 100-year period (the effect of carbon dioxides is set at 1)

*2 HFC .....value for typical HFC-134a used for refrigerators or the like.

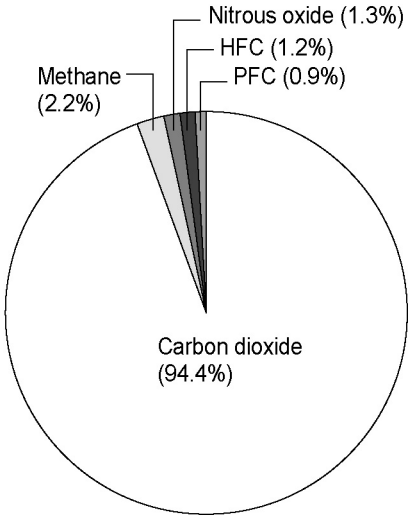
*3 PFC.....value for typical PFC-51-41 used for rectifies or the like

Data: Intergoverenmental Panel on Climate Change (IPCC) (1995)



Source: 2000 Environment White Paper

Relative Contributions of Major Greenhouse Gases to Global Warming in the World (1992)



Source: Ministry of Environment

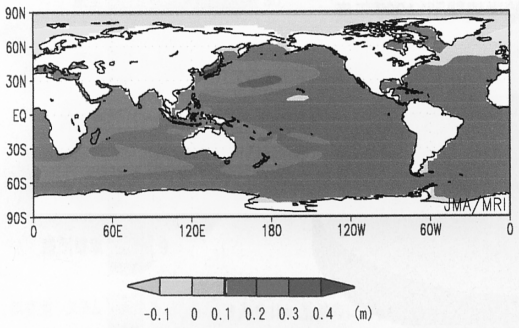
Relative Contributions of Major Greenhouse Gases to Global Warming in Japan (1993)

■ Changes in Carbon Dioxide Concentrations in the Atmosphere

The atmospheric concentration of carbon dioxide fluctuates annually due to photosynthesis or the like of plants. The fluctuation varies from place to place due to differences in vegetation.

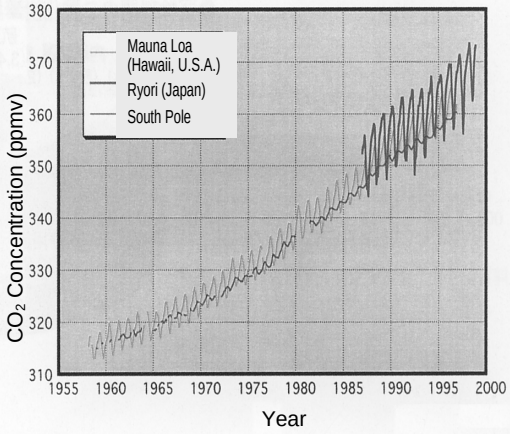
The concentration of carbon dioxide stabilized at about 280 ppmv (ppmv: one millionth of a cubic meter (volume ratio) before the industrial revolution in the late years of the 18th century. However, the concentration increased with the rapid development of industrial production activities or the like, exceeding 350 ppmv in the 1990s, and is currently continuing to increase at an annual rate of 1.5 ppmv.

At present, carbon dioxide emissions per person of Japan are equivalent to about 2.5 tons per annum (in terms of carbon). The analysis or the like of the second report of IPCC shows that to stabilize the carbon dioxide concentration at about two times the concentration before the industrial revolution (550 ppm), CO_2 emissions per person of the world must be curbed to 1 ton per annum or lower at the end of the 21st century.



Source: "Information of predictions of global warming, Vo. 1," Japanese Meteorological Agency

Predictions of a Rise in Sea Level due to Global Warming (around the year 2100)

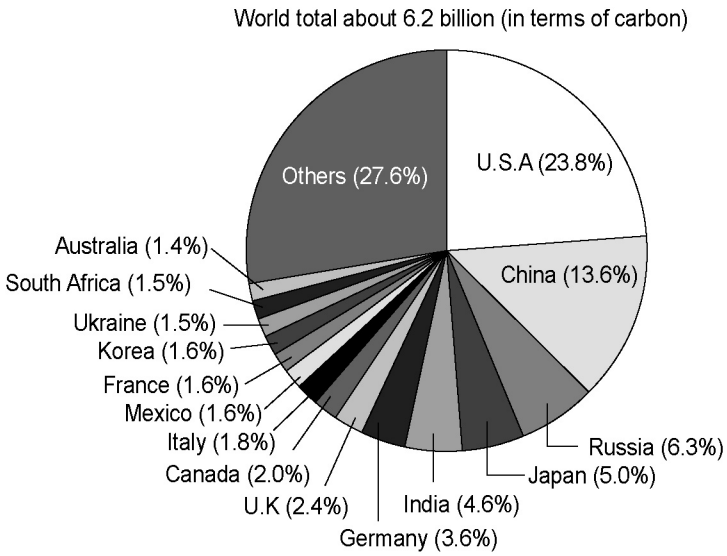


Data: Japan Meteorological Agency

Changes in Carbon Dioxide Concentrations at Three Stations in the World

■ Carbon Dioxide Emission for Individual Countries

The carbon dioxide emission shares for individual countries are the USA with 23.8%,China with 13.6%, Russia with 6.3% and Japan with 5.0%.



Data: Environment Agency (Japan):Carbon Dioxide Information and Analysis center (USA)

Carbon Dioxide Emissions for the World (individual countries) in 1996

(2) Untited Nations Framework Convention on Climate Change and the Kyoto Protocol

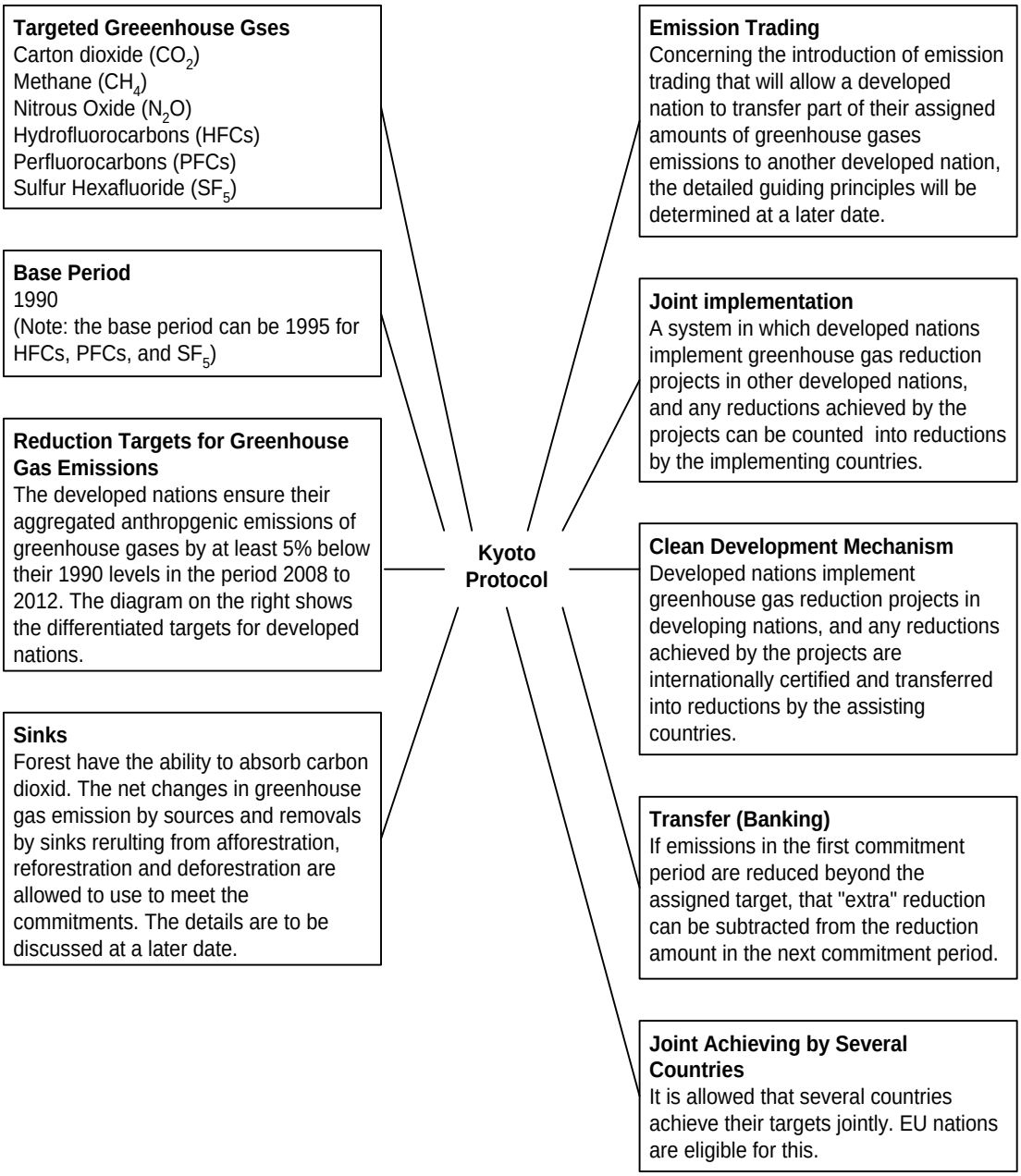
The United Nations Framework Convention on Climate Change, whose ultimate objective is "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic intererence with the climate system," was adopted in May 1992, and a ceremonial event to sign the Convention by heads of states was organized at the Earth Summit (Rio de Janeiro) in June of the same year. (Currently 186 countries (including one area) including Japan signed.)

To realize the purposes of the convention, the third session of the conference of the parties (COP3) was held in Tokyo in December 1997. At the session, the Kyoto Protocol was adopted. The protocol provides that Japan would reduce greenhouse gases including carbon dioxide by 6% from 1990 during a period of from 2008 to 2012 (first commitment period).

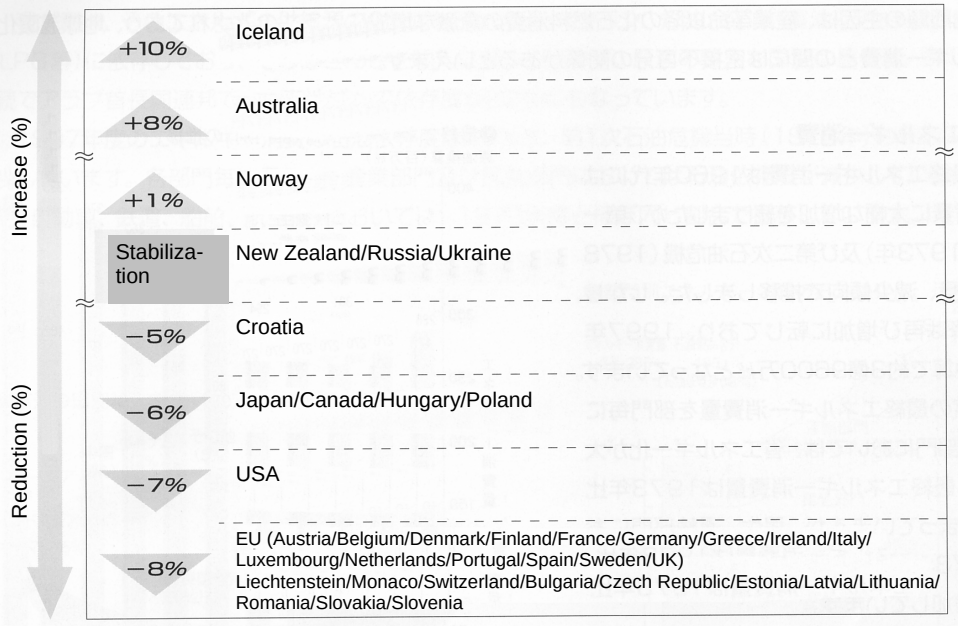
Subsequently, at the sixth session of the conference of the parties (COP6) held in Hague, the Netherlands in November 2000, to bring the Kyoto Protocol into effect at least by 2002, major items including materialization of the system of the Kyoto mechanism concerning emissions trading, joint implementation, a clean development mechanism (CDM) introduced in the Kyoto Protocol, and a conformance system specifying treatment of a country failing to meet the promise of reducing and restraining emissions or the like were discussed. However, the

signatories failed to reach an agreement, and COP6 was once suspended. Discussions are scheduled to be continued.

Subsequently, at the resumed sixth session of the conference of the parties (COP6) to the Framework Convention on Climate Change held in Bonn, Germany in July 2001, a basic agreement on the Kyoto mechanism was reached (the Bonn Agreements). Furthermore, at the seventh session (COP7) in November 2001, the Bonn Agreements were put into statutory form, thereby rules for implementation of the Kyoto Protocol were decided.

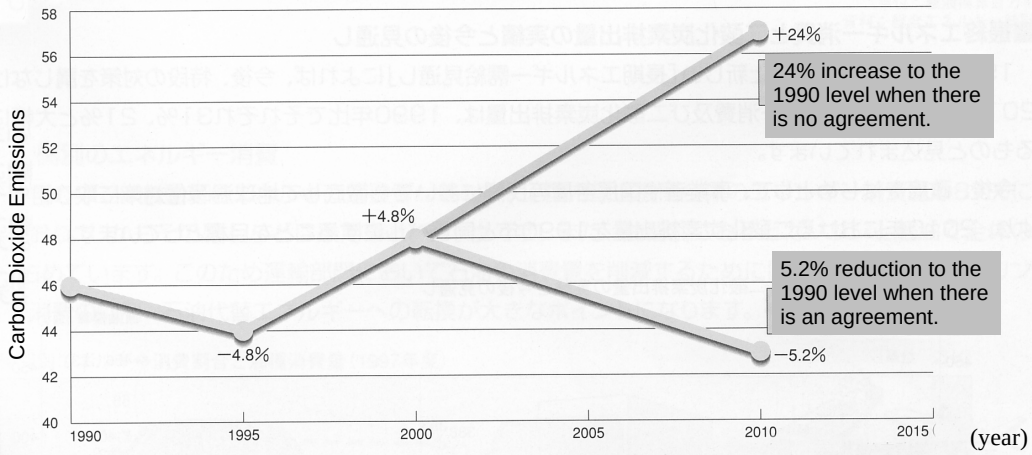


Major Points of the Kyoto Protocol



Reduction Targets for Greenhouse Gas Emissions (relative to 1990 level)

Expressed as the amount of carton 100-million Tons



Source: Data from the office of the United Nations Framework Convention on Climate Change

Estimated Effects of Carbon Dioxide Emission Reduction by the Kyoto Protocol (advanced industrialized nations)

■ Requirements for Kyoto Protocol to enter into force

Kyoto Protocol enters into force on the 90th day after the following two conditions are satisfied:

1) 55 or more nations have ratified it.

2) The total of carbon dioxide emissions in 1990 by those Annex I Nations (*) that ratified the Protocol is at least 55% of the total of emissions by all Annex I Nations.

* Nations that are obligated to achieve legally-binding numerical targets on emissions of greenhouse effect gases based on the Kyoto Protocol. (Applicable to developed and economically-transitional nations)

Percentages of Carbon Dioxide Emissions in 1990 by Annex I Nations

	Nation	Carbon dioxide emissions (thousand ton)	Percentage (%)
15 EU nations		3,326,423	24.2
	Germany	1,012,443	7.4
	UK	584,078	4.3
	Italy	428,941	3.1
	France	366,536	2.7
	Spain	260,654	1.9
	Netherlands	167,600	1.2
	Belgium	113,405	0.8
	Greece	82,100	0.6
	Sweden	61,256	0.4
	Austria	59,200	0.4
	Finland	53,900	0.4
	Denmark	52,100	0.4
	Portugal	42,148	0.3
	Ireland	30,719	0.2
	Luxembourg	11,343	0.1
Annex I Nations other than EU and Umbrella Group		1,073,140	7.8
●	Poland	414,930	3.0
△	Romania	171,103	1.2
●	Czech	169,514	1.2
△	Bulgaria	82,990	0.6
●	Hungary	71,673	0.5
△	Slovakia	58,278	0.4
	Switzerland	43,600	0.3
●	Estonia	37,797	0.3
△	Latvia	22,976	0.2
	Liechtenstein	208	0.0
	Monaco	71	0.0

	Nation	Carbon dioxide emissions (thousand ton)	Percentage (%)
Umbrella Group			
	USA	4,957,022	36.1
	Canada	457,441	3.3
	Australia	288,965	2.1
	Norway	35,533	0.3
	New Zealand	25,530	0.2
	Iceland	2,172	0.0
	Japan	1,173,360	8.5
	Russia	2,388,720	17.4
	Total	**13,728,306**	**100.0**

● indicates an EU candidate nation
△ indicates a nation in negotiation for EU membership

Source: Ministry of Environment

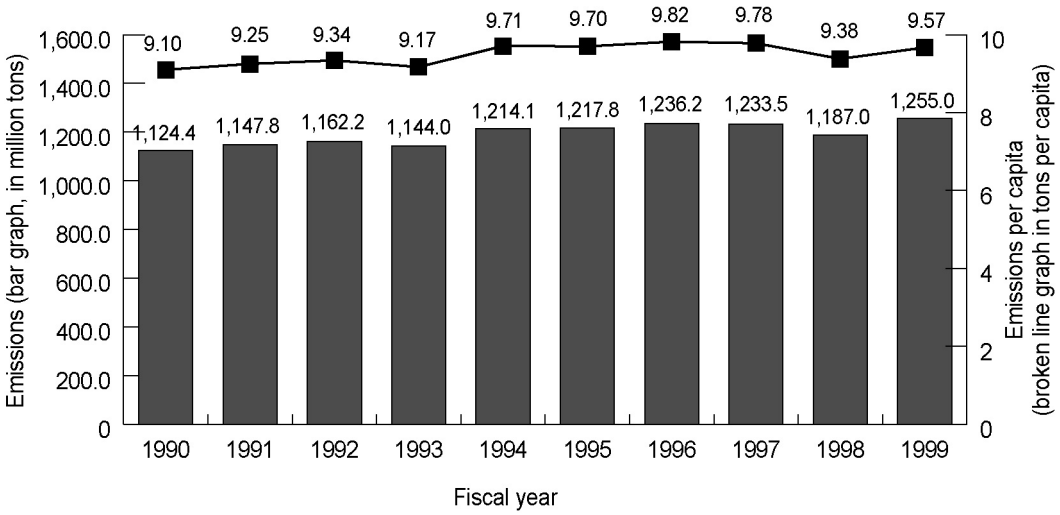
(3) Present condition of the global warming problem in Japan

1) Present condition of CO_2 emission in Japan

Japan is the world's fourth largest CO_2 emitting country, and plays a very important role in solving the global warming problem.

■ Transition of CO_2 emissions in Japan

Japan's carbon dioxide emissions in 1999 totaled about 1,225 million tons, about 9.67 tons per person.

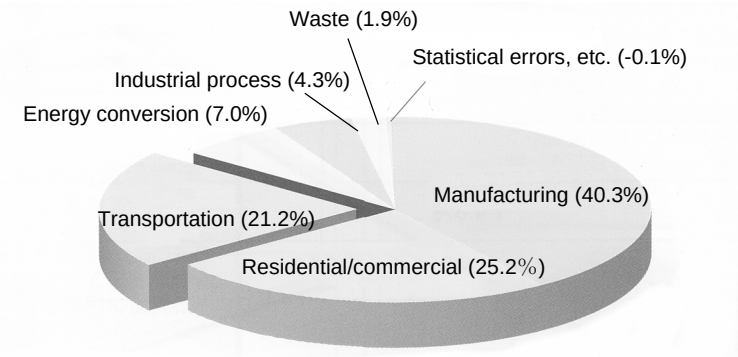


Source: Council of Cabinet Ministers Concerned with the Conservation of the Global Environment

Energy Consumption in Japan

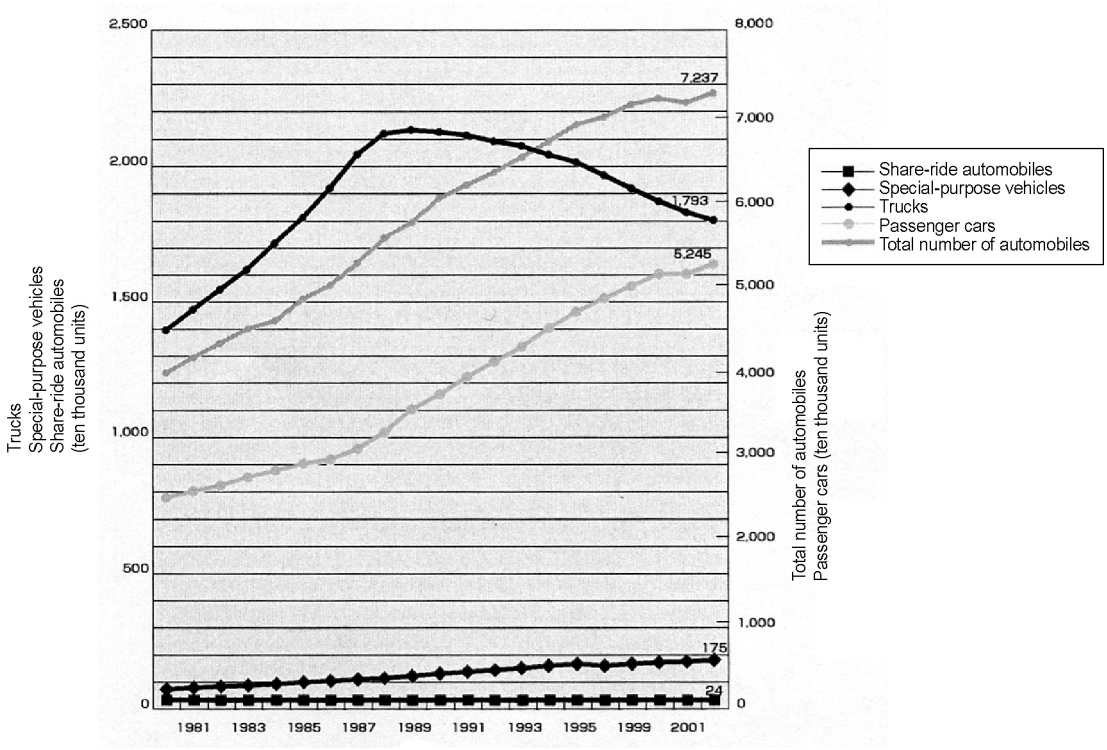
■ CO_2 emissions in percentage by sector in Japan

The industrial sector accounts for 40.3% of total carbon dioxide emissions of Japan, the residential/commercial sector 25.2%, and the transport sector takes 21.2%. Among these, emissions from the transport sector increased about 17% from 1990 to 1995 due to the great increases in automobile ownerships and driven distances. Years after 1995 also saw a continuous increase in carbon dioxide emissions, particularly from private passenger cars, and the figure in 1999 was a 23% increase from the one in 1990.



Source: Meeting of cabinet ministers concerned with global environment conservation

Japanese Carbon Dioxide Emissions (individual sectors) for Fiscal 1999



1: Passenger cars include mini-sized motor vehicles.
2: Small special vehicles and Type I and Type II motor-driven cycles are not included.

Source: Ministry of Land, Infrastructure and Transport

Change in Automobile Ownerships

2) The Present and Future of Transport and Energy

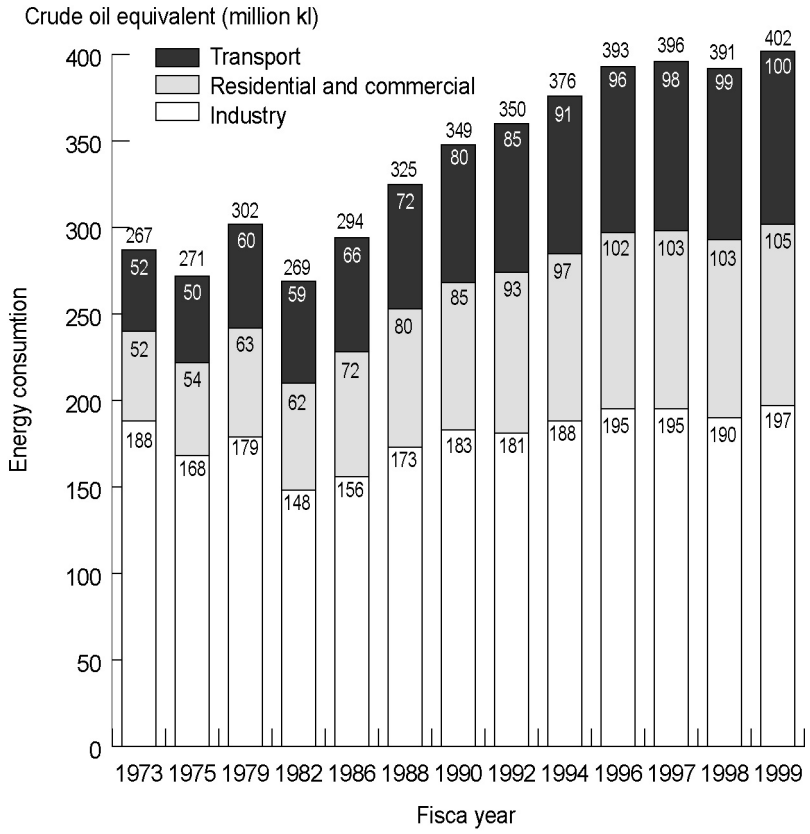
The main cause of global warming has been the rapid increase of fossil fuels consumption since the industrial revolution. Global warming and energy consumption are inseparably related.

■ Energy consumption in Japan

Energy consumption in Japan broadly increased associated with the economic growth in the 1960s, but a shift toward energy saving occurred following the first and second oil crises (1973 and 1978). However, this reversed back to renewed increases from 1983 onwards, and energy consumption reached approximately 416 million *kl* in crude oil equivalent in fiscal year 1999.

With regards to final energy consumption in 1999 by sector, the industrial sector accounting for nearly half of total consumption, recorded only 1% increase in final energy consumption from 1973.

On the other hand, the residential/commercial sector and the transportation sector, accounting for one fourth of total consumption, respectively, recorded a significant increase of 102% and 113%, respectively from 1973. Reasons for this include the prevalence of convenient and comfortable lifestyles with automobiles, air conditioners and other amenities.



Data: Energy Balance Tables in Japan

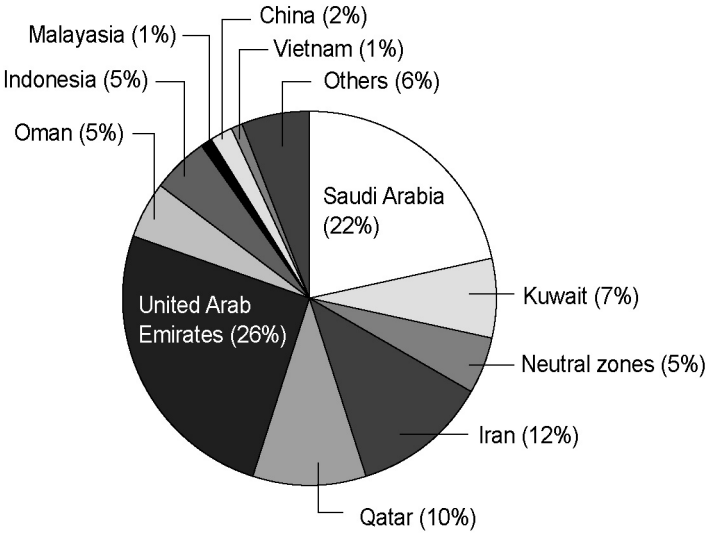
Changes in Final Energy Consumption (individual sectors)

■ Japan's Dependency on Oil for Energy Consumption

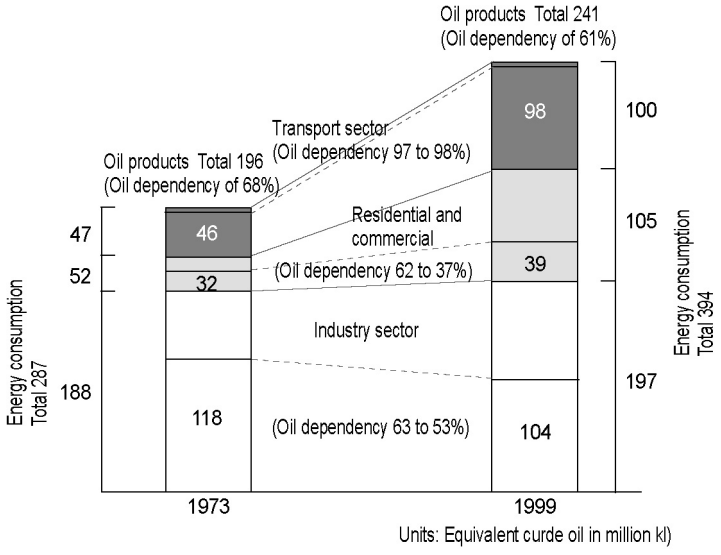
Japan depends on oil products (fuels such as gasoline, kerosene, light oil, heavy oil, aviation fuel, and liquefied petroleum gas) for about 60% of energy supply sources. Nearly all of these are imported. Some 87% of crude oil imports come from the Middle East region with the United Arab Emirates occupying pole position for 14 consecutive years.

Oil dependency for energy consumption was 61% as of fiscal 1999, which is a reduction on the 68% recorded at the time of the first oil crisis (1973). In

consumption sectors oil dependency is dropping in the industry sector and the residential and commercial sector, but has hardly changed from the 1973 levels in the transport sector (automobiles, railways, ships and aviation).



Crude Oil Import Percentages from Individual Countries (1998)



Data: Energy Balance Tables in Japan

Oil Dependency for Energy Consumption in Individual Sectors

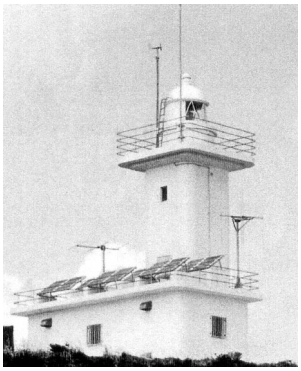
Column: Using Untapped Energy

In order to restrain emission of CO_2, NOx or the like by means of transportation and reduce an environmental load of the entire transit systems as a whole, technology development to use energy not used previously is being carried out.

Development of a breakwater to convert a wave force to electric power, introduction of a regional air conditioning system through use of waste heat, use of solar cell generation for lighting of station buildings and navigational aids, introduction of wind power generation facilities in ports and sea areas, for example, can be cited.

Examples include development of breakwaters that convert wave force to electric power, introduction of district air conditioning systems that utilize waste heat, use of power generated by solar cells on buildings of airport terminals and railroad stations, and on beacons, introduction of wind power generation facilities in ports and sea areas.

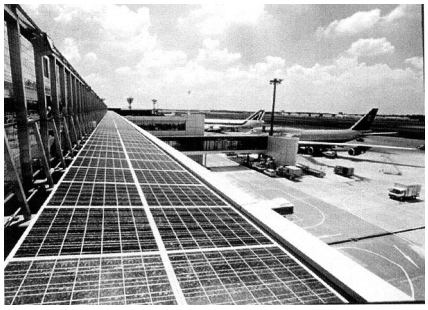
(a) Environmentally Friendly Lighthouses



The Maritime Safety Agency operates and maintains some 5,600 aids to navigation such as lighthouses and lighted buoys to ensure the safety and efficient navigation of ships. However, there are sometimes difficulties in using commercial electricity when installing aids to navigation on the sea, isolated islands, capes, reefs and shoals, due to the nature of locations. Here, the development of alternative energy supplies is essential.

In securing power sources for navigational aids, an effort is made to expand use of natural energy such as a wind force, sunlight, and a wave force. At present, natural energy is used for power sources of about 2,400 light houses, light buoys or the like equivalent to about 43% of a total number of such equipment.

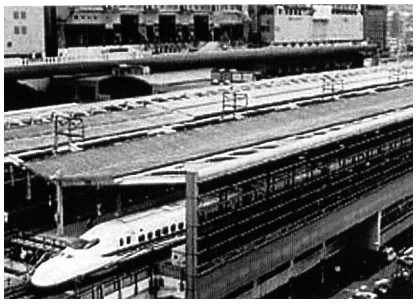
(b) Photovoltaic Power Generation System



Photovoltaic power generation is expected to come into widespread use as a clean power generation method because it does not emit carbon dioxides or the like, differently from thermal power generation.

At the New Tokyo International Airport, solar cell panels having the generating capacity a total of 120 kW are installed at three locations within the airport for providing power for lighting and others in the airport. This is the largest of photovoltaic power generation systems operating in airports of Japan.

(c) Solar power generation system of Sinkansen Kyoto station



A solar power generation system is installed over a large area of about 800 m^2 on the roof of the up line platform in Shinkansen Kyoto station. Generated power can illuminate the entire Shinkansen platforms of Kyoto station.

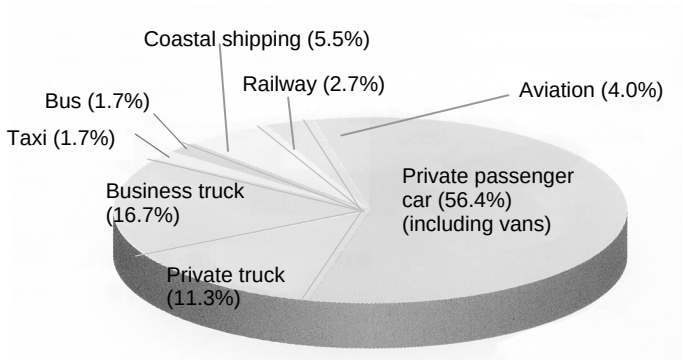
(4) Present condition of the global warming problem in the transport sector

1) Present condition of CO_2 emission in the transportation sector

CO_2 emissions from the transportation sector account for about 20% of Japan's CO_2 emissions, and are increasing yearly, showing an 23.0% increase from 1990 in 1999.

■ CO_2 emissions in percentage by means of transportation

Of CO_2 emissions of the transportation sector, those from automobiles represent 87.8%. Passenger cars account for 56.4% of the emissions.



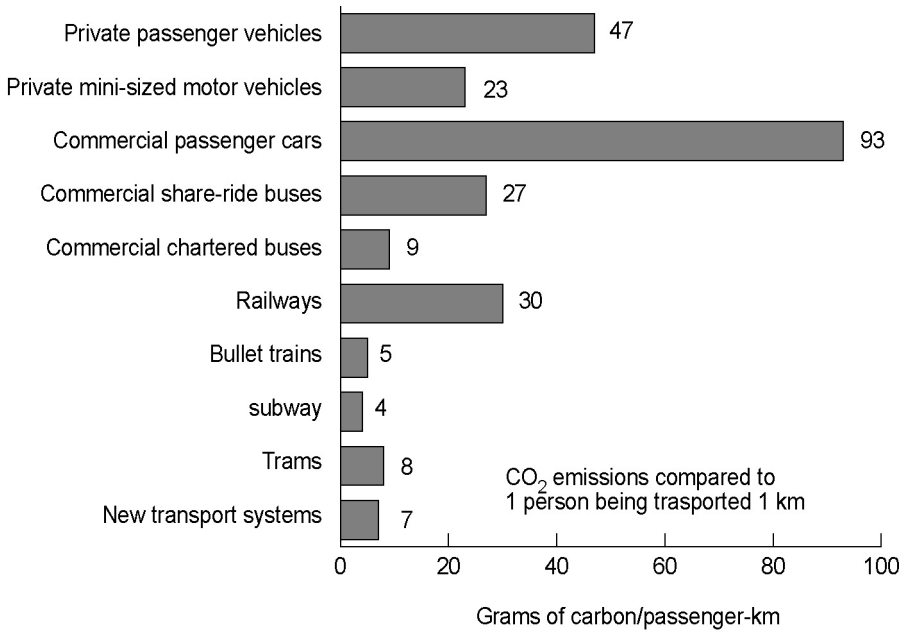
Source: Ministry of Land, Infrastructure and Transport

Carbon Dioxide Emissions in the Transportation Section (individual models of transport) for Fiscal 1998

■ Emission Units of Carbon Dioxide in the Transport Sector

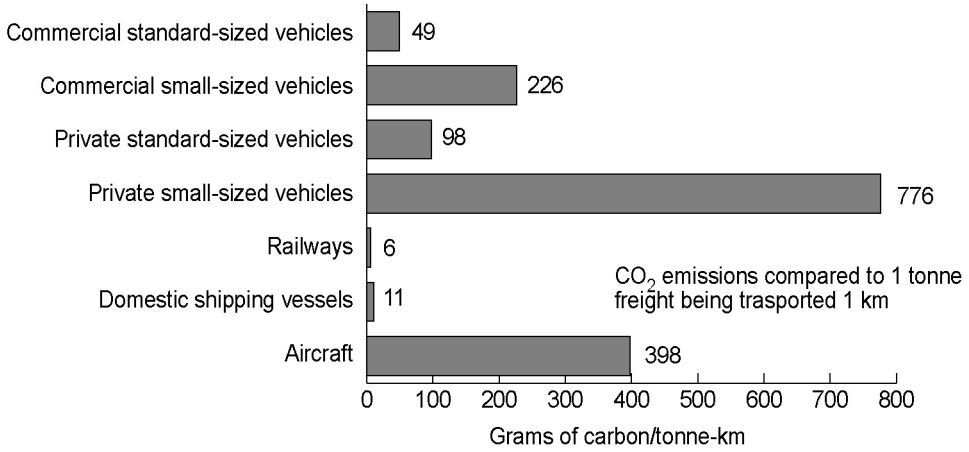
A comparison between CO_2 emissions per unit for passenger transportation (CO_2 emissions involved in carrying a person 1 km) shows that owner-driven motorcars emit about 9 times more CO_2 than railroads. Reduction of CO_2 emissions necessitates promotion of use of public means of transportation whose unit requirement CO_2 is smaller than owner-driven motorcars.

As for the unit requirement of CO_2 emission of cargo transport means (CO_2 emissions involved in carrying a cargo of 1 ton 1 km (in terms of carbon), owner-driven pickup tracks emit 130 times more CO_2 than railroads, 70 times more CO_2 than coastal shipping, 3.4 times more CO_2 than business pickup trucks. Efficient physical distribution should be sought for including efficient use of business trucks and modal shift or the like to coastal cargo shipping and railroads.



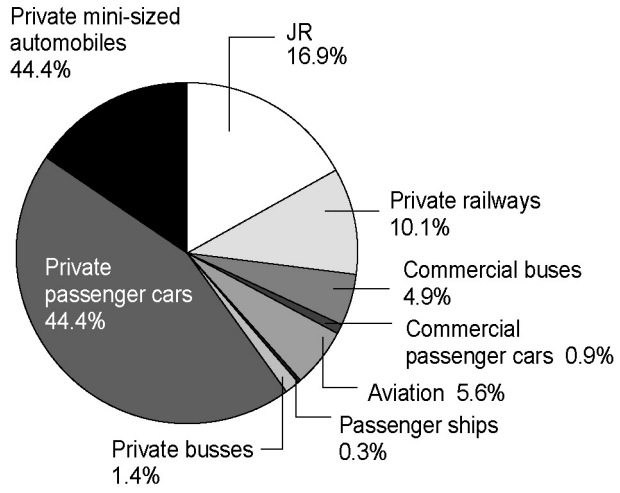
Source: made from data by the Ministry of Land, Infrastructure and Transport
Note: Private motor vehicles and private mini-sized motor vehicles include cars and trucks.

Emission Units of carbon Dioxide for Passenger Transport (1999)



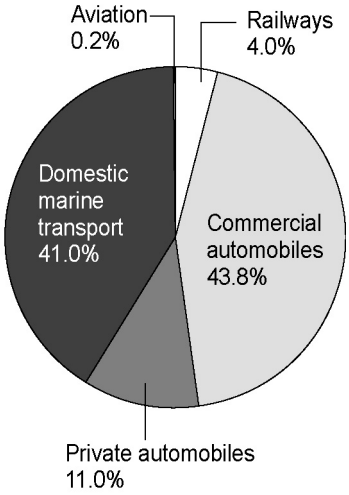
Source: made from data by the Ministry of Land, Infrastructure and Transport
Note: Standard-sized vehicles have a load capacity of 2,000 kg or more.

Emission Units of carbon Dioxide for Freight Transport (1999)



Source: Transport White Paper 2000

Domestic Passenger Transport Share by Means of Transport (person km)

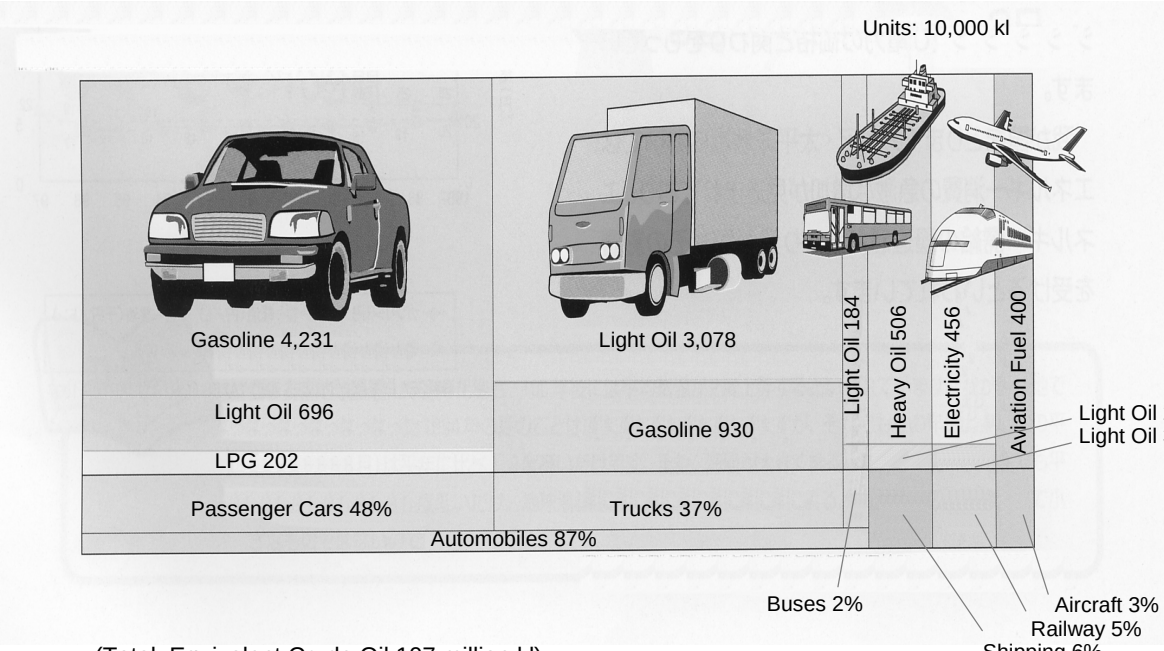


Domestic Freight Transport Share by Means of Transport (ton km)

2) Energy consumption in the transportation sector

■ Energy Consumption in Individual Transport Models

Automobiles are by far the largest energy consumers in the transport sector, reaching some 87% of all energy consumed by domestic transport modes; moreover, nearly all of this is taken up by passenger cars and trucks. Also a look at individual oil clssifications shows gasoline and light oil holding 85% of the total. Thus control of the use of gasoline and light oil consumption in automobiles and switch to alternative energy are the major measures to reduce oil consumption in the transport sector.



(Total: Equivalent Crude Oil 107 million kl)
Data: The Survey on Transport Energy

Energy Consumption Rates and Oil Type Consumption Levels for Individual Transport Mode (Fiscal 1998) (Note: domestic transport only)

3) Efforts directed at reduction of CO_2 emissions in the transport sector

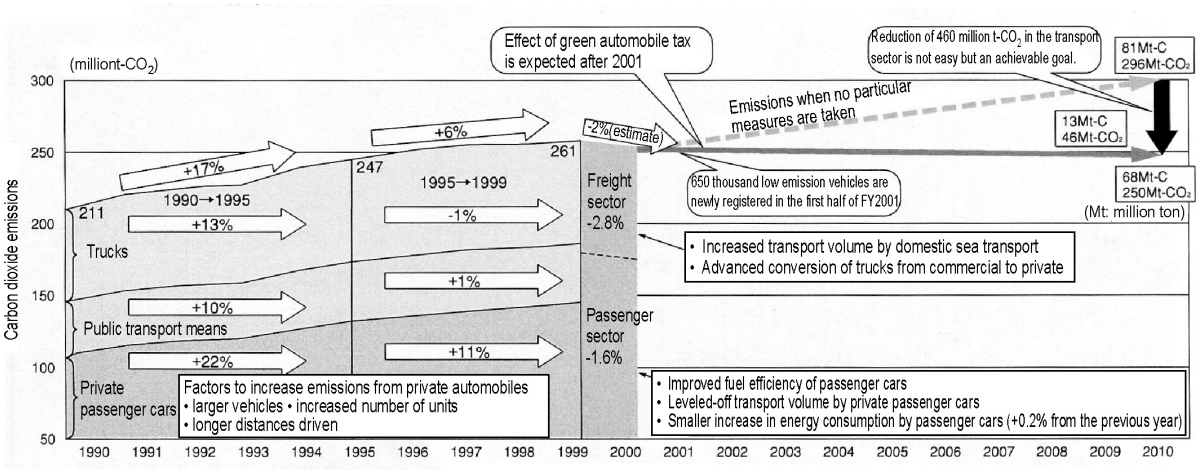
National transport administration is in a position to promote measures against globa domestic transport only l warming in the transport sector and the fields related to housing and construction within the livelihood sector. The Ministry of Land, Infrastructure and Transport established its Global Warming Prevention Headquarters with the Minister as its chief on November 16, 2001, and improved a system to deal with measures against global warming.

The transport sector is a base for people's living and economic activities. It is concerned that direct measures such as restricting traffic volume and energy consumption to reduce carbon dioxide emissions would have adverse effects. Therefore global warming prevention measures in land and transport administration should be based on voluntary efforts, incentives, and promotion of technological development, and need to avoid adverse effects on people's living and economic activities as much as possible.

The Outline of Global Warming Prevention predicts that the transport sector, which accounts for about 20% of the total carbon dioxide emissions in Japan, will increase its emissions to about 296 million t-CO_2 by 2010 if no measures are taken. This is required to be curbed to a level similar to the one in 1995 (about 250

million t-CO_2). Therefore the transport sector needs to promote some measures to cut about 46 million t-CO_2 of carbon dioxide in 2010.

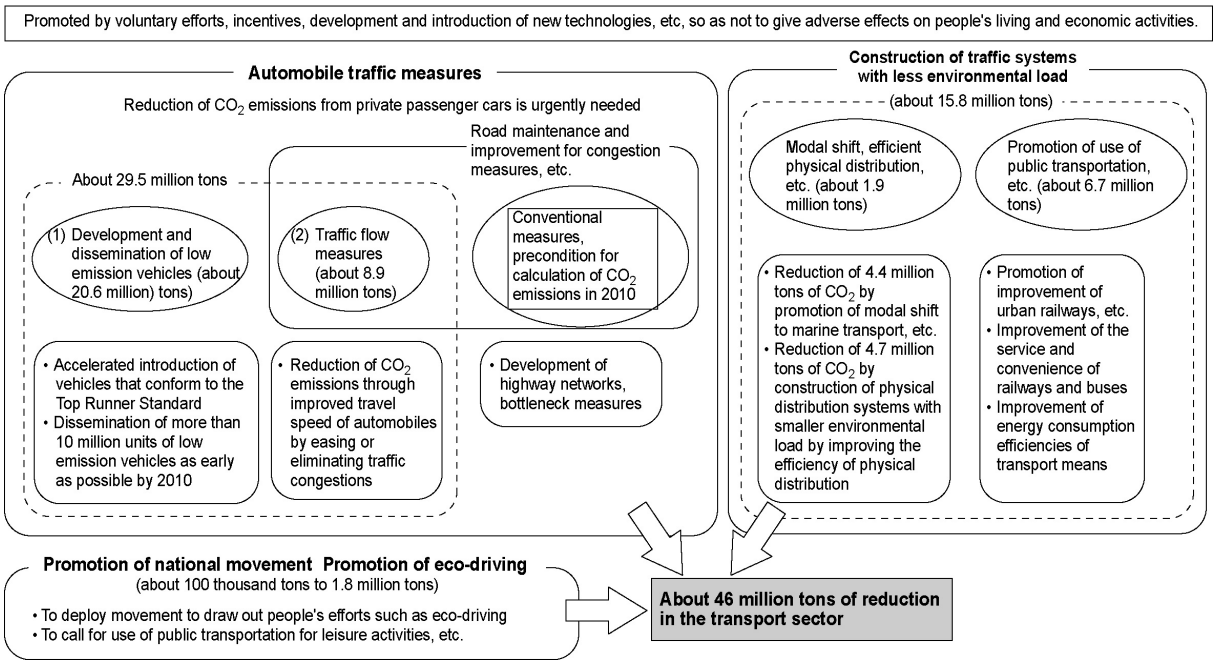
88% of carbon dioxide emissions in the transport sector is from automobiles. Emissions from public transport means and freight transport tend to stabilize in recent years (1995–1999), but emissions from private passenger cars are still increasing, for which some measures are urgently needed.



The 2000 emissions are estimates by the Ministry of Land, Infrastructure and Transport based on "The Year 2000 Energy Demand and Supply Results (preliminary report)" (published on January 31).
Public transport means: bus, taxi, railway, passenger ship, domestic sea transport, domestic aviation.

Change in Carbon Dioxide Emissions in the Transport Sector

However, emissions increased about 23% already by the end of FY 1999 (compared with 1990) because private passenger cars got larger and ran longer. Now it is necessary to strengthen measures to promote use of public transportation and measures for effective physical distribution such as modal shift to construct a traffic system with smaller environmental load, as well as measures for automobile traffic by traffic flow control and development and dissemination of low emission vehicles to reduce carbon dioxide from automobiles.

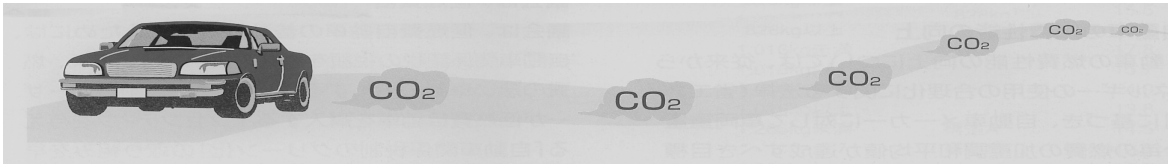


Ideas for Global Warming Prevention in the Transport Sector

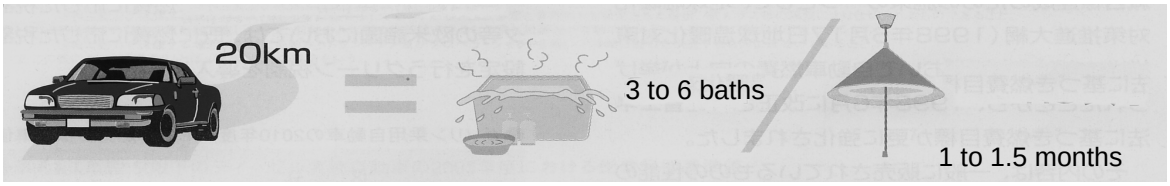
Column: Relationship between Daily Life and Greenhouse Gas Emissions

Carbon dioxide, the biggest greenhouse gas contributor to the cause of global warming, is emitted in large volumes during daily life. So unlike environmental pollution up to now, the victim and the assailant are the same.

For example, a car with a fuel efficiency of 13 km/l (10・15 mode) emits approximately 50 g of carbon dioxide (carbon equivalence, same as below) for every 1 km traveled, and a car with a fuel efficiency of 8 km/l (10・15 mode) emits approximately 80 g of carbon dioxide.



The heating of an common family bath water generates approximately 280 g of carbon dioxide. And the use of a 60-watt light for one hour generates approximately 6 g of carbon dioxide through electricity generation. Therefore, the use of a car for a single 20 km trip is the equivalent of 3 to 6 times heating of bath water or the use of 60-watt light for 5 hours a day over a 1 to 1.5-month period.



Furthermore, a car left idling for 10 minutes consumes approximately 130 cc of fuel which is the equivalent of a 1 to 2 km trip. And such a trip generates 90 g of carbon dioxide. The equivalent to this would be the boiling of 2*l* of water 9 times (boiling 2*l* of water produces 10 g) or 3-day use of a 60-watt light.

2. Current state of problems on road traffic environment

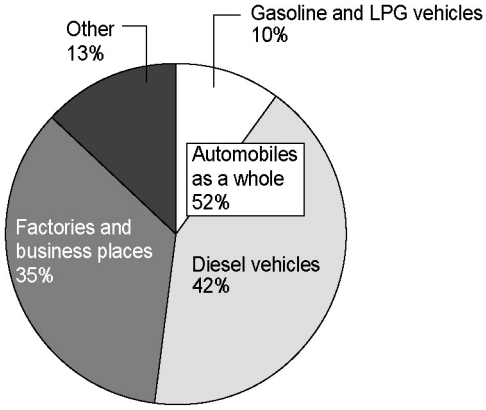
The biggest regional environmental problem now is the worsening air pollution caused by nitrogen oxides (NOx) and particulate matters (PM) emitted from automobiles.

NOx cause acid rain and photochemical smog. Among them, nitrogen dioxide (NO_2) is said to have adverse effects on the human respiration system. And among particulate matters, diesel exhaust particles (DEP) emitted from diesel vehicles are suspected to cause health damages, such as cancer, bronchitis and asthma, by adhering to the lungs and other organs.

In these circumstances, it is important to promote road traffic environment measures aggressively in the transport sector where automobiles account for about 50% of the overall NOx emissions.

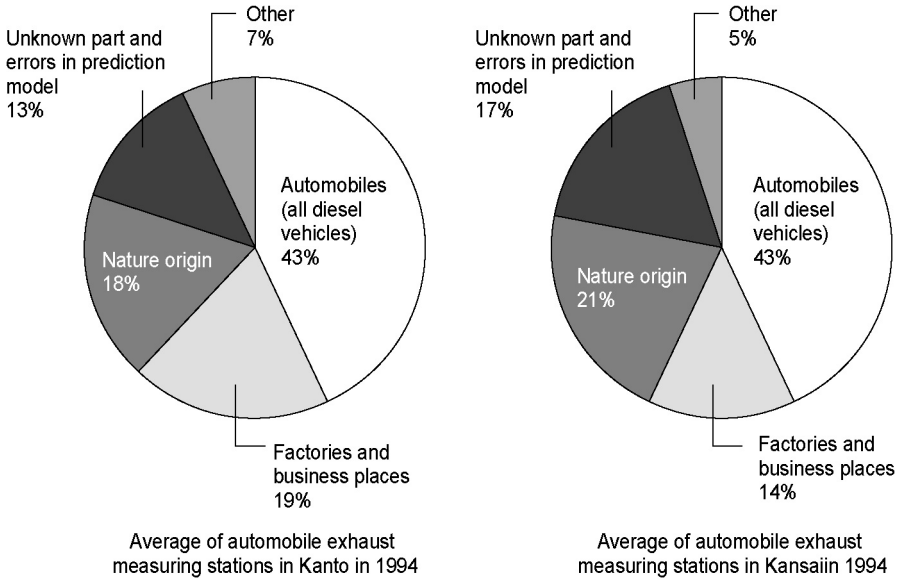
(1) Current state of air pollution in large city areas

52% of nitrogen oxides (NOx) and 43% of particulate matters (PM) emitted in large city areas are from automobiles. Among them, about 80% of NOx and all PM are from diesel vehicles.



Made from the report on discussion meetings for measures to reduce total NOx from automobiles (March 2000)

Emissions by Source of Nitrogen Oxides in Areas Specified by the Automobile Nox Law (1997)

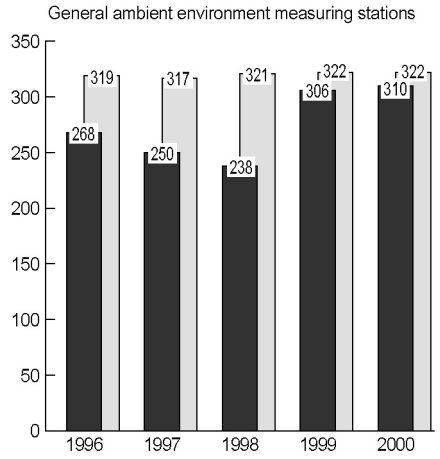


Percentage Contribution by Source to Particulate Matters in Kanto and the Kansai

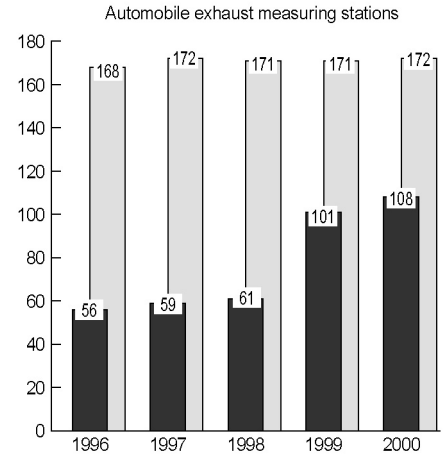
The distribution of stations that did not achieve environmental standards for nitrogen dioxide (NO_2) in 2000 shows that such general ambient environment measuring stations are distributed in Chiba, Tokyo, Kanagawa, and Osaka Prefectures; and such automobile exhaust measuring stations are distributed in 9 prefectures including Hokkaido, Aichi, Mie, and Kyoto, as well as in the current specified areas of the Automobile NOx Law. The percentage of automobile exhaust measuring stations that achieved environmental standards among those in all specified areas of the Automobile NOx Law was 33.3% in 1996, followed by thirty-some %, and 35.7% in 1998. After that the percentage was improved to 59.1% in 1999 and 62.8% in 2000, but the situation is still severe. Areas where high concentrations of NO_2 were measured were concentrated in city centers of the Kanto and Kansai areas.

As for achievement on suspended particulate matters (SPM) in all the specified areas of Automobile NOx Law, 30.6% of general ambient environment measuring stations achieved the standards in 1996, followed by 74.9% in 1999 and 85.5% in 2000, which suggests a tendency of improvement. On the other hand, the achievement ratios among automobile exhaust measuring stations were relatively low (16.7% in 1996, 63.4% in 1999 and 52.0% in 2000).

Specified areas as a whole



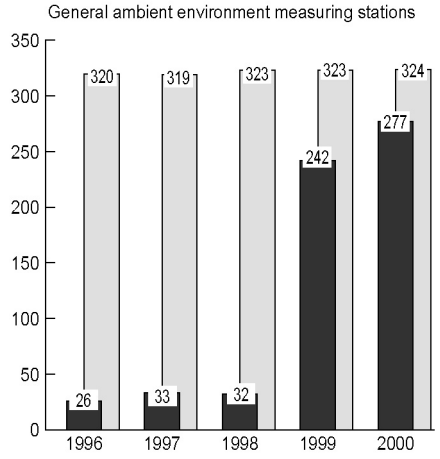
	1996	1997	1998	1999	2000
Achievement ratio (%)	84.0	78.9	74.1	95.0	96.3



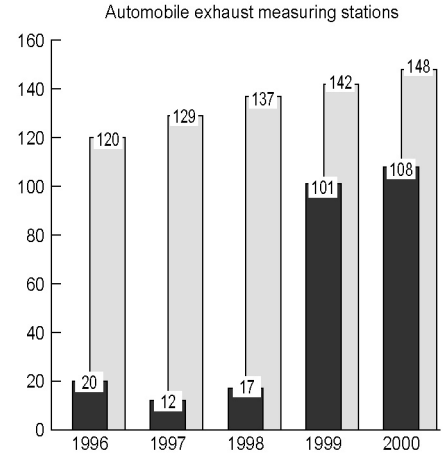
	1996	1997	1998	1999	2000
Achievement ratio (%)	33.3	34.3	35.7	59.1	62.8

Achievement of Environmental Standard for Nitrogen Dioxide in Specified Areas of the Automobile NOx Law

Specified areas as a whole



	1996	1997	1998	1999	2000
Achievement ratio (%)	30.6	26.6	33.7	74.9	85.5



	1996	1997	1998	1999	2000
Achievement ratio (%)	16.7	9.3	12.4	63.4	52.0

Achievement of Environmental Standard for Suspended Particulate Matters in Specified Areas of the Automobile NOx Law

(2) Movement toward solutions for air pollution problems

As mentioned in (1) above, air pollution by automobiles is in a serious state, and it is important to keep going toward a solution for the entire environment of a region to protect health of local residents.

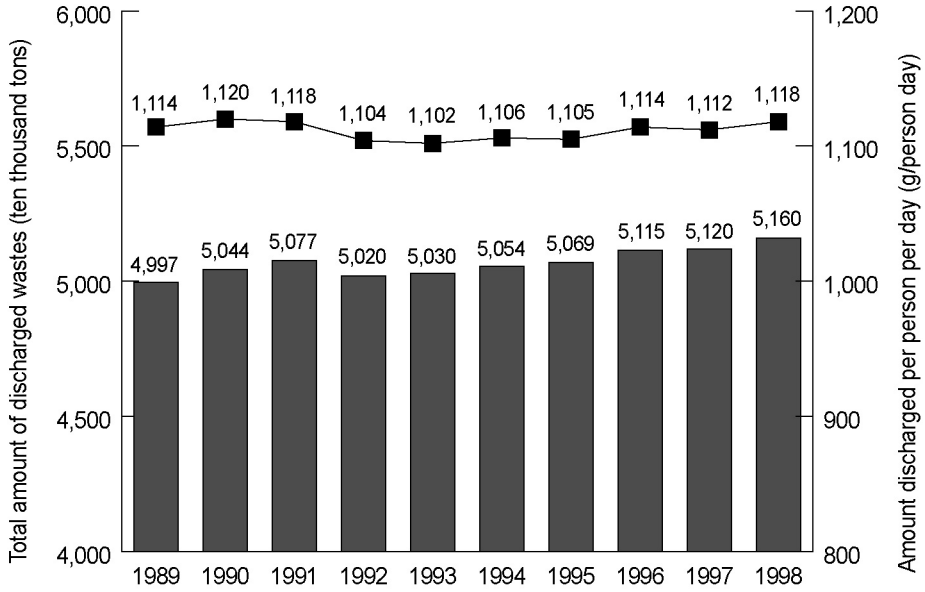
In this situation, the Amagasaki pollution case was settled in December 2000, and the Southern Nagoya pollution case was settled in August 2001. An urgent challenge is that the national government, local public bodies, private enterprises, and local residents unite to improve local environment.

3. Current state of problems on wastes and recycling

Total amount and per-person per-day amount of discharged general wastes increased sharply around 1985, but they leveled off from 1989 to 1998. The total discharge of general wastes in 1998 was about 51.6 million tons (about 1 kg per person per day).

Discharged amount of industrial wastes had been about 400 million tons since 1990 without much variation, but has been slightly decreasing since 1996.

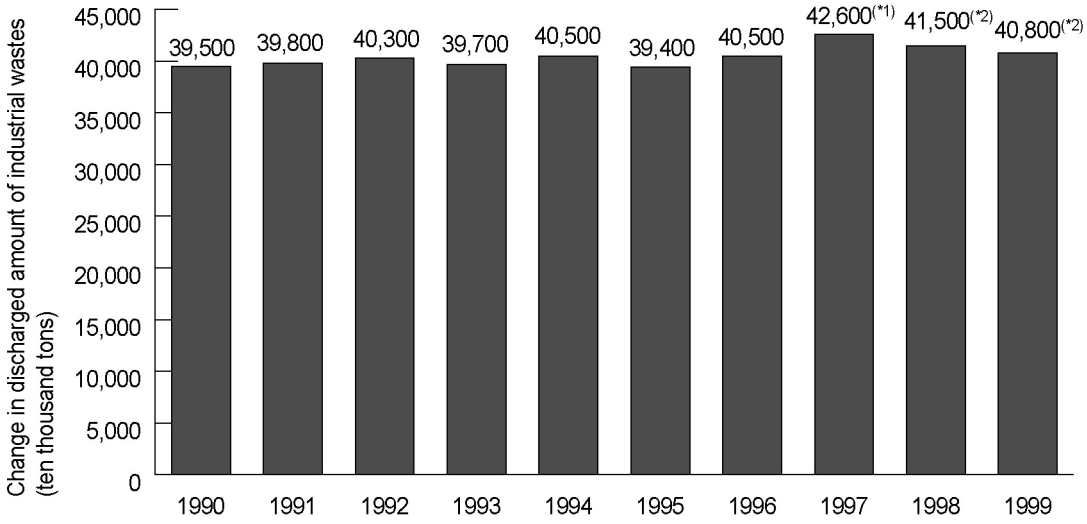
In this situation, the transport sector needs to promote recycling and proper disposal of automobiles, their parts, ships and other transport machines.



Note 1: Discharged amount of wastes = collected amount of wastes + directly carried-in amount of wastes + in-house disposed amount

Note 2: Calculation assumed that specific gravity of wastes is 0.3 t/m3. (The volume of the part above ground of Tokyo Dome is 1,240,000 m^3)

Change in Discharged Amount of Wastes



*1 shows the discharged amount of 1996 that is cited in “Target amounts for waste reduction” set by the government with 2010 as its target year (Government decision on September 28, 1999) based on the Basic Policy of Dioxin Measures (decision by the ministerial meeting for dioxin measures).

*2 Discharged amounts in 1997 and later were calculated under the same conditions as *1.

Change in Discharged Amount of Industrial Wastes

III. Major Environmental Measures in the Transport Sector

1. Promotion of global warming prevention

The Outline of Global Warming Prevention requires the transport sector to restrain its carbon dioxide emissions in 2010 to a 17% increase from 1990. To achieve this goal, the Outline includes the following measures. The Ministry of Land, Infrastructure and Transport will promote measures in the transport sector along with the Outline.

Current measures and their reductions	Additional measures and their reductions	National policies, etc. (current ○, additional ◎)
■Automobile traffic measures		
●Development and dissemination of low fuel consumption vehicles and low emission vehicles including clean energy automobiles, and environmental consideration on running patterns of commercial automobiles, etc.		
・Development and dissemination of low fuel consumption vehicles and low emission vehicles including clean energy automobiles		
○Measures to improve fuel efficiency of automobiles (Expected reduction in emissions) About 13.9 million t-CO_2 <Target amount of introduction> Energy saving effect: about 5.4 million kl (Assuming that all manufacturers achieve standards in each target year for gasoline automobiles and diesel automobiles) ■Passenger cars (gasoline) ・Target year 2010 ・Energy saving effect* about 23% ■Passenger cars (diesel) ・Target year 2005 ・Energy saving effect* about 15% ■Trucks (gasoline) ・Target year 2010 ・Energy saving effect* about 13% ■Trucks (diesel) ・Target year 2005 ・Energy saving effect* about 7% (* Due to the Top Runner Standards set after the old Outline, overall energy saving effect is about 20% more than initially expected) ○Promotion of wider use of clean energy automobiles (Expected reduction in emissions) About 2.2 million t-CO_2 <Target amount of introduction> Energy saving effect: about 800 thousand kl	○Accelerated introduction of vehicles that meet the Top Runner Standards, rapid progress in dissemination of low emission vehicles through green automobile tax and reduced automobile acquisition tax, and acceleration of development and dissemination of low emission vehicles starting with procurement by the government for use as general official vehicles (Expected reduction in emissions) About 2.6 million t-CO_2 (note) <Target amount of introduction> Energy saving effect: about 1 million kl (Note) Future revision of the Outline should reflect recent progress in wider use of low emission vehicles through green automobile tax and reduced automobile acquisition tax of April 2001 and wider use of low emission vehicles by the government for general official vehicles.	○The top runner standard scheme for automobiles was introduced by the amendment to the Law concerning the Rational Use of Energy of 1988 ◎Introduction of green automobile tax ◎Extension of reduced automobile acquisition tax ◎Formulation of a method to measure fuel efficiencies for discussion on fuel efficiency standards for trucks with gross vehicle weight exceeding 2.5 t. ◎Promotion of efforts to switch government's general official vehicles to low emission vehicles within about three years from Fiscal 2002 ◎Promotion of technological development and demonstration tests toward the world first practical use of fuel cell vehicles ◎Promotion of development of low emission vehicles including clean energy automobiles with an eye to next generations ◎Formation of IT networks toward dissemination of low emission vehicles including clean energy automobiles ◎Promotion of a subsidy system for low emission vehicles including clean energy automobiles ○Support for practical application of share use systems of electric automobiles ◎Promotion of subsidies for preparation of a fuel supply infrastructure (eco stations) ◎Measures to improve quality of automobile fuels to bring out full capability of exhaust gas post-treatment devises. (Sulfur content in light oil should be lowered from 500ppm to 50ppm by the end of 2004. Further improvement is aimed, including lower sulfur content in gasoline.)

・Environmental consideration on running patterns of commercial automobiles, etc		
	○Revision of existing measures and promotion of revised measures for promotion of eco driving of buses and trucks ○Promotion of measures for lower load on environment by environmental consideration on running patterns of commercial automobiles, etc ・Dissemination of vehicles equipped with an idling-stop device (Expected reduction in emissions) About 1.1 million t-CO_2 <Target amount of introduction> Energy saving effect: about 400 thousand kl (Assuming that about 30% of renewed buses and trucks will be equipped with the device) ・Restriction on running speed of large trucks (Expected reduction in emissions) About 800 thousand t-CO_2 <Target amount of introduction> Energy saving effect: about 300 thousand kl	◎Promotion of green management of automobile transport business operators, starting with fiscal 2002 ◎Mandatory installation of a speed restriction device on large trucks (new models: September 2003. Trucks in use: after September 2003, sequentially)
●Measures for traffic flow		
○Adjustment of demand for automobile traffic (Expected reduction in emissions) About 700 thousand t-CO_2 <Target amount of introduction> Energy saving effect: about 200 thousand kl ○Promotion of Intelligent Transport Systems (ITS) (Expected reduction in emissions) About 3.7 million t-CO_2 <Target amount of introduction> Energy saving effect: about 1.4 million kl	○Revision and steady implementation of current measures	○Promotion of Transportation Demand Management (TDM) ◎Utilization of the demonstration experiment of transportation demand management (TDM) established in 2001 for formulation of the General Plan for Smoothing Urban Area Traffic ○Promotion of improvement of conditions for use of bicycles by improving bicycle paths and bicycle parking lots ○Implementation of social experiments for promotion of use of bicycles ○Preparation of the non-stop automatic fee payment system (ETC), upgrading and expansion of the service to about 900 tollbooths nationwide by the end of fiscal 2002 ○Enhancement of traffic information collection through installation of optical beacons, etc. ○Promotion of the Vehicle Information and Communication System (VICS) (service started nationwide in fiscal 2002) ○Upgrading of traffic control centers, including upgrading of central processor units and introduction of a new signal

		control system (MODERATO) ○Promotion of traffic pollution lowering system (EPMS), etc. ○Preparation of vehicle operation control system for commercial vehicles (MOCS) ◎Promotion of environment-responsive traffic control project ◎Development and standardization of Internet ITS and probe information systems ○Development of a system that supports safe and comfortable driving by providing drivers with information, hazard warning, etc ○Based on the Green Procurement Law, the government introduces devices for ETC and 3 media VICS actively, and promotes their dissemination. ○Central control of traffic signals <Assuming preparation of about 40 thousand units from 1995 to 2010> ◎Promotion of precise and proper road traffic information by road traffic information provider business operators through the 2001 Road Traffic Law amendment, etc. ◎Precise operation of the traffic information verification system ◎Promotion of preparation of database for traffic regulations
	○Promotion of projects to provide information on road traffic	
○Measures against on-street parking ○Reduction of engineering works on road (Expected reduction in emissions) About 400 thousand t-CO_2 <Target amount of introduction> Energy saving effect: about 100 thousand kl ○Improvement of traffic safety facilities (Expected reduction in emissions) About 700 thousand t-CO_2 <Target amount of introduction> Energy saving effect: about 200 thousand kl ○Promotion of traffic alternatives utilizing information communication		○Enforcement of proper parking regulations ○Development of illegal-parking deterrence systems, parking guidance systems, etc. ○Promotion of crackdowns on illegal parking ○More use of multipurpose underground conduits, promotion of concentrated works and joint works, and proper employment of road-use permits ○Installation of systematic and responsive traffic signals <Assuming upgrading of about 20 thousand units from 1995 to 2010> ○Upgrading of traffic control ○Promotion of bottleneck elimination by improving railway crossing signals and traffic guidance by good use of traffic information boards ○Promotion of wider use of LED on traffic lights ○Tax measures and financial supports for corporations' upgrading of information communication environment, introduction of teleworking, and support for SOHO, etc. ◎Provision of information, dissemination and

such as teleworking		enlightenment toward promotion of teleworking and SOHO.
■Construction of a traffic system with small load to environment		
●Modal shift, efficient physical distribution, etc.		
○Promotion of domestic marine and railway freight transports (Expected reduction in emissions) About 1.5 million t-CO_2 <Target amount of introduction> Energy saving effect: about 500 thousand kl	○Revision of current measures and steady promotion ○Discussion on a scheme for promotion of environmental load lowering physical distribution systems	◎Discussion on systems including legislative measures to support efficiency-raising of main line physical distributions ◎Promotion of demonstration experiment of Traffic Demand Management (TDM) that contributes to efficient physical distribution within metropolis ◎Promotion of demonstration experiment for lower environmental load on main lines, starting in fiscal 2002 ◎Proposal to revise the Cargo Transport Handling Business Law to deregulate entry regulation and fee regulation, at the 2002 regular session of the Diet
	○Promotion of modal shift to marine transport and improvement of transport efficiency by enhancing competitiveness through revision of regulation and introduction of new technologies (Expected reduction in emissions) About 2.6 million t-CO_2 <Target amount of introduction> Energy saving effect: about 1 million k (Assuming that the share of transport by domestic marine increases to 44%)	◎Increase the share by domestic marine transport to 44% by enhancing competitiveness of marine transport · Formulation of the Next Generation Domestic Marine Transport Vision within fiscal 2001 · Revision of business regulation such as entry regulation · Revision of social regulation such as boarding system of sailors · Completion of demonstration experiments on super eco ship by fiscal 2005; practical application starting in fiscal 2006 ◎Basic preparation of domestic trade terminals suitable for combined integrated transport, shortening of in-bay navigation time by realization of in-bay non-stop navigation, construction of marine highway network · Planned completion of Tokyo Bay Entrance Route Improvement Project in 2007 · Planned preparation of enhanced functions for navigation control and support, with a central focus on the Marine Transport Center, including utilization of AIS (automatic ship identifier) in Tokyo Bay by fiscal 2006
	○Improvement of convenience of railways with increased capacity of transport (Expected reduction in emissions) About 300 thousand t-CO_2	○Enhancement of transport capacity of railways ◎Proposal to revise the Railroad Service Law to deregulate entry regulation and fee regulation, at the 2002 regular session of the Diet

	<Target amount of introduction> Energy saving effect: about 100 thousand kl (Assuming that the share of transport by rail containers increases to 3.6%)	◎Preparation of a cold chain system for foods by use of railways, etc.
○Efficient physical distribution (Expected reduction in emissions) About 4.7 million t-CO_2 <Target amount of introduction> Energy saving effect: about 1.8 million kl	○Revision of current measures and their effects as follows, and steady promotion · More efficient truck transport (Expected reduction in emissions) About 2.9 million t-CO_2 <Target amount of introduction> Energy saving effect: about 1.1 million kl (Assuming that the number of trailers owned increases about 15 thousand units, and that of 25t vehicles about 70 thousand units, from fiscal 1996 to fiscal 2010.) · Decrease in land transport distance of international cargos (Expected reduction in emissions) <Target amount of introduction> Energy saving effect: about 700 thousand kl (Assuming about 93 million ton km of reduction in land transport)	◎Proposal to revise the Trucking Service Law to vitalize commercial truck transport by deregulation, at the 2002 regular session of the Diet ○Larger vehicles and more trailers ○Reinforcement of bridges for larger vehicles ○Preparation of international marine container terminals in central core international ports ◎Basic preparation of multipurpose international terminals ◎Preparation of joint delivery facilities for perishable goods ○Installation, improvement, and central control of signals
●Promotion of use of public transportation systems		
○Promotion of use of public transportation systems (Expected reduction in emissions) About 5.2 million t-CO_2 <Target amount of introduction> Energy saving effect: about 2 million kl (Assuming about 80 million unit-km of reduction in use of passenger cars)	○Revision of current measures and steady promotion ○Steady promotion of preparation of new rail lines and modified personal rapid transit systems in urban areas ○Promotion of use of public transportation systems by further improvement of their service and convenience	○Aid for installation of new rail lines in urban areas (about 310 km planned to start service between 1995 and 2010) ○Promotion of preparation of new transport systems in urban areas, such as modified personal rapid transit (about 100 km planned to start service between 1995 and 2010) ○Preparation of new Shinkansen lines ○Promotion of use of public transportation systems by improving their service and convenience, including introduction of IC cards and improvement of connections ◎Utilization of the demonstration experiment of transportation demand management (TDM) established in 2001 for formulation of the General Plan for Smoothing Urban Area Traffic ◎Promotion of use of public transportation systems by national movement ○Improvement of traffic nodes such as station plazas ○Execution of social experimenst that contribute to promotion of use of public

		transportation systems ○ Promotion of preparation of Public Transportation Priority System, etc. by installation of dedicated and priority lanes for buses, and signal control that gives priority to buses
●Improvement of energy consumption efficiencies of other transport systems * except effects by “improvement of energy consumption efficiencies of ships”		
○Improvement of energy consumption efficiency of railways (Expected reduction in emissions) About 400 thousand t-CO_2 <Target amount of introduction> Energy saving effect: about 100 thousand kl (Assuming about 7% of improvement in energy consumption per unit) ○Improvement of energy consumption efficiency of aviation (Expected reduction in emissions) About 1.1 million t-CO_2 <Target amount of introduction> Energy saving effect: about 400 thousand kl (Assuming about 7% of improvement in energy consumption per unit)	○Promotion of development of new technologies	○Promotion of new introduction of railroad vehicles and aviation equipment · Efforts by business operators for introduction of energy-saving vehicles and equipment · Renewal of vehicles and equipment by supportive measures for introduction of new vehicles and equipment ◎Support for development of new technologies such as Super Eco Ship ◎Research and development of energy-saving next-generation transportation

(1) Development, dissemination, etc of low emission vehicles

Development and dissemination of low emission vehicles is the largest pillar for reduction of CO_2 emissions in the transport sector. It is also very important to deal with the air pollution problem caused by automobiles.

1) Kinds and characteristics of low emission vehicles

The low emission vehicles that are already in a stage of practical use are CNG (compressed natural gas) automobiles, electric automobiles, methanol automobiles, hybrid automobiles, and fuel efficient/low emission approved vehicles (note). The next generation low emission vehicles that are currently under development are dimethyl ether vehicles, which are to replace large diesel vehicles, super clean diesel vehicles,

Source: Honda
A fuel cell automobile, test driving on public road

and fuel cell automobiles, which theoretically emit no exhaust gas (see "Characteristics of low emission vehicles). To promote development and dissemination of these low emission vehicles with lower environmental load, the following efforts are in progress.

Characteristics of Low Emission Vehicles

Type of vehicle		Characteristics
Low emission vehicles in practical use	Fuel efficient/low emission approved vehicle	Vehicles that achieve early the fuel standard based on the "Law on Rational Use of Energy" (top runner standard), and are approved as low emission vehicles based on the "Outline of Approval of Low Emission Vehicles".
	Hybrid automobile	Automobiles that are designed to achieve lower emissions and energy saving by combination of two or more sources of power, such as an internal-combustion engine and a battery. There are series, parallel and other schemes according to how the power sources are combined. In Japan, hybrid passenger cars and buses are already available in the market.
	CNG (compressed natural gas) automobile	Automobiles powered by natural gas compressed under high pressure. Technical challenges include smaller fuel tank and higher power. CO_2 emission is 20–30% lower than gasoline-powered vehicles. Environmental advantages include low NOx emission and no PM emission.
	Methanol automobile	Automobiles powered by methanol. Methanol has very high octane value but low energy density, so the tank needs about two times as large capacity as gasoline vehicles. Exhaust gas contains no PM, and NOx emissions can be lower than diesel vehicles.
	Electric vehicle	Powered by electricity accumulated in battery, so no emission while running. Remaining problems include charging time, infrastructure, cost and range.
Next generation low emission vehicles	DME (dimethyl ether) automobile	Automobiles powered by DME, which is made from natural gas or biomass and can be stored as liquid under relatively low pressure. Applicable to diesel engines. No PM emissions. Development has been just started globally.
	Fuel cell automobile	Fuel cell is a system that gains electric power from reaction of hydrogen and oxygen. Its efficiency is higher than conventional engines. Hydrogen is either stored directly or gained by modification of hydrocarbons such as methanol and gasoline. The former emits no exhaust gas while running, and even the latter emits far less NOx and CO_2 than gasoline engines do.
	Next generation hybrid automobile	Compared with existing hybrid automobiles, these hybrid automobiles run the engine at its optimum efficiency point, and equipped with more efficient regenerative braking system and high performance battery system, making low fuel consumption and low emissions possible.
	Super clean diesel vehicle	Diesel vehicles that have significantly improved emissions and fuel efficiency by adopting the common rail direct injection technology for higher efficiency and post treatment technology such as DPF developed as PM measures.
	LNG (liquefied natural gas) automobile	Automobiles that carry natural gas in liquid under low temperature and high pressure. Compared with CNG vehicles carrying a same size of tank, a range per charge is longer, so applicability to long distance large trucks and high speed buses is discussed, but the problem is how to store the fuel.
	Solar cell automobile	It uses solar energy, so emits no gas while running, but has many problems before practical use, such as low running power and low durability of solar cells.
	GTL (synthetic liquid fuel) automobile	Automobiles that use liquid hydrocarbon fuel of low impurity, which is synthesized from natural gas, etc. No SOx emissions, because GTL fuel contains no sulfur.
	Gas turbine automobile	Automobiles powered by small gas turbines. A variety of fuels can be used, including natural gas, LPG, and light oil.

	Bio diesel vehicle	Existing diesel engines can be used without modification by using fuels similar to diesel oil, that are obtained by esterification of vegetable oils from rapeseeds, soybeans, sunflower seeds, etc. These fuels are similar to diesel oil in overall energy efficiency, but their lifecycle CO_2 emissions are lower because they are derived from plants.

(Note) Fuel efficient/low emission approved vehicles

Fuel efficient vehicles

Vehicles that achieve early the fuel standard based on the
"Law on Rational Use of Energy" (top runner standard)
Examples: Passenger cars

Vehicle weight 828 kg or greater, less than 1,016 kg (1,000cc Class)	17.6 km/l
Vehicle weight 1,016 kg or greater, less than 1,266 kg (1,300-1,500cc Sedan Class)	16.0 km/l
Vehicle weight 1,266 kg or greater, less than 1,516 kg (1,500-2500cc Sedan Class)	13 km/l

+

Low emission vehicles

Latest regulation values

75% reduction level 50% reduction level 25% reduction level

2) Specific measures for development and dissemination of low emission vehicles

■ Action Plan for Development and Dissemination of Low Emission Vehicles

In July 2001, three ministries (the Ministry of Land, Infrastructure and Transport; the Ministry of Economy, Trade and Industry; and the Ministry of Environment) formulated the "Action Plan for Development and Dissemination of Low Emission Vehicles" to promote development and dissemination of low emission vehicles.

This action plan defines "low emission vehicles" for which the government should work to disseminate, sets its dissemination goal to be "more than 10 million units as early as possible before fiscal 2010", states that the three ministries should work in close cooperation for development and dissemination of low emission vehicles, and indicates specific steps.

■ Formulation of general strategy for further development and dissemination of low emission vehicles

In May 2001, the "Conference for General Strategy for Development and Dissemination of Environmental Vehicles" was established in the Ministry of Land, Infrastructure and Transport, and discussion was made on strategies for development and dissemination of low emission vehicles and strategies for development of next generation low emission vehicles.

In July 2001, the Conference made an urgent recommendation that the three largest urban areas should introduce CNG buses and trucks intensively, with consideration on the urgency of air pollution problems in large urban areas and the initiative of government to introduce low emission vehicles.

On December 19 of the same year, the Conference made a report on basic strategies to promote development and dissemination of low emission vehicles. More specifically, the report shows the following as the strategies for development and dissemination of low emission vehicles by 2010:

(1) to develop low emission vehicles that have higher environmental performance, while trying to improve fuel quality, which is a precondition of development, with support from the government.

(2) to utilize the green automobile tax system and other supportive systems for dissemination of low emission vehicles. It is also necessary to lower the prices of low emission vehicles through mass production effect and deregulations, prepare fuel stations such as CNG stations, and improve convenience.

(3) to ensure smoother traffic flow and restrict traffic volumes by traffic flow measures and efficient physical distribution, concurrently with the development and dissemination of low emission vehicles.

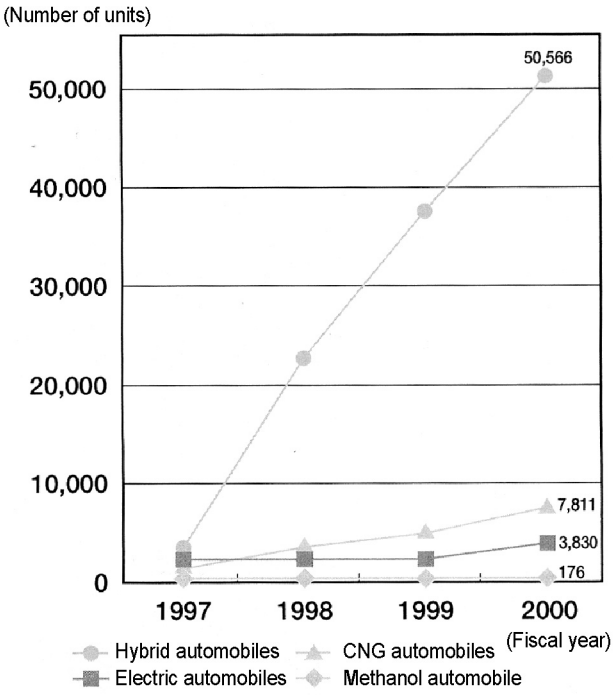
As for development of next generation low emission vehicles aimed at practical use after 2010, the following strategies are indicated:

(1) Passenger cars emphasize higher fuel efficiency and aim at reducing CO_2 emission per unit to about 1/2 of the current level. Large vehicles emphasize lower emissions and aim at reducing NOx to less than 1/10 of the regulation value and PM to zero or a level close to zero.

(2) Types that are considered applicable to large trucks and buses are next generation hybrid automobiles, dimethyl ether (DME) automobiles, and super clean diesel vehicles.

(3) Therefore it is necessary to carry out development after clarifying the roles of industry, government and academia, while also intending international harmony.

Based on the general strategies shown in the report by the Conference, measures for further development and dissemination of low emission vehicles will be promoted.



* Fuel efficient/low emission approved vehicles began to be used widely in 2000 when the low emission approval system was established. In 2000, about 570 thousand units were registered.

Data prepared by the Ministry of Land, Infrastructure and Transport

Number of Low Emission Vehicles in Use in Japan
(excluding fuel efficient/low emission approved vehicles*)

■ Green automobile tax system

In April 2001, the green automobile tax system was introduced to promote development and dissemination of low environmental load automobiles. Its main content is as follows. On the premise of neutral tax income, automobile taxes on low emission vehicles are reduced for two years depending on their low emission levels, and diesel vehicles older than 11 years and gasoline vehicles older than 13 years are imposed a heavy tax. As for automobile acquisition tax, there are special treatments, such as 300,000 yen deduction from acquisition price of fuel efficient/low emission approved vehicles, and reduced tax rates for CNG, methanol, electric, and hybrid automobiles.

With progress in technological development and cooperation of automobile makers, the number of types of automobiles that are eligible for tax reduction in the green tax system increased 85% between the end of December 2000 and the end of September 2001. The number of registered low emission vehicles (except mini-sized automobiles) in the first half of fiscal 2001 was about 650 thousand units (44% increase compared with the second half of the previous fiscal year), and low emission vehicles accounted for 33.5 % of the automobiles registered in the first half of fiscal 2001 (20.7% in the second half of the previous fiscal year).

Period	Electric, methanol, and CNG vehicles	☆☆☆ and fuel efficient	☆☆ and fuel efficient	☆ and fuel efficient (gasoline only)	Total	Number of registered units	Registration ratio
April 2001–September 2001	1,407	19,106	240,890	390,640	652,043	1,946,351	33.5%
(for reference) October 200–March 2001	1,282	18,389	150,435	283,215	453,321	2,191,161	20.7%

Data prepared by the Ministry of Land, Infrastructure and Transport

Main Points of the Green Automobile Tax

1. Increasing and reducing automobile tax amount (new)

1) When an ecofriendly automobile (an automobile imposing a low environmental load) is bought, a light tax is imposed thereon and a heavy tax is imposed on an old model enforcing a high environmental load.

2) Automobile tax reduction and increase are set on a tax revenue neutrality basis in which the reduction and the increase may balance with each other.

Light tax

- Electric, compressed natural gas powered and methanol powered vehicles: 50% reduction
- ☆☆☆ and fuel efficient vehicle: 50% reduction
- ☆☆ and fuel efficient vehicle: 25 % reduction
- ☆ and fuel efficient vehicle: 13 % reduction

* When an automobile is registered as a new automobile between April 1, 2001 and March 31, 2002, the automobile tax for 2002 and 2003 is reduced.
* When an automobile is registered as a new automobile between April 1, 2002 and March 31, 2003, the automobile tax is reduced for 2003 and 2004.
* Fuel efficient vehicle: one attaining the 2010 fuel efficiency standards under the revised Law concerning the Rational Use of Energy

Heavy tax

- Over 11 years old diesel powered vehicle: 10% increase
- Over 13 years old gasoline powered vehicle: 10% increase

* When an automobile is over 11 years or 13 years by March 31, 2002, the tax is increased after fiscal 2002.
* When an automobile is over 11 years or 13 years by March 31, 2003, the tax is increased after fiscal 2003.
* Ordinary buses and low pollution vehicles are excepted.
* The age of an automobile is the number of years passed after is is registerd as a new automobile.

2. Reduction of automobile acquisition tax

1) Replacement for discarded diesel powered vehicle

Light tax

Latest regulation vehicle acquired by discarding an old model diesel powered vehicle

In the NOx specified areas

October 1, 2001 to March 31, 2003: 2.3% reduction
April 1, 2003 to March 31, 2005: 1.9% reduction
April 1, 2005 to March 31, 2007: 1.5% reduction
April 1, 2007 to March 31, 2009: 1.2% reduction

Outside the NOx specified areas

April 1, 2001 to March 31, 2003: 0.5% reduction

2) Low pollution vehicle exception

Light tax

Acquisition of electric automobile, compressed natural gas automobile, methanol automobile, and hybrid vehicle (acquisition by March 31, 2003)

Electric, methanol-powered, compressed natural gas-powered, and hybrid vehicles (buses and trucks) 2.7% reduction
Hybrid (passenger car) 2.2% reduction

Light tax

Acquisition of fuel efficient/low emission approved vehicle (acquisition by March 31, 2003)

Tax base: ¥300,000 reduction from acquisition tax

3) Early acquisition exception of latest emission regulations complying vehicle

Light tax

Acquisition of a 2002 emission regulations complying vehicle (Gasoline mini-sized truck, diesel passenger car, and diesel light-weight vehicle (gross vehicle weight 1.7 t or less))

April 1, 2001 to September 30, 2002: 1.0% reduction
October 1, 2002 to February 28, 2003: 0.1% reduction

Acquisition of a 2003 emission regulations complying vehicle (Diesel middle- and heavy-weight vehicles (gross vehicle weight more than 1.7 t and up to 12 t))

April 1, 2002 to September 30, 2003: 1.0% reduction
October 1, 2003 to February 29, 2004: 0.1% reduction

50% reduction Electric, compressed natural gas-powered, and methanol-powered vehicles ☆☆☆ and fuel efficient vehicle	Typical eligible model	Standard tax amount (total for two-year period of reduction amounts for two years)	New tax amount	Reduction under green tax
	Nissan Bluebird Sylphy (1800 cc)	Automobile tax ¥79,000 Acquisition tax ¥93,000	¥40,000 ¥78,000	- ¥39,000 - ¥15,000
	Toyota Prius (1500 cc)	Automobile tax ¥69,000 Acquisition tax 109,000	¥35,000 ¥61,000	- ¥34,000 - ¥48,000

(Note) As Toyota Prius is an automobile falling into a low pollution vehicle exception concerning the automobile acquisition tax, the reduction under the new tax is great.
The number of models covered by the new tax is for those of ☆☆☆ and fuel efficient vehicles.

25% reduction ☆☆ and fuel efficient vehicle	Typical eligible model	Standard tax amount (total for two-year period of reduction amounts for two years)	New tax amount	Reduction under green tax
	Honda Odyssey (2300 cc) Honda Avancier (2300 cc)	Automobile tax ¥90,000 Acquisition tax ¥135,000	¥68,000 ¥120,000	- ¥22,000 - ¥15,000
	Honda Accord (2000 cc) Honda Stream (2000 cc)	Automobile tax ¥79,000 Acquisition tax ¥105,000	¥60,000 ¥90,000	- ¥19,000 - ¥15,000
	Mazda Familia (1500 cc) Honda Civic (1500 cc)	Automobile tax ¥69,000 Acquisition tax ¥75,000	¥52,000 ¥60,000	- ¥17,000 - ¥15,000

13% reduction ☆ and fuel efficient vehicle	Typical eligible model	Standard tax amount (total for two-year period of reduction amounts for two years)	New tax amount	Reduction under green tax
	Toyota Mark II (2500 cc) Mitsubishi Shario (2400 cc)	Automobile tax ¥90,000 Acquisition tax ¥150,000	¥79,000 ¥135,000	- ¥11,000 - ¥15,000
	Subaru Legacy (2000 cc) Toyota Vista (1800 cc)	Automobile tax ¥79,000 Acquisition tax ¥100,000	¥69,000 ¥85,000	- ¥10,000 - ¥15,000
	Toyota Corora (1500 cc) Nissan Cube (1300 cc)	Automobile tax ¥69,000 Acquisition tax ¥65,000	¥61,000 ¥50,000	- ¥8,000 - ¥15,000
	Toyota Vitz (1000 cc) Nissan March (1000 cc)	Automobile tax ¥59,000 Acquisition tax ¥53,000	¥52,000 ¥38,000	- ¥7,000 - ¥15,000

(Note) The standard tax amount of the acquisition tax is calculated on the basis of a standard selling price of each model.
The new tax amount is a temporary value and there will be minor corrections. Even the foregoing models may be excepted depending on their displacements and specifications. Confirmation at a dealer or the like is necessary.

■ Leading introduction by the national government

Based on the policy of leading introduction of low emission vehicles, which was indicated in the policy speech by the prime minister in May 2001, and the Law Concerning the Promotion of Procurement of Eco-friendly Goods and Services by the State and Other Entities (Green Procurement Law), which was put into effect entirely in April 2001, active efforts are under way to switch general official vehicles of the government to electric automobiles, CNG automobiles, methanol automobiles, hybrid vehicles, and fuel efficient/ultra low emission approved vehicles (☆☆☆). Similar efforts are under way by local public bodies.

◎The fiscal 2001 procurement policy for low emission vehicles by the Ministry of Land, Infrastructure and Transport

The Ministry of Land, Infrastructure and Transport plans to procure 97 units of general official vehicles in this fiscal year; they will be either electric automobiles, natural gas automobiles, methanol automobiles, hybrid vehicles, or ☆☆☆ and fuel efficient vehicles. The Ministry also plans to procure 172 vehicles other than the general official vehicles; they will be either electric automobiles, natural gas automobiles, methanol automobiles, hybrid vehicles, or fuel efficient/ultra low emission approved vehicles (☆☆☆).

■ Support measures for development and dissemination of low emission vehicles

Aids for short-term intensive introduction of low emission trucks and buses; formulation of technical standards concerning safety and environmental issues of and development of next generation low emission vehicles which are to replace large diesel vehicles; and approach to and provision of information to concerned parties for introduction of low emission vehicles.

■ Mandatory installation of speed limiter on large trucks

In order to prevent accidents on expressway caused by excessive speed and to reduce fuel consumption, it will become mandatory from September 2003 for large trucks to equip with a speed limiter that limits speed of the large truck to 90 km/h or less.

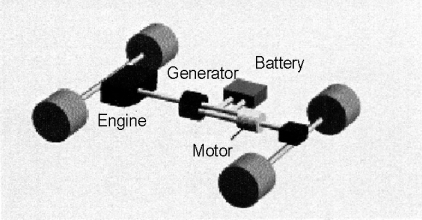
Column: Hybrid automobiles

Hybrid vehicles are already available in the market as futuristic automobiles with low emissions and low fuel consumptions.

Mechanism of a series-type hybrid automobile

An internal combustion engine does power generation only, the electricity is accumulated in battery. The electric power from the battery drives the motor to run the vehicle.

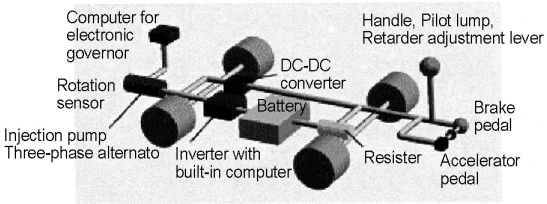
· Toyota Coaster HEV (micro bus) released in 1997



Mechanism of a diesel/electric hybrid bus

A three-phase alternator placed on the flywheel of a diesel engine assists the engine with its motor function when accelerating, and acts as an additional braking system while recharging battery with its generator function when decelerating.

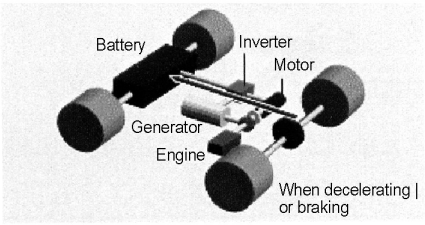
· Hino HIMR Bus, Truck released in 1997



Mechanism of a split-type hybrid automobile

Combination of features of the series type and the parallel type.

· Toyota Prius (small-sized passenger car) released in 1997



Parallel-type hybrid automobiles

A system in which two power sources drive each wheel. One power source drives front wheels and the other power source drives rear wheels, or both power sources drive the same wheels.

· Honda Insight (small-sized passenger car) released in 2000

· Toyota Estima (standard-sized passenger car, four wheel drive) released in 2001

· Toyota Crown Mild Hybrid (standard-sized passenger car) released in 2001

* Data provided by Keihanshin Six Prefectures/Cities Conference on Measures against Automobile Exhaust Gas

Fuel cell automobiles

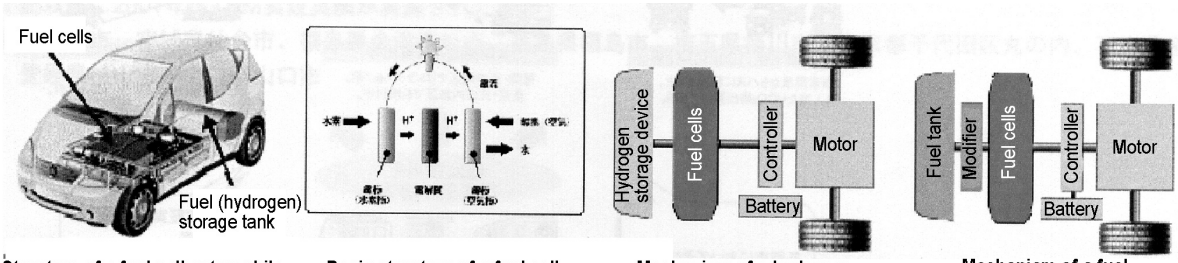
Fuel cell automobiles, in principle, emit no carbon dioxide or harmful substances, and they are considered to replace gasoline automobiles in particular in future. In Japan, automakers are now testing these vehicles on public roads. But, for wider use, it is necessary to solve technical problems and realize further cost cutting.

A fuel cell reacts hydrogen and oxygen to generate electricity by a principle that is reverse to electrolysis of water. It emits nothing other than water in principle, which is very good for environment. In addition, while conventional internal combustion engines can use about 10 to 20 % of generated energy for driving, fuel cells can use more than 40 % of energy for driving, which is also good for energy-saving.

There are two methods in existing fuel cell automobiles; one is to use hydrogen itself as fuel, and the other is to obtain hydrogen from methanol or gasoline by modification.

For the hydrogen storage method, it is necessary to develop an efficient and safe storage of hydrogen (high-pressure tanks, hydrogen storage alloys, etc.) and prepare a fuel infrastructure to support wider use.

On the other hand, the modification method on methanol and gasoline can utilize the existing fuel infrastructure, but further improvement is necessary on modifiers that break down fuel and extract hydrogen. In the process of modification, about 1/3 as much CO2 as that from a current gasoline automobile is emitted.



Structure of a fuel cell automobile　Basic structure of a fuel cell　Mechanism of a hydrogen storage type　Mechanism of a fuel modification type

Material provide by Petroleum Association

(2) Promotion of measures on traffic flow

In Japan, problems in a “motorized society” are getting more serious. Economic loss by traffic congestion is estimated to be 12 trillion yen per year. About 20% of total CO_2 emissions in Japan and about 40% of total NOx emissions in large cities are caused by automobiles.

■ Promotion of road improvement, etc.

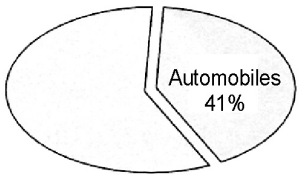
The slow running speeds caused by traffic congestion in urban areas increase emissions of carbon dioxides, NOx and PM from automobiles. Based on this recognition, many measures are being promoted, such as improvement of main road networks including circular roads, improvement of intersections and railroad

crossings by grade separation, construction of Intelligent Transport Systems (ITS), reduction of road works, and measures to prevent illegal parking and waiting.

- Promotion of Traffic Demand Management (TDM)

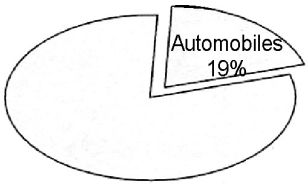
  To solve these problems, namely, to reduce traffic congestion and load on environment, it is effective to control traffic volume of automobiles by promoting use of public transportation and by improving efficiency of physical distribution in combination with introduction of low emission vehicles. However, such efforts may not be attempted because so many parties are concerned and economic burdens are expected.

  Based on recognition of such circumstances, the Ministry of Land, Infrastructure and Transport, in cooperation with the National Police Agency, established the "Traffic Demand Management (TDM) Demonstration Experiment System" in fiscal 2001. In this system, the national and local governments support experiment projects that aim to control automobile traffic volumes in local areas or to improve transport businesses by business operators, if both the Ministry and the Agency approve that such projects are expected to reduce traffic congestion or to have effects on environment. Introduction of low emission vehicles, low-sulfur light oil, or the like are subject to subsidy, if the introduction is an integral part of the experiment project.



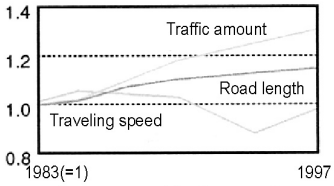
Regional environment

Automobiles emit about 40% of NOx in the urban area.



Grobalenvironment

Automobiles emit 19% of CO_2 in the Japan.



Loss caused by congestion

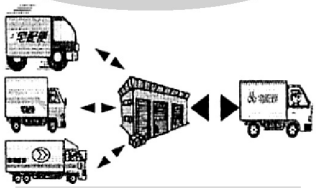
Congestion caused loss of 1.2 bln yen pa.
Traffic amount exceeded the construction of roads.

Improving the public transport

Frequent services, one-coin services

Conversion from the private car to thebus reduces CO_2 emission per capita by 60%

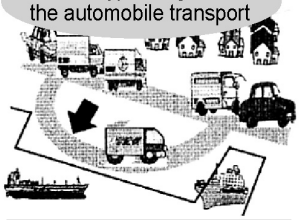
Efficient urban freight services



Joint collection/delivery

The number of trucks were reduced by 70% in Fukuoka. Similar plan in Tokyo.

Bypassing the automobile transport



Onboard ETC system

Increased speed (20 to 40 km/h) reduces NOx and PM by 30%.

Menus of measures are being developed in more than ten cities reflecting specific requirements in each city.

Ingroduction of low emission vehicles

Introducing low emission vehicles and low-sulfur oil

e.g.: CNG buses and trucks emit NOx 70-90% less and no PM.

TDM experiments will be supported in close cooperation of
police
road authority
city planning
transport authority.

Support for TDM (Traffic Demand Management) Demonstration Experiment

Examples of TDM Demonstration Experiment

Sapporo City, Hokkaido	Operation of 100 yen bus in the central area, provision of information on current state of operation via Internet, and efforts to deter illegal parking and waiting on bus routes.
Saitama City, Saitama Prefecture	Promotion of use of environment-friendly bus services, in expectation of wide use of bus transportation during 2002 World Cup soccer games, through sale of discount bus cards for route buses in the city and promotion of “cycle and bus ride”, in combination with efforts to deter illegal parking and waiting on bus routes, shift of the fuel to low-sulfur light oil, and installation of DPF (diesel particulate filter) on route buses.
Kawasaki City, Kanagawa Prefecture	On time operation of route buses in coastal areas by using PTPS (note 2), and the shift of route bus fuel to low-polluting light diesel oil. Efforts to deter on-street parking and waiting by trucks that are waiting for shipment from factories, and promotion of the shit of truck fuel to light diesel oil.
Nagoya City, Aichi Prefecture	Installation of more terrace-type bus stops by road administrators to secure on-time operation of buses for reduction of traffic congestion and environmental load in southern Nagoya. Introduction of CNG buses to the routes in the city and introduction of low-sulfur light oil with DPF equipment by Traffic Bureau of Nagoya City.
Areas around southern Nagoya, Aichi Prefecture	Promotion of detouring from National Route 23 to Ise Coastal Road by trucks of distributors in Aichi Prefecture, and promotion of introduction of CNG (compressed natural gas) vehicles.
Kitakyushu City, Fukuoka Prefecture	To ease traffic congestion along the Kitakyushu City Monorail line, the city first calls for voluntary restraint on private car use, and then the city and the monorail operator prepare bicycle parking places and rental electric bicycles at monorail stations and residential complexes to carry out “cycle and mono ride” for commuters to the central district of Kokura.
Nagasaki City, Nagasaki Prefecture	To ease traffic congestion caused by movement of the tourists who use taxis and rental cars to carry their baggage or check them in to hotels, the Tourism Federation of Nagasaki Prefecture and other organizations first call for voluntary restraint on private car use, then home delivery services deliver the baggage of tourists from Nagasaki Airport to hotels at reduced rates, in order to promote more use of public transportations from Nagasaki Airport to sightseeing spots and from one spot to the other.
Hijimachi, Oita Prefecture	To ease traffic congestion around a theme park (Harmony Park) cause by private cars of visitors, the town first calls for voluntary restraint on private car use, then the railroad company and the theme park company jointly sell discount tickets for ride and admission, and the bus company runs connection buses from the station along with the arrival times of trains, to encourage visitors to use public transportations.
Naha City, Urasoe City and, Okinawa Prefecture	Construction of a large-scale parking lot in Ginowan City and introduction of “park and ride” (note 3) with a bus route from the parking lot into Naha City, to induce commuters to use a bus rather than a private car, and efforts to deter illegal parking and waiting on the bus route.

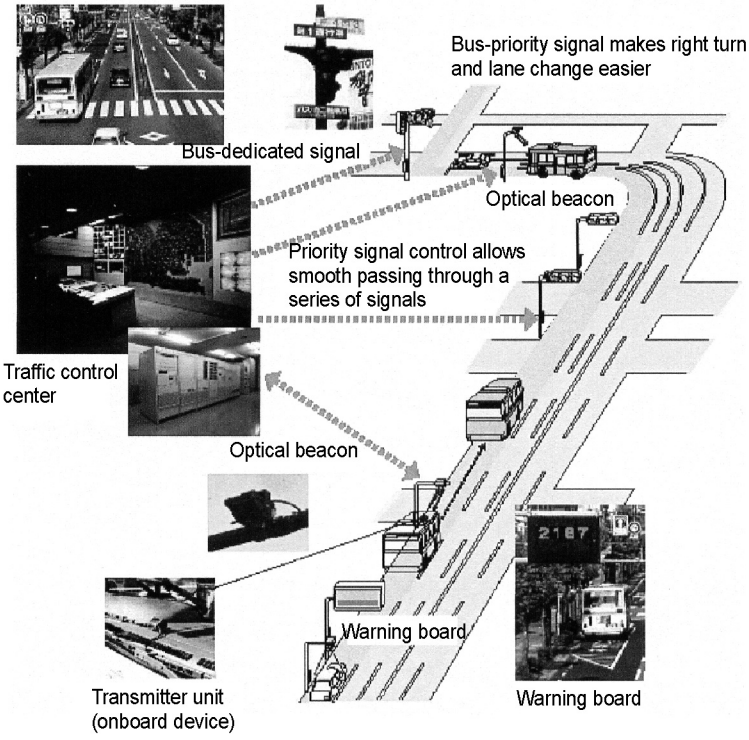
· Other cities where TDM experiments were done in fiscal 2001:
Aomori City in Aomori Prefecture, Sendai City in Miyagi Prefecture, Aizuwakamatsu City in Fukushima Prefecture, Fukushima City in Fukushima Prefecture, Okegawa City in Saitama Prefecture, Marunouchi in Chiyoda Ward of Tokyo, Kanazawa City in Ishikawa Prefecture, Matsuyama City in Ehime Prefecture, and Yamaguchi City in Yamaguchi Prefecture.

Note 1: 100 yen bus

A program to lower existing bus fares to 100 yen, intending for easier go about in the city, appropriate use of automobiles, and smoother road traffic. Sapporo City carried out this program from October 1 to December 31 of 2000 and September 1 to December 31 of 2001. The aim was to make route buses more convenient for daily use for shopping, commuting and working; to make the city center more attractive, and to reduce excessive use of private cars. The program was accepted favorably and extended to June 30 of 2002.

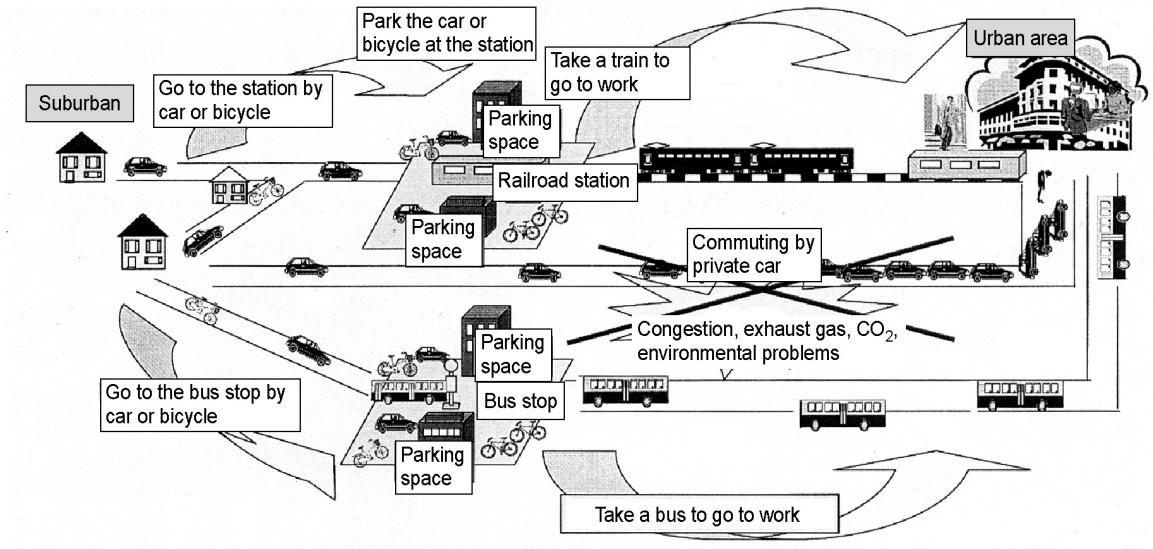
Note 2: PTPS (Public Transportation Priority System)

A system for smoother on-time operation of buses with dedicated/priority lanes and favorable signal control. Each bus sends a unique ID from an onboard transmitter via optical beacons above the road to a traffic control center. The traffic control center judges the current position and destination of the bus from its ID and controls the signals ahead of the bus.



Note 3: Park and Ride

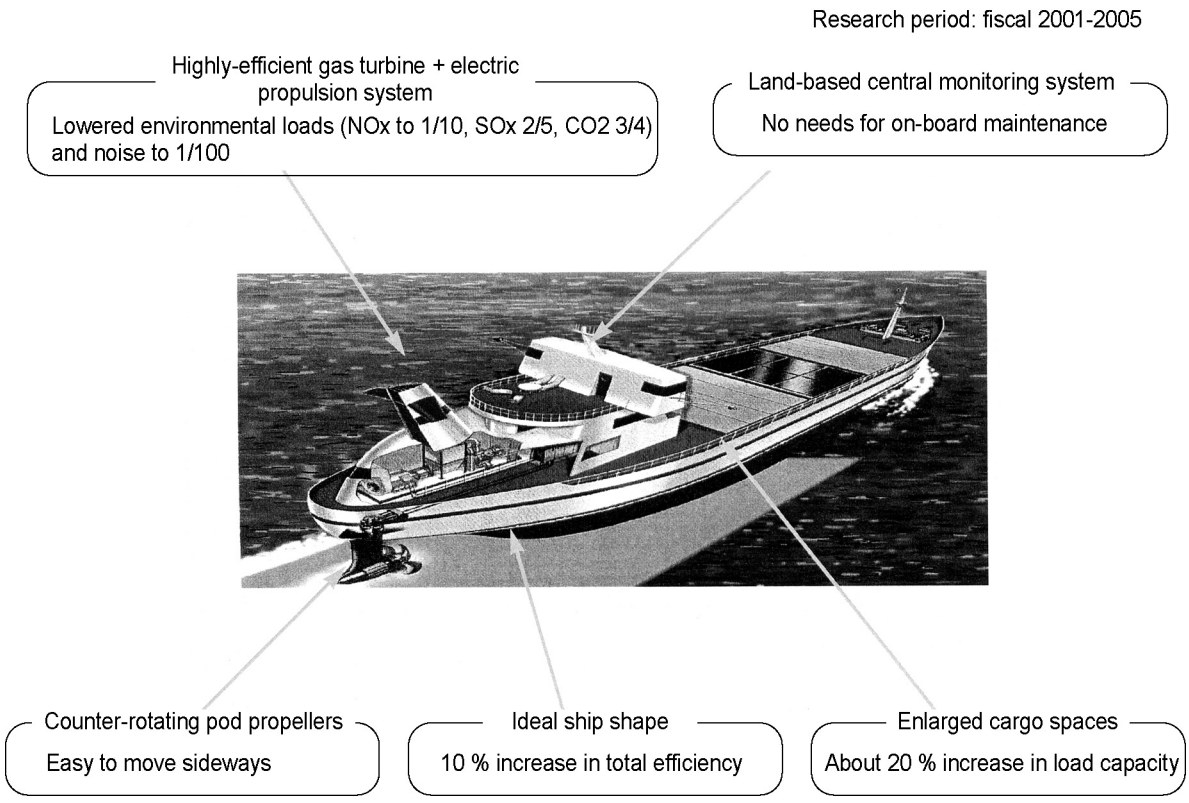
A system in which people park their car or bicycle at the nearest railroad station or bus stop, and ride a train or bus to go to work. This is a mechanism to reduce traffic congestion caused by commuting by private car and to deal with environmental problems such as exhaust gas and carbon dioxide. The system is also called “park and train ride” or “park and bus ride” when train or bus is used, respectively, or “cycle and ride” when bicycle rather than car is used to come to the station (or bus stop).



(3) Efficient physical distribution by promotion of modal shift, etc.

Modal shift means to use more domestic marine transport and railroad freight transport, which are mass transportation with less burden on environment, for further reduction of carbon dioxide emissions in the physical distribution sector..

Promotion of modal shift to marine transport and improvement of competitiveness of marine transport as a base for the shift will be realized by introduction of new technologies, such as development of super eco-ships which improve energy consumption rate of ship, review on regulations, and construction of marine highway networks. A shift to railroad transport will be promoted by improved convenience, such as increased carrying capacity. And more efficient physical distribution will be achieved through review on regulations, improved convenience, and preparation of transport bases such as multi-purpose international terminals.

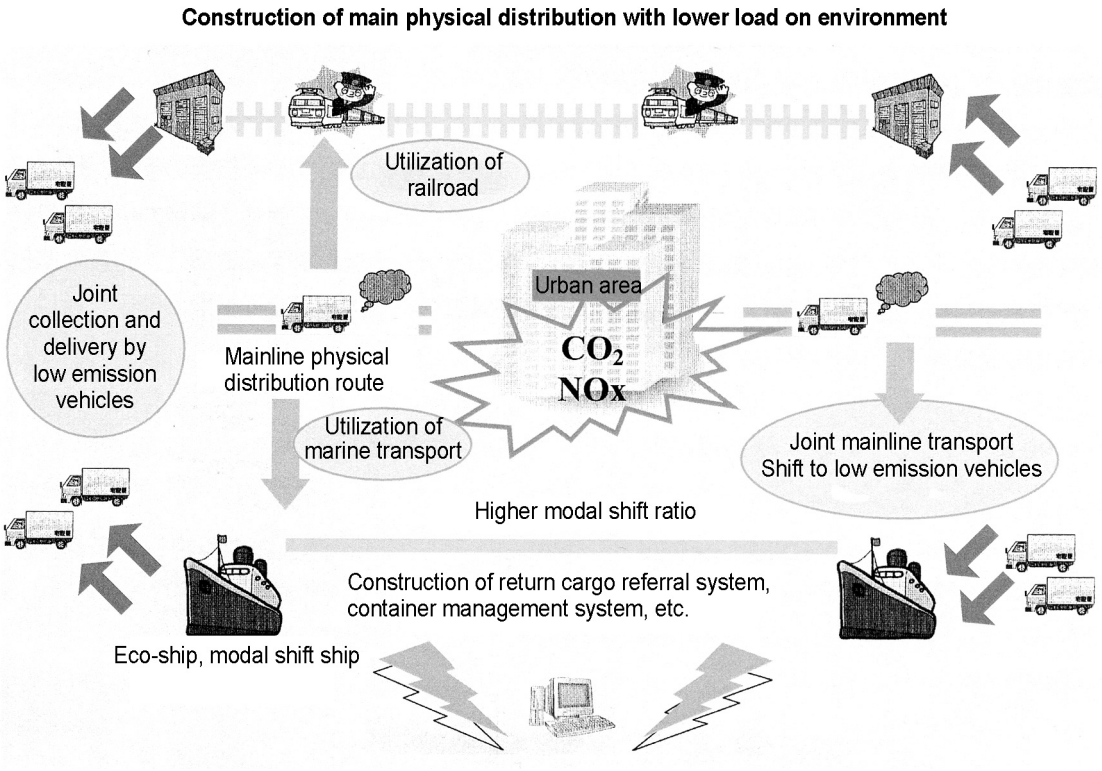


Research and Development of Next Generation Domestic Ships (Super Eco-Ships)

In fiscal 2002, “Demonstration experiment toward lower load on environment by main line physical distribution” was created to support demonstration experiments on modal shift conducted by cooperation of interested parties, such as physical

distribution business operators and cargo owners, involving implementation of scheduled joint transport and utilization of marine transport or railroad transport.

In addition, the vinous physical distribution network, which is indispensable for construction of a circulating society, needs active utilization of railroad and marine transport from the viewpoint of reducing emissions of CO_2 and NOx.



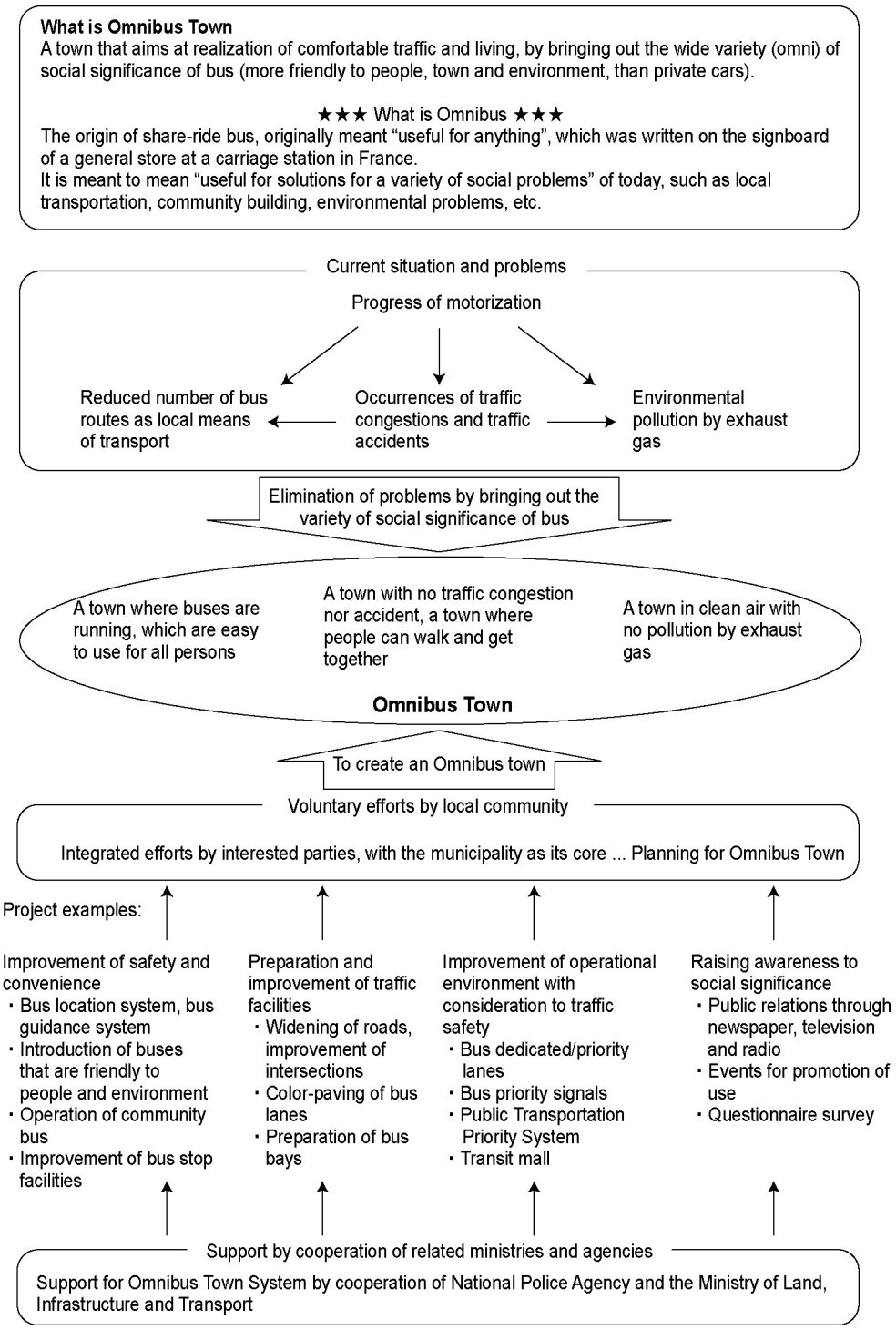
Demonstration Experiment toward Lower Load on Environment by Main Line Physical Distribution

(4) Promotion of use of public transportations

Development of new railroad lines and new transit systems in and around large city areas and improvement of convenience of railroad and bus will shift the passengers who have been using their own cars to use public transportations, which have lower load on environment, and also will reduce traffic volume of automobiles. Prevention of global warming also requires these to be promoted.

In this regard, necessary aids are provided for about 300 km of new railroad lines and about 100 km of new transit systems from 1995 to 2010. In addition, promotion of use of existing railroads is in progress through a support measure for introduction of IC cards.

For bus, various measures are in progress in combination with the aforementioned TDM measures, such as the Omnibus Town concept and other projects for wider use of bus, installation of dedicated lanes, elimination of illegal parking, and other measures to improve operational environment for bus services.



Outline of the Omnibus Town Concept

Column: Next generation new public transportation systems: Two types of tired tram and a guide way trolley bus

In 1997, three systems of new public transportation were proposed to the "Committee on Urban Transport Systems by PREDIT (National Program for Research and Innovation on Public Transportation of France, Subsidy System)" consisting of Paris region, Bureau of Transport, and other public and private entities.

Two of them (TVR and Translohr) are tired trams, also called single-rail trams (street cars). They are hybrid trams that switch between the tram mode running on single-rail and the trolley-bus mode as needed. The other one (CIVIS) is an optical-guide-way trolley bus. A camera recognizes the markings painted on road for guidance, and the bus runs by tracking those markings. CIVIS, unlike ordinary buses, has a central driving position, and a overall shape that is similar to a tram. All the three are of dual mode; they can run by themselves without overhead catenaries.

These are already running in three cities in France, and many cities in the world have decided to introduce them.

TVR (right)

(5) Promotion of improvement of energy consumption efficiency of transportation

To reduce CO_2 emissions without adverse effects on people's living and economic activities, it is important to promote development of new technologies. Examples are the aforementioned low emission vehicles and super eco-ships, development of automobile engines, and development and dissemination of idling stop devices, which contribute reduction of CO_2 emissions by stopping the engine automatically when the car is not moving.

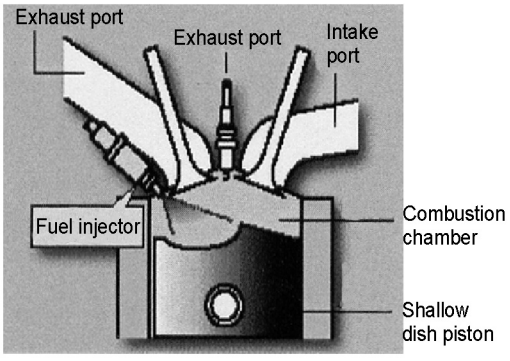
■ Technologies to contribute to reduction of CO_2 emissions

・Gasoline lean burn engine

A "lean burn" engine burns fuel with more air than ordinary engines. This saves consumption of gasoline. The theoretical minimum ratio of air to fuel in weight for complete combustion is 14.5–14.8:1. A state with thinner fuel (mixture ratio 22-25:1) is the lean region (lean burn).

・Gasoline direct injection engine

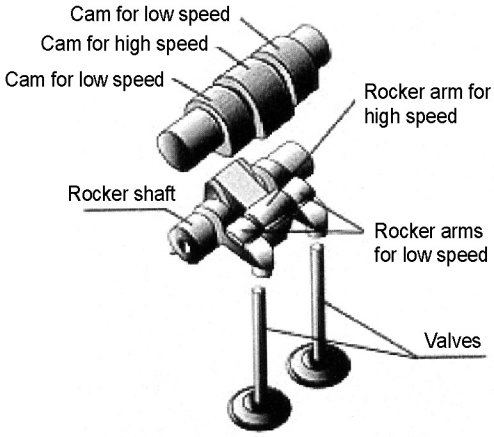
A engine that inject fuel directly into cylinders. It burns fuel in a super lean region where the mixture ratio is 40–50:1, which is yet thinner than a lean burn engine. The air-fuel mixture



Structure of a In-cylinder Direct Injection Method

is stratified and combusted to obtain a good fuel efficiency.

・Variable valve timing



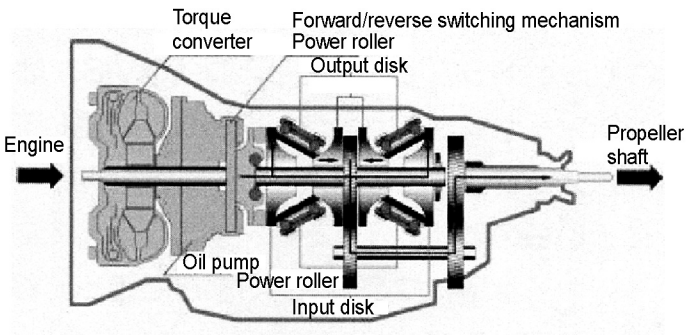
A system that was developed to achieve smaller tradeoffs in performance under different operation conditions. This is achieved by varying the open/close timing of intake and exhaust valves and their lift heights. In ordinary engines, when valve timing is set to get large torque at low speed, performance at high speed is sacrificed, and when performance at idling is emphasized, torque at middle speed becomes smaller. Thus inefficiency at some point is unavoidable. Variable valve timing is a system to make these incompatible performances compatible by optimizing the open/close timing of intake and exhaust valves and their lift heights. This can ensure high efficiency both at low speed and high speed.

・Idling stop device

An idling stop device on a manual transmission vehicle stops the engine automatically when the gear shift lever is placed into the neutral position while the vehicle is at halt, and it restarts the engine when the clutch pedal is stepped down to start the vehicle. Similar devices are beginning to be used for automatic transmission taxis and two-wheeled vehicles. These devises cut fuel consumption while idling, and contribute to higher fuel efficiency.

・Automatic Continual Variable Transmission (CVT)

An automatic transmission that can use the engine's best fuel-efficiency region effectively by transmitting driving force via belts and rollers with small loss. Optimum gear ratio for the present running condition is set, aiming for higher fuel efficiency.



Example of Toroidal CVT with Disks and Power Rollers

(6) Promotion of further activities for prevention of global warming by people toward dissemination of eco-driving and wider use of public transportations

Exhaust gas from automobiles is one of major factors to global warming, and it contains NOx, PM and other air-polluting substances. To reduce exhaust gas from automobiles, it is important that people drive automobiles with due considerations to the environment. For this, it is necessary to publicize how to drive friendly to the environment (eco-driving) and to promote business management with low load on the environment (green management). Also necessary is to promote wider use of public transportations for commuting and leisure by calling for people's voluntary actions.

These measures for promotion of further activities for prevention of global warming by people and target CO_2 emissions are incorporated into the "Outline of Measures for Global Warming Prevention".

Promotion of further activities by people for prevention of global warming

	Current measures and their reductions	Additional measures and their reductions	National policies, etc. (current ○, additional ◎)
1. Efforts by general public			
The transport sector	○Voluntary restraint on automobile use, etc. ○Promotion of idling-stop while parking or waiting, etc. 20–40% (140-280 thousand t-CO_2)	○Practice of eco-driving, etc. <20–40%> (About 810-1,620 thousand t-CO_2) ・Set the temperature of car air-conditioner 1 degree higher ・Do not fill the gasoline tank up ・Try to drive with no sharp accelerations ・Do not carry unnecessary baggage on automobile ・Plan and drive ・Keep proper tire pressure etc. ○Introduction of goods that are useful for reduction of environmental load (About 20–30 thousand t-CO_2) ・Heat-insulate passenger cars as much as not to interfere the view for driving With film <20–40%> ・Introduction and installation of parts and goods that contribute to reduction of CO_2 emission while running the automobile.	◎Provision of information and promotion of model projects based on the proposal by the "Wa-no-kuni Kurasi Conference" ◎Implementation of "Global Warming Prevention Diagnosis" ◎Provision of information, etc. by National Global Warming Prevention Activity Promotion Center, and Prefecture Global Warming Prevention Activity Promotion Centers ◎Promotion of local efforts through "Local Conference on Global Warming Prevention" ◎Public relations and provision of information through local organizations ○Preparation of systems for education, enlightenment, lecturing and provision of information ○Enhancement of public relations ◎Performance evaluation for environmental goods and their dissemination by provision of information, to be implemented from 2002. ○Enlightenment and dissemination of bicycle use
2. Efforts by business operators			
The transport sector		○Promotion of eco-driving with company vehicles <20–40%> (Expected reductions are included in the abovementioned practice of eco-driving)	

(7) Efforts to reduce CFCs substitutes and other substances

CFCs have severe effects on global warming and deplete ozone layer. To prevent their emission into the air, the "Law on Methods for Secure Implementation of Collection and Demolition of Chlorofluorocarbons Related to Specific Products" was established in June 2001, and set forth the responsibility of CFCs demolition business operators.

Responding to this, the Ministry of Land, Infrastructure and Transport is taking necessary measures so that appropriate actions are taken based on the same law when automobile maintenance business operators repair car air-conditioners, accept used automobiles equipped with air-conditioners, and collect CFCs. The Ministry will also continue measures for protection of ozone layer and prevention of global warming, such as measures for converting coolant for truck, container, etc. from CFCs to substitutes.

(8) Efforts toward reduction of greenhouse effect gases from international aviation and oceangoing shipping

The greenhouse effect gases emitted from the fuel for international aviation and oceangoing shipping (bunker oil) is said to account for about 3% of the total greenhouse effect gases emitted in the world. Reduction of greenhouse effect gases originated from bunker oil is a very important issue for Japan, which must depend on aircrafts and ships for transportation of passengers and freights from and to other countries.

This problem is discussed in Framework Convention on Climate Change, International Aviation Organization (CAO) and International Maritime organization (IMO), in which Japan also participates actively. To contribute to future argument, the Ministry of Land, Infrastructure and Transport discussed technological prospect toward reduction of emissions, and also discussed applicability of specific reduction measures.

Column: Advance Eco-driving

With the number of cars currently standing at over 70 million, a few simple actions when driving-like not idling during parking, traveling economic speed on motorways, and keeping tire pressures correct-help reduce carbon dioxide emissions. Therefore, each driver who takes care to drive in an environmentally friendly manner is as important as technology being developed to reduce carbon dioxide emissions. To this end, the term "eco-driving" has been coined to promote such environmentally friendly driving.

◆ Stop Unnecessary Idling

Quit idling when picking people up or dropping things off. A car idling for 10 minutes burns 130 cc of gasoline, and a large diesel vehicle wastes up to 1,800 cc of fuel with 1 hour of idling.

◆ Travel at Economic Speeds

Driving at about 40 km/h on normal roads and 80 km/h on motorways are economic speeds to drive at. There are examples of mileage dropping approximately 30% in diesel trucks when they run at 100km/h instead of 80 km/h on motorways.

◆ Check Your Vehicle Thoroughly and Keep the Tire Pressure Correct

Drive 50 km on tires just 0.5 kgf/cm^2 under the correct pressure and you will have wasted 150 cc of gasoline for a family car.

◆ Do Not Carry Needles Luggage

Drive 50 km with 10 kg of non-required luggage and you will waste 15 cc of gasoline for a family car.

◆ Stop Needless Revving

Revving a car 10 times wastes 60 cc of gasoline and revving a large diesel vehicle 10 times wastes 100 cc to 170 cc of diesel fuel.

◆ Stop Quick Pullaways, Sudden Accelerations and Braking, and Keep a Safe Distance from other Cars

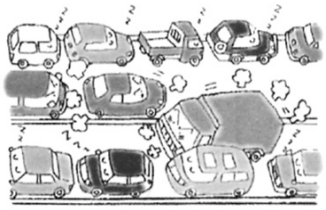
Pulling away quickly or accelerating suddenly 10 times wastes 120 cc of gasoline for a family car. Such actions in a diesel vehicle will mean about a 15% waste in comparison to smooth driving.

◆ Change Gear Early

Avoid driving full pelt in lower gears. Remember changing gears early is important.

◆ Illegal Parking Causes Traffic Jams

Dropping down to 20 km/h from 40 km/h is said to worsen mileage by 40% to 50%.

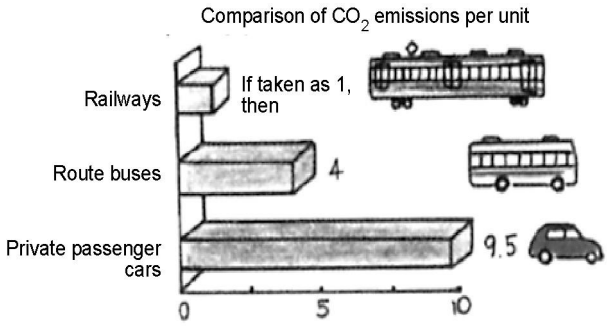


◆ Use Air Conditioning Modereately

When air conditioning is used, so is fuel. Therefore run your air conditioning at a moderate temperature to save fuel.

◆ Take Passengers (Double Up) when Driving and Use Public Transport Whenever Possible

The carbon dioxide emissions for carrying 1 person 1 km are — if we set railways as 1 — an astounding 9.5 for cars and 4 for route buses.



2. Promotion of measures for road traffic environment

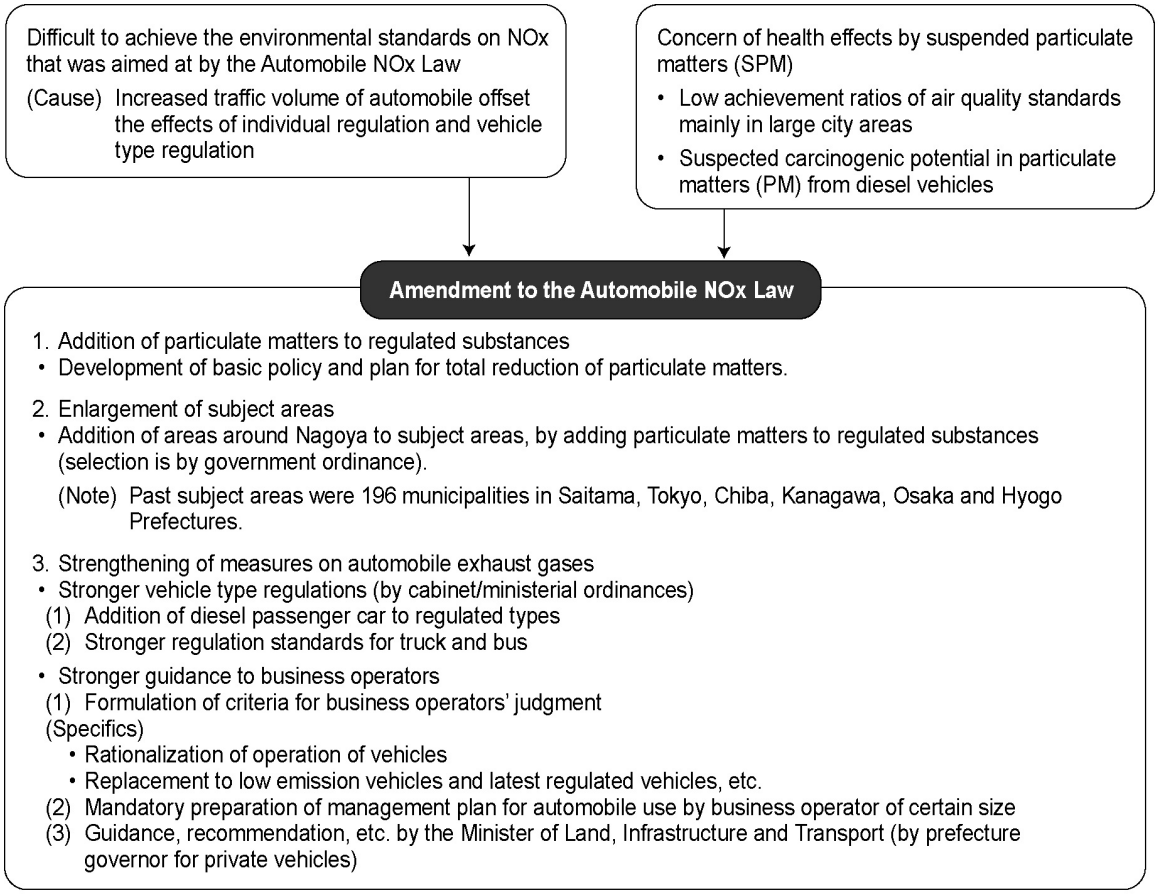
Development and dissemination of low emission vehicles and traffic flow measures are important not only for prevention of global warming but also for measures on road traffic environment to deal with air pollution caused by NOx, PM and other harmful substances that are emitted from automobiles. In addition to the various measures mentioned before, the following measures on road traffic environment are in progress.

(1) Strengthening of regulations on exhaust gases

For air pollution by nitrogen oxides (NOx) in large city areas, several measures have been carried out, including the regulation based on the former Automobile NOx Law (established in 1992), but achieving the air quality standards for NOx has been increasingly difficult due to the increased traffic volume of automobiles and other reasons. In addition, air pollution by particulate matters (PM) is also in severe conditions. Particularly the PM from diesel vehicles are concerned to have adverse effects on people's health, because they are suspected to cause cancers.

Therefore, to strengthen the conventional measures on NOx and reduce PM from automobile traffic, an amendment to the Automobile NOx Law was proposed to the 151st regular session of the Diet and was established in June 2001. By this amendment, PM were added to the substances to be regulated along with NOx, and subject areas were enlarged. The emission regulation on diesel vehicles now in use will become stricter in phases. The Ministry of Land, Infrastructure and Transport will issue necessary guidance and recommendation to truck and bus business operators, and implement further measures on emissions.

On the Automobile NOx Law



(2) Promotion of short-term intensive introduction of CNG buses and trucks and introduction of DPF

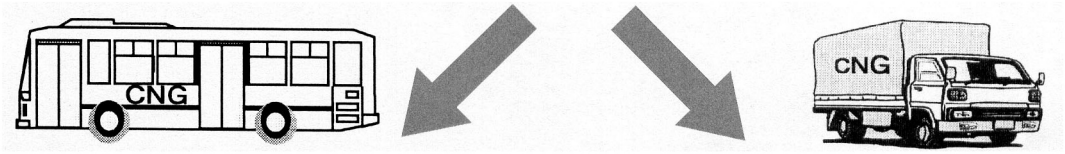
The urgent recommendation by the Conference on General Strategy for Development and Dissemination of Low Emission Vehicles, and the Action Plan for Development and Dissemination of Low Emission Vehicles, have pointed out the necessity of efforts for short-term intensive introduction of the low emission vehicles that are already in the phase of practical use, such as CNG automobiles. In 2002, support measures for introduction of CNG buses and trucks and other low emission vehicles and DPF were established, in cooperation with local public bodies, for bus/truck business operators in the three major metropolitan areas.

Short-term intensive introduction of CNG automobiles, etc. targeting the busses and trucks in the three major metropolitan areas.

Number of units to be subsidized:	2,500 collection/delivery trucks, 150 buses
Goals of introduction:	About 30,000 collection/delivery trucks and about 1,000 buses in 5 years
Business operators eligible for subsidy:	Bus/truck business operators, etc. in the NOx /PM measure areas based on the automobile NOx /PM Laws
Vehicles eligible for subsidy:	CNG buses, hybrid buses, and CNG trucks

Subsidy scheme:

National government → (Subsidy) → Bus/truck business operators → (Subsidy) → Local public bodies



Direct effects

Improvement of air quality by reduction of NOx and PM

(Example)
Introduction of 30,000 CNG trucks and 1,000 CNG buses
→10-15% reduction in NOx and PM emissions from collection/delivery trucks and buses

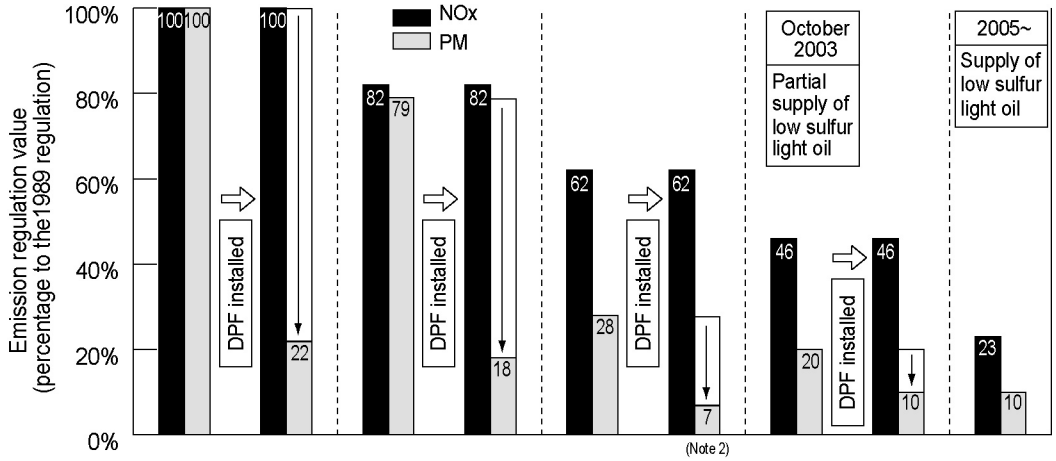
Takeoff effects

Further dissemination by lowered prices of low emission vehicles

Types of DPF

	Name	Maker	Price	Remark
High sulfur light oil type	Alternate regeneration DPF	Isuzu Ceramic	(Cost of parts) Large size: about 3,400,000 yen Middle size: about 1,150,000 yen Small size: about 850,000 yen (Cost of modification) Small size: about 250,000 yen	Some limitation due to the structure of vehicle concerning available space for installation of DPF
Low sulfur light oil type	Continuous regeneration DPF (Oxidation by NO_2 (CRT))	Johnson-Matthey	(Cost of parts) Large size: about 550,000–800,000 yen Middle size: about 200,000–600,000 yen Small size: about 110,000–170,000 yen (Cost of modification) About 20,000─30,000 yen	Filters become clogged if other than low sulfur light oil is used.
	Continuous regeneration DPF (Oxidation by catalyst (CRT))	Engelhard	(Cost of parts) Large/Middle size: about 500,000–700,000 yen (Cost of modification) About 20,000–30,000 yen	High sulfur light oil can be used, but sulfate occurs under high load, and reduction rate of PM is lowered.

(Note)
1. Current tolerance for sulfur content is 500ppm in both Japan and Europe.
2. Petroleum Federation has stated that it will provide low sulfur light oil partially when the automobiles with PM emissions reduced to the diesel new long-term target level begin to be supplied to the market in 2003 or 2004.



Regulation year	1989 (Note 1)	1994 (short-term regulation)	1998 (long-term regulation)	2003 (new short-term regulation)	2005 (Note 3) (new long-term regulation)
Type of DPF	Alternate regeneration	Continuous regeneration Alternate regeneration	Continuous regeneration Alternate regeneration	Continuous regeneration Alternate regeneration	Continuous regeneration Alternate regeneration
Remark	・Cannot be used in specified areas by amended NOx Law.	・Cannot be used in specified areas by amended NOx Law. ・Installation of DPF device is subsidized if the grace period for application of amended NOx Law is three year or longer. ・Subsidy for introduction of low sulfur light oil in the area where low sulfur light oil is supplied by priority as a TMD demonstration experiment.	・Subsidy for introduction of low sulfur light oil in the area where low sulfur light oil is supplied by priority as a TMD demonstration experiment.	・The Motor Industrial Federation plans to supply only those PM reduction automobiles equivalent to the new long-term regulation, assuming supply of low sulfur light oil.	・Assuming low sulfur light oil

* Described are emission regulation values and regulation years for diesel freight vehicles (gross vehicle weight more than 3.5 tons and equals to or less than 12 tons)

(Note 1) Regulation on PM emissions began in 1994, and unregulated in 1989 of short-term regulation. In this reference, actual PM emissions is taken as 100%.

(Note 2) Effects of installation of DPF is calculated with data from Isuzu Motors on alternate regeneration DPF with assumption that the PM emissions will be reduced accordingly.

(Note 3) The third report by Central Environment Council sets the target year to be 2007, but we assumed this is brought forward to 2005.

(3) Promotion of development of next generation low emission vehicles

As for next generation low emission vehicles under development, their early practical use as replacement of present large-sized diesel vehicles is promoted by preparing technical standards and evaluation methods for safety and environment, with Independent Administrative Institute Traffic Safety and Environment Laboratory as a core research organ, in cooperation with industry, government and academia.

(4) Green automobile fuel

Some of the DPF devices described above operate properly only when low sulfur light oil is used. For improvement of road traffic environment, automobile fuels must be made green.

From this point of view, sulfur content in light oil is to be lowered from the present 500 ppm to 50 ppm by the end of 2004. Petroleum Federation has already stated that it will bring this forward and supply low sulfur light oil in large cities by 2003. Also for gasoline, further improvement is intended, such as lower sulfur content.

On the other hand, in Europe, further improvement in fuel characteristics is under way toward zero sulfur content (less than 10 ppm) in gasoline and light oil.

In Japan as well, it is desired to promote development of low emission vehicles by further lowering the sulfur content in fuels to fundamentally improve the fuel efficiencies and emission levels.

(5) Regulation on emissions from special vehicles

To improve air quality around large cities, it is necessary to take measures for special vehicles (forklift, etc.) which account for about 20% of NOx emissions in large cities. Therefore it was decided that a new emission regulation will be introduced for diesel vehicles in October 2003.

(6) Other measures to reduce emissions from diesel vehicles

1) Elimination of poorly-maintained vehicles

To reduce environmental load by automobiles, it is necessary to maintain their emission performance during use. Poorly-maintained vehicles emit more NOx and PM than normal vehicles, and pollute the environment.

To reduce emissions from such vehicles, effective inspection and maintenance is necessary. A released data shows that inspection and maintenance done by maintenance business operators and transport business operators reduced black smoke emissions by more than 10% for more than half the vehicles.

From now on, it is necessary to take further comprehensive measures, such as inspection of brought-in vehicles by maintenance business operators, voluntary inspection of owned vehicles by transport business operators, and stronger enforcement with on-street inspections.

2) Thorough prohibition of illegal light oil

Illegal light oil (inferior light oil) is a mixture of light oil and A-heavy oil, and is sold without approval of Governor, to avoid tax. If illegal light oil is used for

diesel trucks, it is said that air pollution will advance, NOx and PM will increase by up to 35% and 17%, respectively. To restrict the use of such illegal light oil, it may be necessary, in addition to stricter law enforcement, to require automobile users to use “fuel of a certain or higher levels of quality” as a measure for safety and environment with a viewpoint of illegal light oil.

3. Construction of a recycling-oriented society

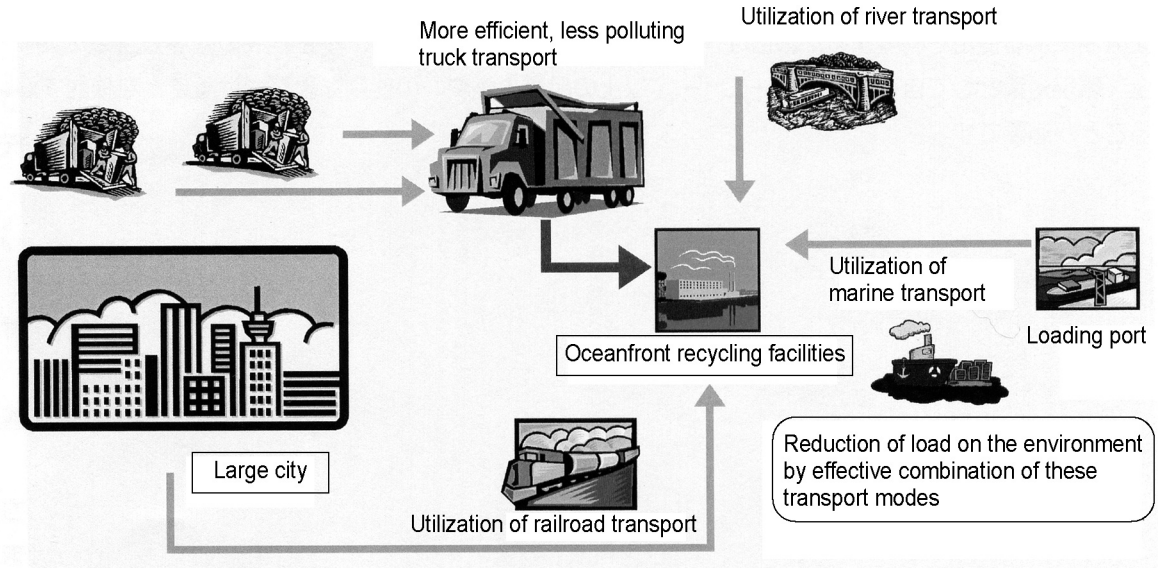
(1) Construction of a venous physical distribution system

Transport of wastes so far has been mainly by low volume transport for short distance. But, with progress of recycling, transport of wastes to recycling bases and transport of resources made from wastes to place of consumption are expected to occur in large volumes and large areas. Therefore, it is necessary to place waste-related transportation as venous physical distribution and prepare a system that contributes to recycling and does not impose much load on the environment.

Venous physical distribution does not need high-speed transport, but it needs transport of lowest possible cost. To use marine transport and railroad transport effectively and construct a venous physical distribution system with small load on the environment, it is necessary to consider what the entire system should be, even in the planning stage of recycling facilities.

■ Construction of a venous physical distribution system for formation of zero garbage cities

The seven prefectures and cities around Tokyo and the related ministries established Zero Garbage Conference in July 2001 to solve problems in implementation of a project toward realization of zero garbage cities and promote steady progress of the project. The Conference, in cooperation with private business operators, will promote construction of a venous physical distribution system with small load on the environment that corresponds to the formation of waste/recycling bases in the coastal area of Tokyo Bay. The Ministry of Land, Infrastructure and Transport, in cooperation with the seven prefectures and cities, starts study on the current status of physical distribution, and research on transport network and needs for improvement of mooring, yards and other facilities.



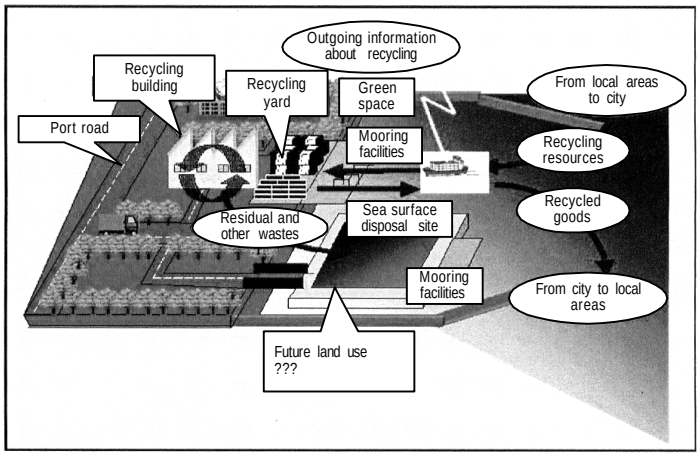
■ Construction of a comprehensive venous physical distribution system around ports

For realization of a recycle-oriented society, a venous physical distribution system is constructed on a port, which becomes a base of venous physical distribution, by utilizing existing stock as much as possible, with the main focus on lowering distribution costs and reducing load on the environment. Particularly in large city areas, where waste treatment is reaching the limit because of the large amount of discarded wastes, we aim to form a venous physical distribution bases, in cooperation with Eco-Town Projects, by utilizing low/un-used sites in the coastal part to incorporate into a new recycling-oriented city.

Potential of ports
・Easy to obtain large sites necessary for construction of large recycling facilities
・Fairly prepared physical distribution base stock (quay, port road, etc.)

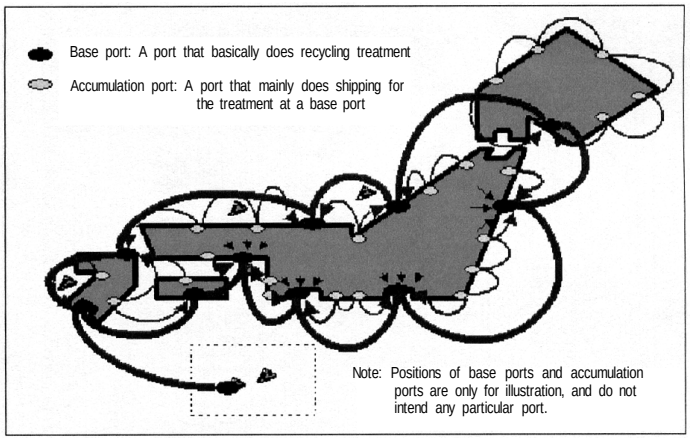
Construction of a venous physical distribution system for realization of
・Utmost utilization of existing stoc recycling-oriented society k, and placement of a comprehensive venous physical distribution base at each block
・Formation of a wide-area venous physical distribution network by utilization of marine transport

Utilization of ports as a new space for recycling/venous industry of the 21st century



▪ Concept of a comprehensive venous physical distribution base

Concentration of large recycling facilities, a sea surface waste disposal site for disposal of residual, stockyard and other basic structures for venous physical distribution, and integrated development of these, form a comprehensive venous physical distribution base for the collection, transportation and treatment of recycling resources.



▪ Concept of a wide-area venous physical distribution network

Realization of cost reduction in collection and transport by a wide-area network of venous physical distribution bases through marine transport, which is suitable for long-distance mass transport, low-cost, and friendly to the environment.

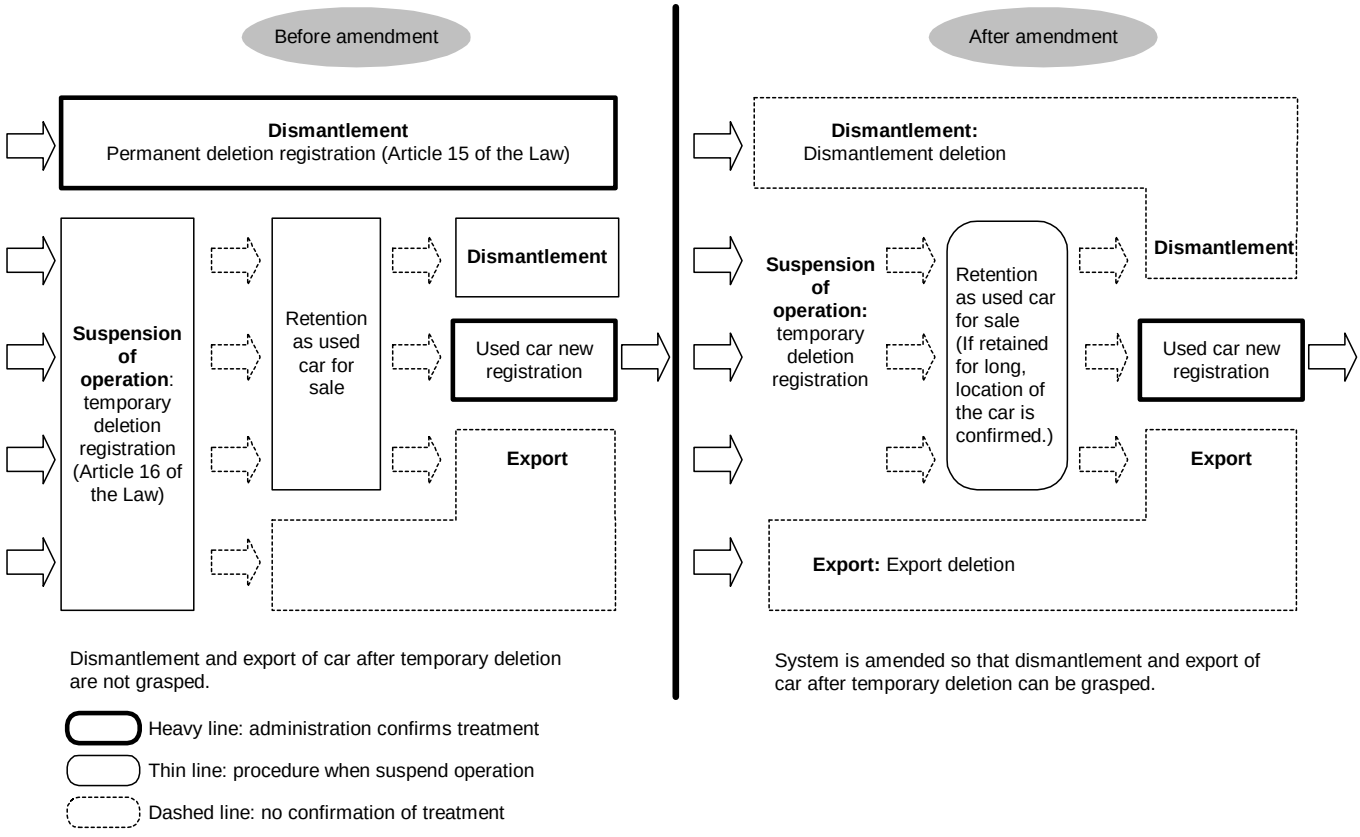
If concentration of recycling facilities and use of marine transport are advanced by construction of comprehensive venous physical distribution systems around ports, about 20% reduction in cost for recycling is possible.

(2) Measures for automobile recycling

Each year, about 5 million disused automobiles are discarded. They used to be recycled through wreckers because automobiles were valuable as resource for useful metals and parts. But now final disposal sites are in shortage, so shredder dust must

be reduced. And cost for final disposal is rising and price of scrap iron is staying low. In these years, increasingly, one has to pay, rather than get paid, when disposing a car. People are beginning to worry about illegal dumping and improper treatment.

For this, the "Law on Recycling of Disused Automobiles (Automobile Recycling Law) (proposal)" will be submitted to the Diet in April 2002, aiming at proper treatment and recycling of disused automobiles by requiring automakers and other related parties to share appropriate burdens. At the same time, from the viewpoint of promoting automobile recycling, the Road Trucking Vehicle Law will be amended to require that permanent deletion registration is done after the disused car is properly dismantled according to the framework of the Automobile Recycling Law. To ensure that this process is certainly done, the amendment will also require that actual status of use of the car is properly grasped.



Proposed Amendment to the Deletion Registration System

(3) Measures for FRP boats

FRP (fiber reinforced plastic) boats, which came in wider use in late 1960s, are not retired properly by users, because disposal cost is high and the number of disposal business operators is limited. Damping at sea and other problems are occurring. And, more FRP boats will be disposed. We need to implement a low-cost disposal method soon, and further establish a processing method for effective utilization of limited resources and promotion of construction of a recycling-oriented society.

To this end, the Ministry of Land, Infrastructure and Transport has been implemented the "Disused FRP Boats Highly Recycling System Construction Project" since fiscal 2000. So far, research and development has been done on technology to reuse waste FRP as raw material for cement and reuse technology to replace parts only where the body is deteriorated or damaged.

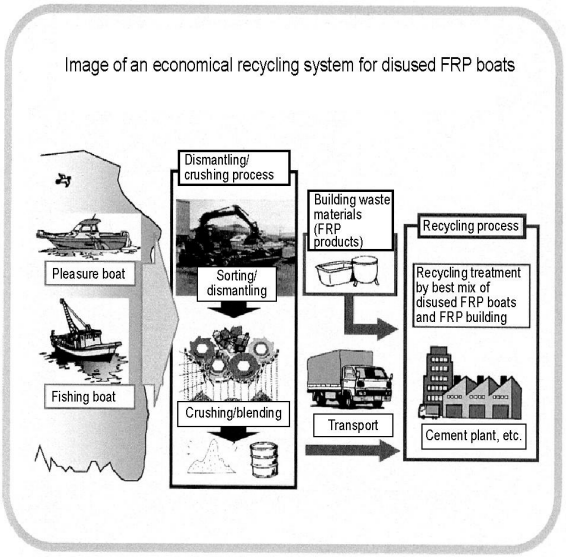
Now, the Ministry aims at development of technologies related to recycling and reusing, solution for clear sharing of roles and costs among concerned parties by 2003, and start of a recycling system in fiscal 2005.

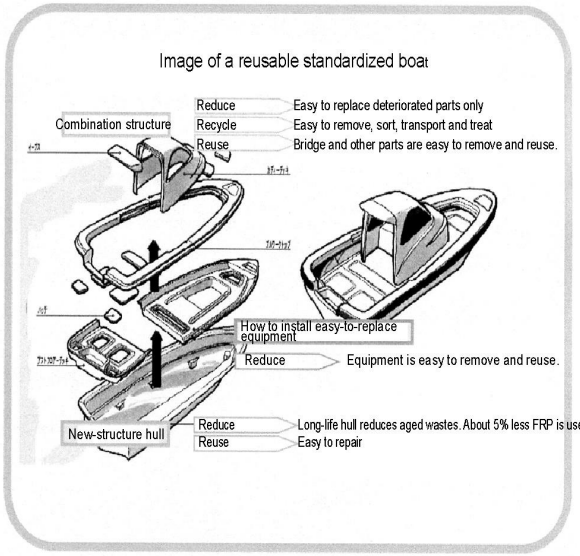
■ Construction of highly recycling system for disused FRP boats

Purpose: To address social problems concerning disused FRP boats that are illegally dumped, left alone, sunk, or wasted, we establish a proper disposal system for disused FRP boats and respond to social requirements such as construction of a recycling-oriented society and effective utilization of resources.

Contents: (1) Development of element technologies necessary for starting demonstration tests at a demonstration recycling plant, and feasibility study on the recycling system.

(2) Research and development of reuse technology that allows to replace parts only where the body is deteriorated or damaged.





4. Efforts of EcoMo Foundation

(1) Green Management (business operation with small load on the environment)

The international standard on environmental management system, ISO14001, is attracting attentions as a means to improve environmental problems, and increasingly many corporations are obtaining approval of ISO14001. However, for small and medium-sized companies, which account for the majority of the trucking industry, acquiring the approval is not easy, because it involves significant burdens on economic and human resources.

Thus, to support and promote efforts for improving the environment in the trucking industry, EcoMo Foundation has, in cooperation with Japan Trucking Association, made a manual for promotion of green management, according to the ideas in International Standard ISO 14031 on environmental performance evaluation. Its main contents are “implementation of eco-driving”, “introduction of low emission vehicles”, “inspection and maintenance of vehicles”, and “promotion of proper treatment and recycling of disused vehicles and waste materials”. The criteria for performance evaluation were made with the ideas of ISO14001 to bring continual improvement of the environment. By using this manual, even a small or medium-sized enterprise can easily set a goal for environmental improvement and evaluate its efforts, so that voluntary efforts are expected to progress.

In fiscal 2002, the Foundation will hold lecture courses on green management and carry out dissemination activities through guidance and advice. And we will also discuss how to make these efforts well-established.

Furthermore, in fiscal 2002, we will make a manual for promotion of green management in the passenger sector (bus and taxi), after the trucking sector. Finally, we hope to expand this to private vehicles (corporate vehicles, official vehicles).

Items to be Evaluated in the Green Management Promotion Manual

Large item	Small item (specific content of effort)
1. Preparation of a mechanism/system for preservation of environment	Policy on environment
	System for promotion
	Environmental education for employees
2. Implementation of eco-driving	Establishment of quantitative goals for fuel efficiency
	Implementation system for eco-driving
	Enforcement of idling stop
	Preparation of means of promotion
3. Introduction of low emission vehicles	Low emission vehicles: setting up of introduction goal and efforts
	Diesel vehicles conforming latest regulations: setting up of introduction goal and efforts
	Efforts for system about low emission vehicles determined by local community
4. Inspection and maintenance of automobiles	Implementation system for inspection and maintenance
	Appropriate inspection and maintenance based on the state of vehicles
	In addition to legally designated inspection, implementation of inspection and maintenance based on own standards which consider severe use as well
5. Promotion of control on discharge of disused cars and waste materials, proper treatment, and recycling	Proper management of disused cars and waste materials
	Control on discharge of waste packaging materials

(2) Promotion of conversion to a lifestyle which incorporates transportation with low load on the environment

Progress of motorization is a factor to cause global warming and air pollution. To improve this situation, we have to change our lifestyle itself, which depends on cars excessively, in addition to lower environmental load of individual cars, and we have to consider how to be friendly to the environment. Based on these ideas, a variety of trials are in progress all over the world.

As an integral part of such trials, the Foundation did the following efforts in fiscal 2001.

1) Implementation of social experiments on car-sharing

Car-sharing is a technique that retains convenience of owner's car, lowers the cost and trouble of car ownership, helps conversion from a lifestyle of excessive dependence on cars, and represents a new way of using a car. In car-sharing, several individuals jointly own and use a car. It began in Germany and Switzerland ten and several years ago. Today, there are about 200 organizations in Europe, and their membership is more than 125,000. It is pointed out that car-sharing contributes to reduction of numbers of vehicles and distances traveled, and to effective use of urban space.

The Foundation paid attention to this car-sharing in fiscal 1999, and has been doing overseas studies, discussion on how to disseminate it in Japan, formulation of proposal for social experiment, etc. In fiscal 2001, we conducted social experiments in Kita Ward and Mitaka City for about three months, respectively, to verify the possibility of wide use and social effect in Japan. In Kita Ward, 43 residents in private-sector condominium apartments shared 4 vehicles, and in Mitaka City, 28 residents in Housing Corporation rental housing shared 2 vehicles. The vehicles were low-emission gasoline-powered vehicles (fuel efficient and low emission approved vehicles), and fees were collected according to use.

In these experiments, the people who converted from their own cars to shared cars moved by car about 70% less frequently than they did before. After the experiments, car owners were asked if they would give up their car when car-sharing was made commercialized. 50% of them answered, "Yes, after considering the fee," and 40% answered, "Yes, after considering the numbers of cars and participants." Only 4% of them answered, "No." Furthermore, of the people who did not own a car but wanted to own one in future, 60% answered that they would not own a car if car-sharing was commercialized. On the other hand, it was confirmed that for a full-scale commercialization, it is important to check identification of users, deregulate the current law on distance between vehicle storage and management office (currently restricted to less than 2 km), and implement a variety of official support such as free provision of public parking lot.

Shared-use vehicles lining up in the experiment parking in Kita Ward, Tokyo

We will provide data on these experiments to local public entities,

civic groups, citizens and business operators, who are increasingly interested in car-sharing, and we will try to disseminate the know-how we obtained this time.

2) Eco-Mobility Activities Exchange Meeting

In promotion of lifestyle change in the transportation area, voluntary activities by civic groups are expected greatly, from the viewpoint that they can promote activities based on the needs from specific realities, while attracting interests of citizens.

In recent years, activities by civic groups in green purchase, recycling, and other areas have been spread widely and networking is in progress, but when it comes to the area of traffic environment measures, such movement is yet insufficient. The Foundation hopes to collaborate with civic groups in promotion of conversion to a lifestyle incorporating transportation with low load on the environment. As a part of it, we held the Eco-Mobility Activities Exchange Meeting.

As one of the events in Lifestyle Review Forum 2001 (cosponsored by the Forum Executive Committee consisting of civic groups, and the Ministry of Environment) held in Tokyo in December 2001, the Foundation held the Eco-Mobility Activities Exchange Meeting jointly with the Environment Municipalities Conference.

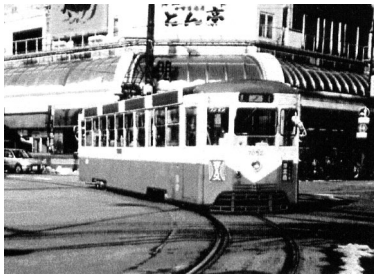
First, there was a lecture on the importance of collaboration between citizens and administration in planning of transportation, followed by reports of 7 civic groups which were deploying activities on local transportation with environmental consideration mainly by citizens in various areas. Then, We exchanged views on the current status, challenges, roles of civic groups, how to get cooperation of the general public, and other issues.

The reports introduced a case in Kanazawa where 1,200 citizens had participated in down-to-earth fieldwork to make a bicycle map, a case in Fukuoka where a civic group is studying the possibility of car-sharing using electric automobiles while involving local public entities and business operators, and other cases.

Column: A case of grass-root civil activities for conservation and vitalization of electric tramway

In Takaoka City in Toyama Prefecture, electric railcars are running on Kaetsuno railway. They are small trams as shown in the photo, but they are carrying about one million passengers a year. Calculation shows that if this railway was abolished and passengers transferred to their own cars, CO_2 emission (carbon equivalent) would increase by 350 tons per year. People in Takaoka City and along the line started movement for continuation, to save the tram they were familiar with for many years. A proposal was made to make it to a joint public-private venture, but adjustment was difficult among Toyama Prefecture, railway business operator, Takaoka City and other parties concerned over continuation of the railway. Citizens were not unified, either.

Thus, a "Group to Think the Future of Trams and Cities, Takaoka (in short, RACDA Takaoka)" developed a grass-root activity "Catering Caravan", while participating in "Man-yo Line Friendly Discussion Gathering" for continuation, as a requested member. To enlighten citizens about tramway and city planning, members of Catering Caravan would go to local meetings, with cooperation of neighborhood associations, appeal the significance of tramway for people's living, and listen to people about what they feel difficult in terms of transportation. More than 30 times of such meetings were held so far (as of January 2002). As a result of these activities, citizens' awareness on tramway was raised, the consultation between administration and the railway business operator progressed, and local businesses added some support. Then it was decided that the tramway should restart as a joint public-private venture in April 2002. This is an example that citizens' grass-root activity saved a means of transportation whose environmental load is small.



IV. Other Measures Concerning Environmental Problems

1. Efforts on noise problems

(1) Measures for noise from automobiles

In fiscal 1999, out of 3,380 measuring points nationwide, only 1,265 points (37.4%) achieved the environmental standards for automobile noise in both daytime and nighttime.

Noise regulation on automobiles was tightened for all vehicle types as the 1998-2001 Regulation based on the report of Central Environment Council, “Future Automobile Noise Lowering Measures (measures for individual automobiles)”. In this, depending on vehicle type, regulation was tightened by up to 3 dB for acceleration noise, up to 6 dB for constant speed noise, and up to 11 dB for close exhaust noise.

(2) Measures for noise from railroads

For Shinkansen lines, various measures are in progress to achieve the environmental standards. But they are technically extremely difficult to achieve by source measures alone. Therefore sound source measures to make peak level 75 dB or less depending on the concentration of houses are in progress. More specifically, extension of sound-proof walls, rail correction by grinding to lower running noise, and other sound source measures; and sound insulation works for hospitals, houses, etc., and other measures for surrounding areas are in progress.

For conventional lines, the 1995 “Guideline for Noise Control Measures on New Construction or Large-Scale Upgrading of Conventional Railroads” is the base for regulation. For new lines, equivalent sound level is 60 dB or less in daytime (7–22 o’clock) and 55 dB or less in nighttime (22–7 o’clock). For upgraded lines, work is done so that noise levels are improved.

(3) Measures for noise from Aircrafts

In fiscal 1999, of the specific airports designated by the government based on the Aircraft Noise Control Law, 8 airports achieved the environmental standards, but 6 airports including Osaka (Itami) and Fukuoka still failed to achieve the environmental standards.

To address these problems, for jet planes, propeller planes and helicopters, operation of an aircraft is prohibited if noise from the aircraft exceeds the standard value based on the international standards set by the International Civil Aviation Organization

(ICAO). For large jet planes to be developed in 2006 or later and helicopters to be developed in 2002 or later, the international standards will be stricter.

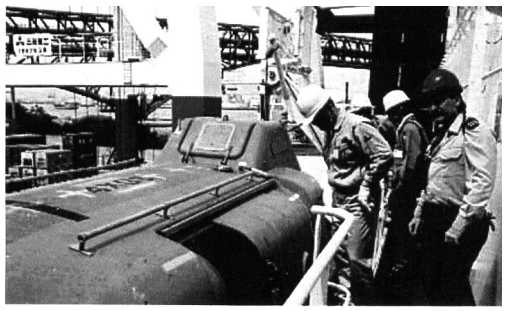
As for measures for surrounding area, sound-proof works on schools, hospitals and houses, compensation for transfer of buildings, preparation of buffer green zones, and creation of parks in vacant lots after transfer in cooperation with local public bodies are in progress.

2. Response to marine pollution

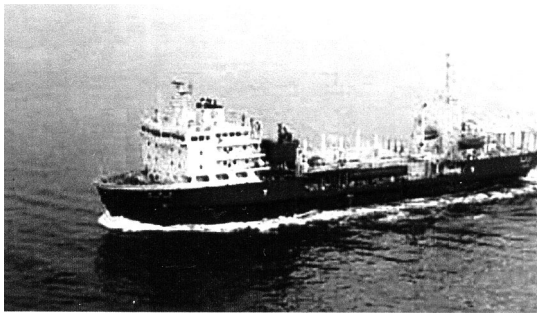
For environmental problems caused by marine transport, worldwide efforts by International Maritime Organization (IMO) and regional efforts such as construction of cooperation systems with neighboring nations are in progress. The Ministry of Land, Infrastructure and Transport is doing the following efforts.

(1) Measures for large-scale oil pollution

In the background of recent large-scale oil pollution, there exist ships that do not meet standards of conventions on marine safety and conservation of marine environment (substandard ships), as one of the major factors. To eliminate them, the Ministry is actively participating in international efforts such as construction of the international data base of ships (EQUASIS), and the Ministry is tightening port state control (PSC) in which the authority enters and inspects ships in Japanese ports to check whether they meet the standards.



Check on lifesaving appliance (life boat)



Large dredge/oil-recovery boat, Kaisho

For oil spill accidents in large scale around Japan, it is necessary to prepare a system that allows immediate arrival at the site and speedy recovery of oil. To this end, the Ministry is deploying large dredge/oil-recovery boats nationwide and constructing a cooperation system with China, Korea, Russia and other neighboring countries through Northwest Pacific Action Plan (NOWPAP).

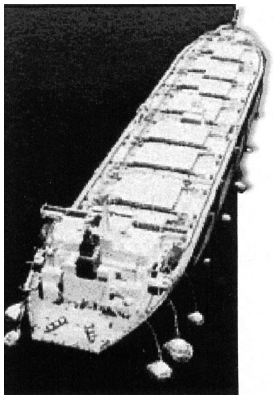
(2) Response to the problem of ship bottom paint

For the problem of ship bottom paint that contains organic tin (TBT), dissolves into seawater and causes abnormality in marine life, Japan voluntarily restrained such paint as the first in the world, and proposed a treaty on regulation to IMO, aiming at total prohibition. As a result, this treaty was adopted by "International Conference on Control of Harmful Antifouling Methods for Ships" in October 2001.

(3) Response to the problem of harmful aquatic organisms in ballast water

Ship ballast water* contains planktons and other organisms, and they are moved to a place that is not their original habitat. This is considered to have harmful effects on the ecosystem and damage human health and economic activities. Japan has proposed a treaty to obligate ships proper control on ballast water. This treaty is scheduled to be adopted by the international conference to be held in 2003 after further discussion.

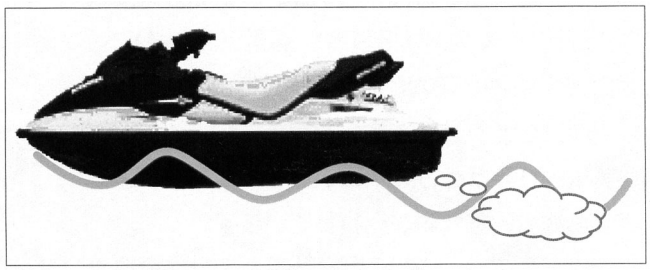
* Seawater that is loaded in tankers and other ships as weight to secure safety when the ship is empty-loaded.



Ore carrier, discharging ballast water

3. Measures for exhaust gas and noise from pleasure boats

Some pleasure boats and water bikes often run about within an area repeatedly, which may cause environmental problems with noise and exhaust gas.



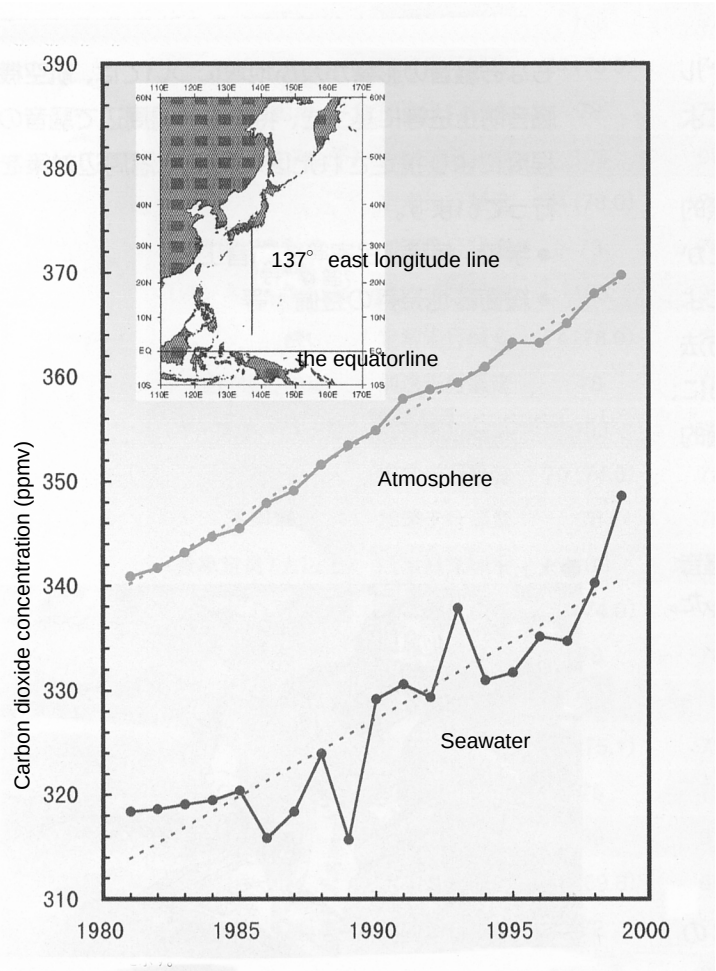
So far, in water quality surveys conducted by the government, prefectures, environmental groups, it has been confirmed that the organic chemical compounds in water from exhaust gas are below the environmental standards. However, to keep reducing their effects on environment, the Ministry will actively promote further measures for lower load on environment, such as development of low environmental load engines that reduce organic chemical compounds in exhaust gas, technical development toward lower noise from machines, and introduction of navigation rules in a water area that contains water intake.

4. Observation and monitoring of the global environment

To implement correct measures for environmental problems of the transport sector, correctly keeping track of changes in air and oceans through long steady observation and monitoring is necessary.

The Maritime Safety Agency carries out constant monitoring observation and the like of water temperature, the salt content, ocean currents, ocean waves and marine pollution by a survey ship in the area from the south of the main land to the equator area and collects and accumulates a variety of data and exchanges data with countries around the world through Japan Oceanographic Data Center

The Meteorological Agency is carrying out observation and monitoring of air and oceans as a part of the worldwide monitoring network. Along the Global Air Monitoring Program of the World Meteorological Organization (WMO), the agency conducts observation of the atmospheric concentrations of greenhouse gases including CO_2, and the ozone layer in Minami-Torishima (Tokyo), Ryori (Iwate), Yonagunijima (Okinawa), Showa Base in the South Pole and others and carries out comprehensive observation of greenhouse gases from the deep sea to upper atmosphere by means of marine observation ships and airliners.



The long-term observation fixed line along the 137th degree of east longitude in the North Pacific by Ryofu Maru, a marine meteorological observation ship and secular change in carbon dioxides concentration (average value of 3rd to 30th degree of north latitude) in ocean atmosphere and surface seawater on the same fixed line in winter from 1981 to 1999. The dotted lines show their long-term trends.

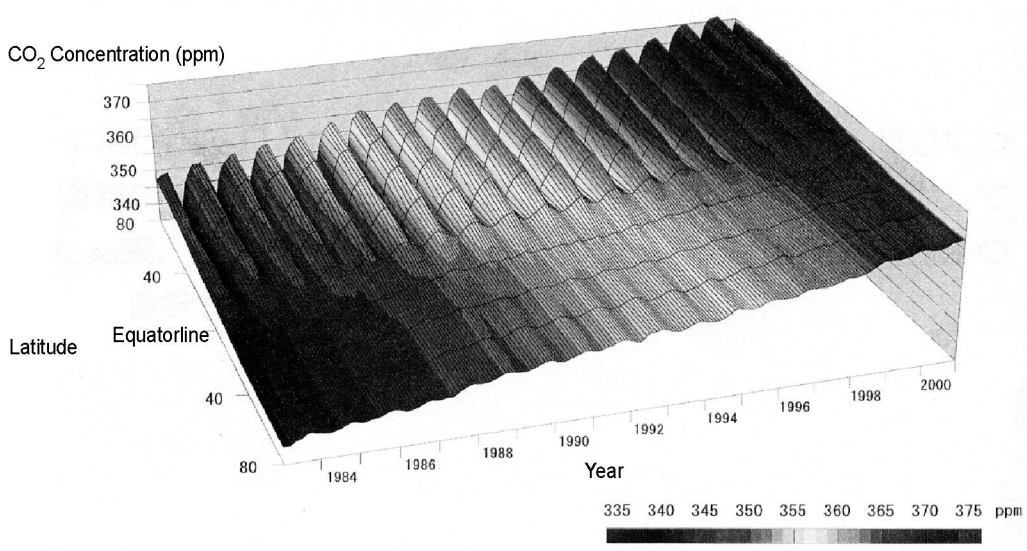
Source: Japan Meteorological Agency

Secular Changes in Carbon dioxide concentration along the 137° east longitude line.

The Meteorological Agency, collects, manage, provide the results of observation of greenhouse gases in all parts of the world as the WMO Greenhouse Gas World Data Center and plays the role of the WMO Quality Assurance Science Center intended for improvement of the quality of observed data in the Asia and Northwest Pacific region.

Furthermore, in fiscal 2002, the Agency will provide monitoring and prediction information on regional climate as the WMO Asia-Pacific Climate Center, and also carry out detailed prediction on global warming over Japan.

To realize observation and monitoring of the interiors of oceans, information of which is not available sufficiently as compared with one on land areas in detail and worldwide, the agency is pursuing construction of the Advanced Ocean Monitoring System (ARGO Program) as a millennium project in cooperation with main countries in the Pacific and neighboring areas. The program is intended to deploy about 3000 intermediate layer floats (automatic observation devices that sink to a depth of 2,000 m below the sea surface) and keep track constantly of conditions such as oceanic circulations affecting climates on the basis of real-time information on water temperature and concentrations of the salt contents obtained from them.



Source: Japan Meteorological Agency

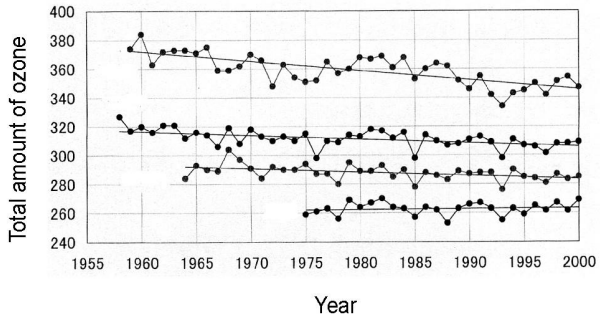
5. Prevention of depletion of ozone layer

The ozone layer plays an important role in protecting life on earth from harmful ultraviolet rays. Depletion of ozone layer is a serious problem. A large ozone hole over the Antarctic region persists, and the ozone layer over Japan is also decreasing in the long term.

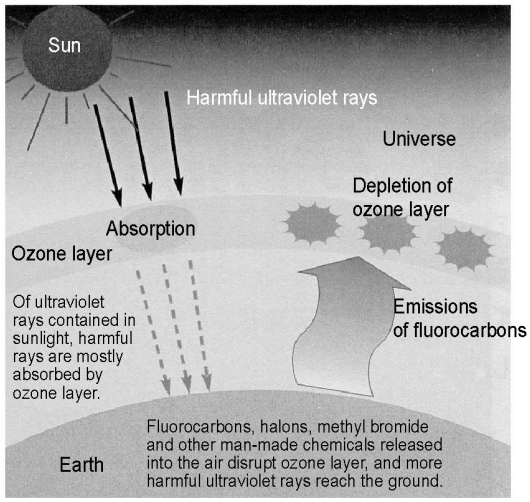
There is an urgent need to reduce emissions of those substances that bring depletion of ozone layer or global warming. The “Law concerning the Secure Recovery and Destruction of Fluorocarbons Contained in Specified Products (Fluorocarbons Recovery and Destruction Law)”, which was approved on June 15 of 2001 and promulgated on 22 of the same month, prohibits arbitrary emissions of three substances, Chlorofluorocarbon (CFC), Hydrochlorofluorocarbon (HCFC), and Hydrofluorocarbon (HFC), which are used as

cooling medium in car air-conditioners, commercial freezers, air-conditioners and other machines. The Law also provides for obligations concerning proper recovery and destruction of these substances when the products are disposed of.

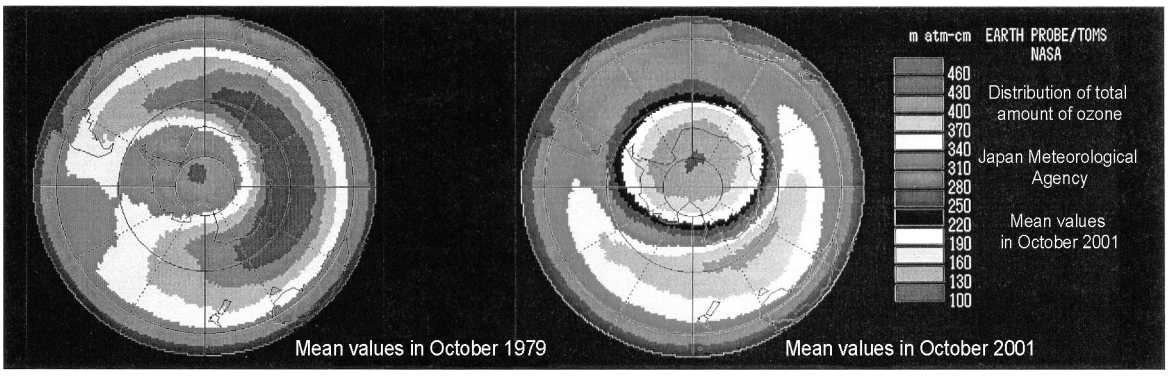
The Ministry of Land, Infrastructure and Transport is observing ozone layer, promoting recovery of ozone-depleting substances, and limiting their emissions into the atmosphere, mainly from car air-conditioners for which the recovery ratio of CFC is still lower. The Ministry is also introducing preferential treatment to promote conversions of facilities to those responding to non-specified Fluorocarbons.



Yearly Average of Total Amount of Ozone at 4 Points in Japan



Mechanism of Depletion of Ozone Layer



Source: Japan Meteorological Agency

Ozone Distribution over the South Hemisphere

6. Measures for chemicals

(1) Measures for dioxins

Dioxins are produced when garbage is burnt. Health effects by dioxins are strongly concerned, but the state of contamination is not clear enough in many coastal areas. Therefore the Ministry of Land, Infrastructure and Transport is doing the Tokyo Bay Resuscitation Project and marine pollution studies to know the current status of dioxins.

(2) Measures for environmental hormones

Environmental hormones (endocrine disrupting chemicals) disrupt endocrine functions of human and wildlife. They have possibilities of exerting various adverse effects, such as decreasing number of human sperms. Needs for measures are increasing. The transport sector has been promoting voluntary restraint in Japan on use of ship bottom antifouling paint that contains organic tin (TBT), which is a kind of chemical suspected to have endocrine disrupting function. We also proposed a treaty for a global total ban to the International Maritime Organization (IMO). As a result, the proposal was adopted in October 2001. In Tokyo Bay and coastal areas of Japan, marine pollution studies are conducted.

(3) PRTR System

Our modern life is based on using many products that contains many chemicals. During the production, use and disposal of these products, many chemicals are discharged through various channels. Among these, some chemicals are suspected to have adverse effects on human health and ecosystems.

To promote better voluntary control on chemicals by business operators and to limit wasteful discharge of chemicals, the PRTR Law was put in force entirely in January of this year. This law provides that business operators themselves should grasp how much chemicals they are discharging, and notify the amount to the administration.

In the transport sector, those business operators in the shipbuilding industry, the railroad industry, the warehousing industry, the automobile maintenance industry, etc. who deal with harmful chemicals are required to report the amounts of such chemicals to the Minister of Land, Infrastructure and Transport via the governor of prefecture.

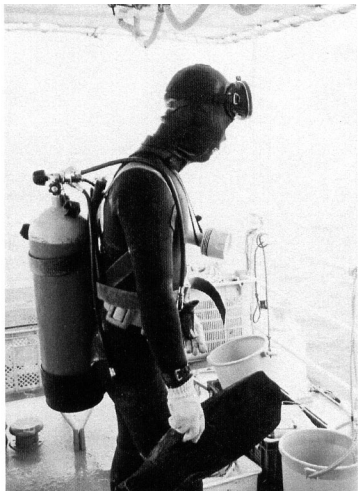
7. Efforts of EcoMo Foundation

Study on dioxin distribution in Setonaikai (Harima Nada)

Dioxins come to the sea, flowing into the bay through rivers, or falling down from the sky after scattered in the atmosphere. Effects of dioxins are not known entirely, except around river mouths and harbors.

Therefore, after Tokyo Bay (in 2000), we studied the distribution of dioxins in bottom mud of Harima Nada, which is an open coastal water body with complex landform next to Osaka Bay. Result of the study shows that the horizontal distribution in surface layer has a concentration range of 2.8–9.0 pg-TEQ/g-dry (note), which is similar to past study results, 0.08–13 pg-TEQ/g-dry. Concentrations of dioxins in the central part of Nada and the north part of Nada off Aioi are high (8.8–9.0 pg-TEQ/g-dry), and those in the northwest part of Nada (around Akashi Strait) are relatively low (0.084–0.17 pg-TEQ/g-dry. The presumed reason is that tidal flows are very fast in Akashi Strait, Bisan Seto and Naruto Strait, and very weak in other areas, and there is a large current turning clockwise in the central part of Nada. Sedimentary process shows peaks (6.9–12 pg-TEQ/g-dry) in the layers of 1960s–1980s. By particle size, dioxins tend to increase as particle size becomes smaller, which is similar to the result in Tokyo Bay. The main origin of dioxins seems to be agricultural chemicals, similar to the back part of Tokyo Bay.

(Note) A unit to express toxic equivalent per 1 g of dry mud (picogram-Toxic Equivalent/gram-dry) : 1 trillionth part of 1 g .



In place of postscript

Junichi Kanemaru
Director-general of EcoMo Foundation

This booklet is an attempt to give an easy-to-understand introduction to the basic data and the latest measures and efforts on environmental issues in the transport sector. We hope the booklet is helpful for those who are interested in environmental issues and who are engaged in practical activities. We will revise the booklet every year to make it better reference material. We welcome your comments and requests.

The Foundation is also providing related information at its website (http://www.ecomo.or.jp/). We would be very happy if you could see the pages, too.

The Foundation is carrying out its activities under wide supports from Nippon Foundation, other transport-related groups/enterprises, local public bodies, and financial institutions. The area of activities is transport, and promotion of barrier-free transport and promotion of environmental measures are its two main pillars. (The Foundation was established in 1994 as Organization for Promotion of Transport Amenities, and efforts for barrier-free transport was started. In 1997, its name was changed to the present name, and efforts for environmental measures were started.)

In fiscal 2002, we in the Foundation will disseminate voluntary efforts for environment improvement, utilizing “Manual for promotion of green management for trucking business operators” which we made in fiscal 2001 or earlier, and we will discuss how to make these efforts firmly established. We will also make a manual for promotion of green management for the bus/taxi sector. At the same time, to steadily promote creation of transport systems with due considerations to the environment, starting from local community with involvement of residents, we intend to start a project in which we will plan measures to improve environment in the transport area for local public bodies and promote its transition to actual operation.

The Foundation hopes to construct a close network with groups and individuals who have same interests and awareness, and to advance efforts in the area of transport toward improvement of the environment in collaboration with these groups and individuals. We sincerely hope for support and cooperation from those who sympathize with our activities, and for opportunities of collaboration in activities in practice.

This booklet was made possible by subsidy from Nippon Foundation and full cooperation from Environment and Ocean Division of Policy Bureau of the Ministry of Land, Infrastructure and Transport. We are deeply grateful.

Activities of the Foundation can be seen on its website.

http://www.ecomo.or.jp/

e-mail: ecomo@ecomo.or.jp

For more information on projects of the Foundation, please visit “Project Results Library” in the website of Nippon Foundation, where you can see reports and other results of our projects.

http://www.nippon-foundation.or.jp

Words of recommendation

Harumi Suda
Director of Japan Center for Climate Change Actions
Representative of Japan Center for Citizens Movement

As a result of efforts by many people who are interested in the global environment, the Kyoto Protocol is likely to come into effect within 2002.

As is known, Japan's target is 6%, but emissions in the transport sector have increased by 23% (fiscal 1999) from 1990. Among them, passengers rather than cargos, particularly passenger cars, have increased significantly.

This renews the importance of ecological mobility. But the reality is, although there are specialized books, no many easy-to-understand statistics or helpful practical guidebooks are available closely at hand. From this viewpoint, this Annual Report is ambitious and easy to use, and in a sense could be a book you must have.

The current of modernization of transportation in Japan is, generally speaking, after the days when railroads were important, to days when expressways and aviation were important, and now at the entrance of a period when one must focus on environmental adaptation as well as speed and safety.

The power to open out this period is actually within citizens ourselves who are the users of private cars. But, if there is no other choice than using cars for individual citizens, then we must say there is something wrong with the system itself. Thus, we need "collaboration" to carry out reforms. I hope this book to become a reference book for that.

Hiroo Ohno
Chief of Environment and Ocean Division
of Policy Bureau of the Ministry of Land,
Infrastructure and Transport

The problem of global warming, which is increasing closed up.

The CO_2 emissions from the transport sector drastically increased in the first half of the1990s. The emissions from domestic transport account for about 1% of the total emissions worldwide (about 20% of emissions in Japan)

On the other hand, fortunately, the increase tendency in CO_2 emissions from the transport section is rapidly leveling off.

About 90% of the CO_2 emissions in the transport section in Japan is due to operation of automobiles. In fact, the increase in the first half of the 90s was caused by the sharp increases in the number of automobiles and distance they traveled, and the biggest reason for the recent leveling off of the increase rate is the rapid dissemination of low emission vehicles and low fuel consumption vehicles.

Now, each of us needs to think about “how to deal with motorized society in new ways”

If development and dissemination of low emission vehicles and fuel efficient vehicles are promoted with further improvement in transport systems, we can put a certain brake on the CO_2 emissions from the transport sector. This possibility is getting higher bit by bit. This is a delightful fact, and for this very reason, I want many people to know the relation between “transport and warming”.

That is what I really think these days.

This book, which is issued by EcoMo Foundation, contains a lot of latest information on transport and warming.

- How much CO_2 are we emitting by using cars?
- What significance does active introduction of low emission vehicles have?
- What vehicles are regarded as low emission vehicles, and what subsidy can they get?
- How is introduction of environment-friendly transport systems in progress?

Answers to these questions are all packed in this book.

Those projects on measures for transport environment that EcoMo Foundation itself is carrying out are enhanced each year little by little. Promotion of green management in trucking and other businesses, conversion to a lifestyle that incorporates transportations

with little burden on the environment. We, in the Ministry of Land, Infrastructure and Transport, have great expectations on active deployment of these projects.

Transport Sector Environmental Annual Report. It is too stiff a name, but my impression after a read was as I mentioned above. Please do not shy away, take a look inside.

Activities of the Foundation can be seen on its website.
http://www.ecomo.or.jp/
e-mail: ecomo@ecomo.or.jp

For more information on projects of the Foundation, please visit “Project Results Library” in the website of Nippon Foundation, where you can see reports and other results of our projects.
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Issued by EcoMo Foundation
Shuwa Kioicho TBR Bldg. #808　5-7 Kojimachi, Chiyoda-ku Tokyo, 102-0083
Phone: (03) 3221-7636　Fax.: (03) 3221-6674

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