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8-2 Energy Efficiency & Conservation in Transportation

運輸部門の省エネルギー政策

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Report of
the Committee on Comprehensive Strategy for the Development and Dissemination of Low Emission Vehicles

December 2001

**Strategic Committee on Comprehensive Strategy
for the Development and Dissemination of
Low Emission Vehicles**

1. Introduction

Air pollution is still a serious problem in Japan's major cities largely due to exhaust emissions from motor vehicles, especially diesel vehicles. As for global warming, motor vehicles generate about 90% of the transport sector's CO_2 emissions, so cuts here are essential.

To create an environment in which future generations can live in comfort, there is an urgent need to promote the development and use of low emission vehicles (LEV) that are environmentally friendly in terms of fuel efficiency and exhaust emission performance, and also to accelerate the development of next-generation LEVs with a vastly improved environmental performance.

Against this backdrop, the Ministry of Land, Infrastructure and Transport (MLIT) established the Committee on Comprehensive Strategy for the Development and Dissemination of Low Emission Vehicles to examine and formulate comprehensive strategies for developing and promoting LEVs and developing next-generation LEVs.

2. Examinations by working groups

To facilitate the formulation of these strategies, the Committee set up two working groups — the Low Emission Vehicle Working Group to examine the development and dissemination of LEVs up to 2010; and the Next Generation Low Emission Vehicle Working Group to examine the development of next-generation LEVs with vastly improved exhaust emission performance and fuel efficiency through anticipated technological breakthroughs after 2010.

In carrying out their examinations, the working groups sought to ensure conformity by keeping up to date with each other's progress through the Secretariat in areas requiring a common understanding, such as the characteristics of each type of LEV, the basic role of the national government in technological development, and views in setting targets for fuel efficiency and exhaust emissions.

3. Reports by the working groups

The working groups prepared reports on their extensive examinations, and recently submitted them to the Committee. The reports highlighted important strategies for developing and promoting LEVs and developing next-generation LEVs, and in this light, it was considered appropriate to adopt the working groups' reports as the Committee report.

4. Future measures by MLIT

(1) Measures based on the report

The report gives specific targets and identifies issues that need to be resolved in the development and promotion of LEVs, and it is crucial that this development and promotion is approached strategically in line with the report. In particular, as the government continues its preliminary work toward the conclusion of the Kyoto Protocol, MLIT should determine targets for cutting CO_2 emissions in consultation with the ministries and agencies concerned based on the fundamental principles contained in the Committee report.

The Ministry also needs to work to secure the necessary budget for promoting the greater use of CNG vehicles in major cities, and developing next-generation LEVs.

(2) Comprehensive environmental countermeasures

Developing and promoting LEVs is not the only means of countering air pollution caused by motor vehicles and global warming; eliminating bottlenecks to improve traffic flow and raising the efficiency of goods distribution are also important measures for addressing these issues. So as well as LEVs, MLIT must also adopt a comprehensive and progressive approach to these other more conventional measures.

Basic strategy for promoting the development of next-generation LEVs

— Outline of the Next Generation Low Emission Vehicle Working Group Report —

Only by truly solving the problem of air pollution caused by motor vehicle emissions, preserving the global environment, and securing the safety of energy supply can we hope to pass on an environment in which future generations can live in comfort, and in this respect, developing next generation LEVs has indeed become an urgent challenge.

Next-generation LEVs deliver a vast improvement in exhaust emission performance and fuel efficiency compared to conventional vehicles through anticipated far-reaching technological innovation from 2010.

This report examines strategies for promoting the development of next-generation LEVs.

1. Basic strategies for developing next-generation LEVs and corresponding vehicles types

- Basic strategies for passenger cars and small and medium vehicles

  Most passenger cars and small and medium vehicles run on gasoline. Individually, they produce only relatively small amounts of nitrogen oxides, and their exhaust emission efficiency is outstanding.

  However, there are huge numbers of these vehicles, and collectively, they are responsible for more than half of the CO_2 produced by the transport sector, so there is a need to proceed with development that gives **priority to improving fuel efficiency** as a measure to counter global warming.

  Corresponding vehicles types include **fuel cell vehicles**, **hydrogen vehicles** and **next-generation hybrid vehicles** for passenger cars, and **next-generation natural gas vehicles** and **next-generation hybrid vehicles** for small and medium vehicles.

- Basic strategies for large vehicles

  Most large vehicles are diesel-powered, and while they provide excellent fuel efficiency, exhaust emissions including nitrogen oxides and particulate matter are a problem.

  Development should therefore give **priority to reducing exhaust emissions** as a means of solving the air pollution problem, while maintaining or even improving the present outstanding fuel efficiency.

  Corresponding vehicles types include **next-generation hybrid vehicles**, **dimethyl ether (DME) vehicles** and **super-hybrid vehicles** for trucks, and for buses, the above vehicles and also **fuel cell vehicles**.

2. Exhaust emission and fuel efficiency targets for next-generation LEVs

Japan should aim at the highest level targets below the control values planned by other countries.

(1) Exhaust emissions and fuel efficiency targets

- Passenger cars and small and medium vehicles

  Development should be aimed at **about half the current level of CO_2 emissions**.

  Japan should then maintain exhaust emission values in new long-term controls, which are set at virtually zero, ultimately aiming at achieving zero exhaust emission.

- Large vehicles

  Development should aim at maintaining and improving the current outstanding levels of fuel efficiency, while seeking drastic improvements in exhaust emission performance.

  · Japan should aim at **cutting nitrogen oxides to less than one tenth the level in new long-term controls planned for introduction from 2005** so that emission levels are close to zero.

  · Japan should aim at levels of **particulate matter emission that are zero or close to zero**.

(2) Improvement of fuel quality

Maintaining and improving fuel quality is essential for promoting the technological development of next-generation LEVs.

(3) Others

Countermeasures for ultra fine particulate matter and unregulated substances should also be examined.

In addition to further lowering vehicle noise and improving recyclability, development must also aim at reducing the environmental load from vehicle manufacture and use to final disposal.

3. Government role in development and dissemination of next-generation LEVs

There is a need to clarify the roles of the industrial, government and academic sectors, and systematically create an environment that can facilitate their efforts in their respective areas of technological development and promotion.

For its part, the government through close cooperation among the relevant ministries and agencies should adopt the following measures to promote the early development of next-generation LEVs and create an environment that will facilitate their widespread acceptance and use.

- Financial support

  The government should extend financial support for the development of large next-generation trucks, which has been held back by high development costs and the limited size of the market, and for establishing fuel supply facilities.

- Institutional support

  The government should provide support for standardization to reduce parts and vehicle costs, for implementing field trials of prototype vehicles, and for drawing up guidelines and technological standards covering safety and environmental preservation.

4. International initiatives to promote the development of next-generation LEVs

- International conferences

  One effective measure is to actively promote the exchange of information on next-generation LEV technologies and policies.

- Standardization

  National standards for next-generation LEVs should be uniform so that resources can be efficiently channeled into technological development.

- Technical cooperation for developing countries

  There is a need to extend technical cooperation and support relating to LEV technology, checks, maintenance and management technology, and their use.

Strategy for the Development and Dissemination of Low Emission Vehicles

— Outline of the Low Emission Vehicle Working Group report —

The development and dissemination of operational low emission vehicles is essential to cut CO_2 emissions in the transport sector and reduce air pollution in the major cities. This should be done based on the strategy summarized below.

1. CO_2 reduction targets through the development and dissemination of LEVs

There is a need to promote countermeasures that take into account the serious level of increased CO_2 emissions from private passenger cars. The government should introduce measures to prevent congestion and improve traffic flow, and also promote the following measures without relying on regulatory means wherever possible to avoid affecting the national life and economic activities.

(1) Bring forward the 10 million LEV target from 2010 as much as possible, then set CO_2 reduction targets on this basis.

(2) Encourage the early achievement of 2010 fuel efficiency standards, and promote the development and dissemination of vehicles that provide even better fuel efficiency.

(3) If items (1) and (2) are not sufficient when formulating guidelines, examine measures to further encourage the use of small (light) vehicles and fuel-efficient vehicles.

(4) Implement monitoring in the future. If reductions in motor vehicle CO_2 emissions are not achieved, there will be a need to introduce further incentives to use small (light) vehicles and fuel-efficient vehicles, and review vehicle fuel efficiency controls.

2. Proposals for concrete measures for the development and dissemination of LEVs

(1) Development

- Clarification of government long-term policy
- Use of the green tax system.
- Balanced improvement of exhaust emission performance and fuel efficiency (fuel efficiency in gasoline-powered vehicles is critical for simultaneously promoting exhaust emission countermeasures and reducing CO_2 emissions).
- Improvement of fuel quality, on which the compatibility of exhaust emission performance and fuel efficiency is premised.

· Promotion of “zero sulfur” in gasoline and diesel fuel.

· Examination into making the use of high-quality fuel obligatory from a safety and environmental perspective.

• Introduction of life-cycle assessment.

(2) Dissemination

• Use of support measures such as budgetary measures, and the green tax system.

• Systematic promotion of green purchases by the private and public sectors.

• Detailed promotion measures (measures directed at users, reducing cost to users).

• Reduction of CNG vehicle prices (mass production effect resulting from greater use, easing compressed gas regulations, reduction of price gap with Europe and other countries).

• Establishment of CNG stands (establishment in major cities and along trunk routes, and easing regulations, including rationalizing operations).

3. Miscellaneous — Comprehensive approach to promoting vehicle-related environmental measures

• Grant LPG vehicles with the same level of environmental performance as LEVs equivalent benefits under the green tax and green purchases systems.

• Use of controls and introduction of new technologies (speed limiters on large vehicles, “idling stop” devices, etc.)

• Promotion of “green management” in the motor vehicle transport industry.

• Promotion of voluntary measures by drivers (“eco-drive” etc.).

• Measures to improve traffic flow (elimination of bottlenecks, optimum synchronization of traffic signals, removal of illegally parked vehicles).

• Government initiatives and cooperation by goods consignors for promoting a modal shift.

Items examined by the Committee on Comprehensive Strategy for the Development and Dissemination of Low Emission Vehicles

1. Committee on Comprehensive Strategy for the Development and Dissemination of Low Emission Vehicles

May 9	1st meeting	• Committee and its functions
		• Current state of motor vehicle exhaust emission countermeasures and CO_2 reduction measures
		• Items to be examined by working groups
July 4	2nd meeting	• State of examinations by working groups
		• Recent trends in LEVs
		* Urgent proposals
Dec. 19	3rd meeting	• Report by the Committee

2. Next Generation Low Emission Vehicle Working Group

June 8	1st meeting	• Details to be examined by the working group and examination methods.
		• Interviews/discussions with manufacturers
June 28	2nd meeting	• Interviews/discussions with related organizations
Sept. 14	3rd meeting	• Fiscal 2002 budget requests for LEV development and dissemination
		• Results of interviews/discussions with manufacturers
		• Framework of the Next Generation Low Emission Vehicle Working Group Report (draft)
Nov. 1	4th meeting	• Next Generation Low Emission Vehicle Working Group Report (rough draft)
Nov. 29	5th meeting	• Next Generation Low Emission Vehicle Working Group Report (draft)

3. Low Emission Vehicle Working Group

June 7	1st meeting	• Low Emission Vehicle Working Group examination schedule • LEV development and dissemination strategy (draft)
Sept. 17	2nd meeting	• "LEV development and dissemination action plan" • Review of the 2010 CO_2 reduction amount in the transport sector • Progress of LEV development and dissemination due to the "greening" of motor vehicle taxation. • Fiscal 2002 budget requests for LEV development and dissemination (MLIT-related) • Specific measures related to LEV development and dissemination • Diesel vehicle exhaust emission countermeasures • Low Emission Vehicle Working Group schedule
Oct. 17	3rd meeting	• Results of interviews/discussions with related industry organizations • Reduction of CO_2 emissions in the transport sector • Draft report framework • Future schedule of the working group
Nov. 21	4th meeting	• Trends toward a conclusion of the Kyoto Protocol based on results of the COP7 • Low Emission Vehicle Working Group Report (draft)
Dec. 10	5th meeting	• Low Emission Vehicle Working Group Report (draft)

A Low-Emission Vehicle Development and Dissemination Strategy

December 2001

Committee on Comprehensive Strategy for Development and Dissemination of Low Emission Vehicles

Low Emission Vehicle WG

Introduction

Amid a steady increase in motor vehicle ownership and an unabating increase in motor vehicle traffic volumes resulting from it, the impact of motor vehicles on global warming, caused by the emissions of carbon dioxide (CO_2) and other greenhouse gases, and air pollution, a problem which is particularly serious in large metropolitan areas, is still considerable, giving rise to an urgent need for the development and dissemination of low-emission vehicles, which are environmentally friendly in terms of both fuel efficiency and exhaust emission performance. Against this background, the Ministry of Land, Infrastructure and Transport set up the Committee on a Comprehensive Strategy for the Development and Dissemination of Low Emission Vehicles in May 2001, and has been investigating strategies for the development and dissemination of low-emission vehicles and development of next-generation low-emission vehicles through its Low Emission Vehicle WG and Next Generation Low Emission Vehicle WG.

1. Emergency Recommendations of Comprehensive Strategy Committee

Around the same time, the Government announced its policy to "gradually replace its motor vehicle fleets with low emission vehicles" through the Prime Minister's keynote speech.

In light of the recent amendment of the Automobile NOx Law and urgency of air pollution and other environmental problems in large metropolitan areas, the strategy committee recommended the intensive short-time-frame introduction of compressed natural gas (CNG) buses and trucks for large metropolitan areas and the development of diesel-alternative next-generation low-emission vehicles as near-future policy measures on July 4, 2001, and these recommendations were reflected in the preparation of the 2002 draft budget and other processes.

2. Action Plan for Development and Dissemination of Low Emission Vehicles

On July 11, the Ministry of Land, Infrastructure and Transport, the Ministry of Economy, Trade and Industry and the Ministry of the Environment adopted an Action Plan for the Development and Dissemination of Low Emission Vehicles. By doing so, they provided a clear-cut definition of low-emission vehicles[*1] (see 1) to 5) below) and set a dissemination target of "at least 10 million units by the earliest possible time before 2010," as well as agreeing to implement policy measures geared towards their development and dissemination through a concerted effort.

The development and dissemination of low-emission vehicles constitutes an area where all ministries concerned need to cooperate, and for this reason, it is necessary to strengthen

the ministerial cooperation structure in relation to the implementation of the action plan and other issues in the future[*2].

1) CNG vehicles
2) Electric vehicles
3) Hybrid-engine vehicles
4) Methanol vehicles
5) Certified fuel-efficient low-emission vehicles (hereinafter referred to as "low-emission gasoline vehicles")[*3]

*1 The scope of "low-emission vehicles" is the same as that of vehicles eligible for a tax concession under the green automobile tax scheme.

*2 Next-generation low-emission vehicles, such as fuel-cell vehicles, are to be investigated through the Next Generation Low Emission Vehicle WG.

*3 These are certified low-emission vehicles under the Low Emission Vehicle Certification Implementation Guidelines that also satisfy the fuel efficiency standards based on the Law concerning the Rationalization of Energy Use (hereinafter referred to as "Energy Conservation Law") — the so-called "top runner standards."

3. Moves geared towards Ratification of Kyoto Protocol

At COP7, held from October to November 2001, an agreement was reached on the details of the implementation rules for the Kyoto Protocol, adopted in December 1997, thus more or less putting in place an environment suitable for bringing it into force by the end of 2002.

On the heels of this, Japan decided to review the Climate Change Policy Program at a November 12 meeting of the Global Warming Prevention Headquarters, which is headed by the Prime Minister, with a view to ratifying the protocol by the end of 2002 and to put the preparatory work into full swing.

Eighty-eight percent of all CO_2 emissions from the transportation sector are attributable to motor vehicles, and private cars are responsible for 64% of this. From the viewpoint of reducing CO_2 emissions from motor vehicles while making the most of the convenience of an "automobile society," it is an important policy goal to reduce the environmental load of individual vehicles through the development and dissemination of low-emission vehicles, and the ratification of the Kyoto Protocol will make it even more so.

In response to these developments, the Low Emission Vehicle WG has finalized its views on a strategy for the development and dissemination of low-emission vehicles that are already at the practical application stage as shown below, by taking into consideration both the mitigation of global warming and reduction of air pollution, centering on large metropolitan areas.

Chapter 1 Necessity of Anti-Global Warming and Air Pollution Control Measures involving Motor Vehicles

When investigating a low emission vehicle development and dissemination strategy, the following points need to be considered:

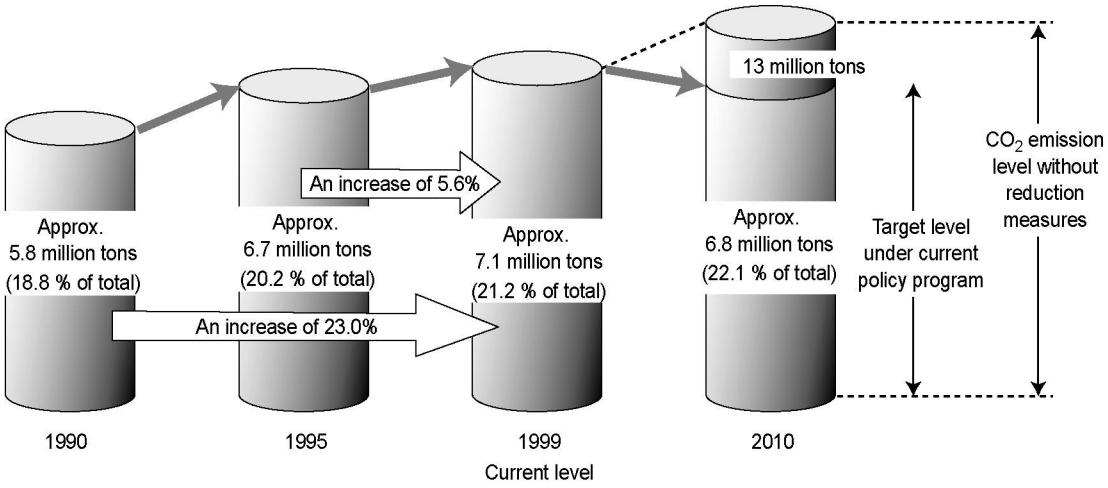
1. State of Global Warming

CO_2 emissions from the transportation sector rose significantly over the 1990s, posting a rate of increase of about 23% from 1990 to 1999 and about 6% from 1995 to 1999.

The biggest contributing factor was an increase in the traffic volume of motor vehicles, particularly private cars (40% from 1990 to 1999), leading to a dramatic 35% increase in CO_2 emissions from private cars.

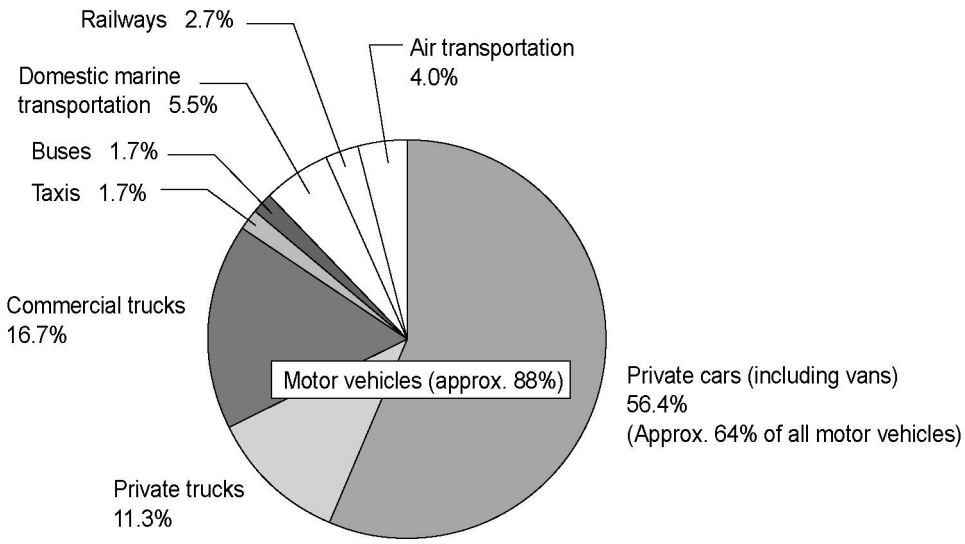
In recent years, motor vehicles have been undergoing an increase in body size (trend towards heavier vehicles) due to, among other things, user preference for luxury cars and recreational vehicles (RVs) and standard changes for light motor vehicles prompted by safety and other considerations. As a result, their average fuel efficiency only improved by about 7% from 1995 to 1999, instead of about 17% as estimated previously on the assumption that vehicle type mix would remain the same.

Trend of CO_2 Emissions from Transportation Sector (Carbon Equivalent)

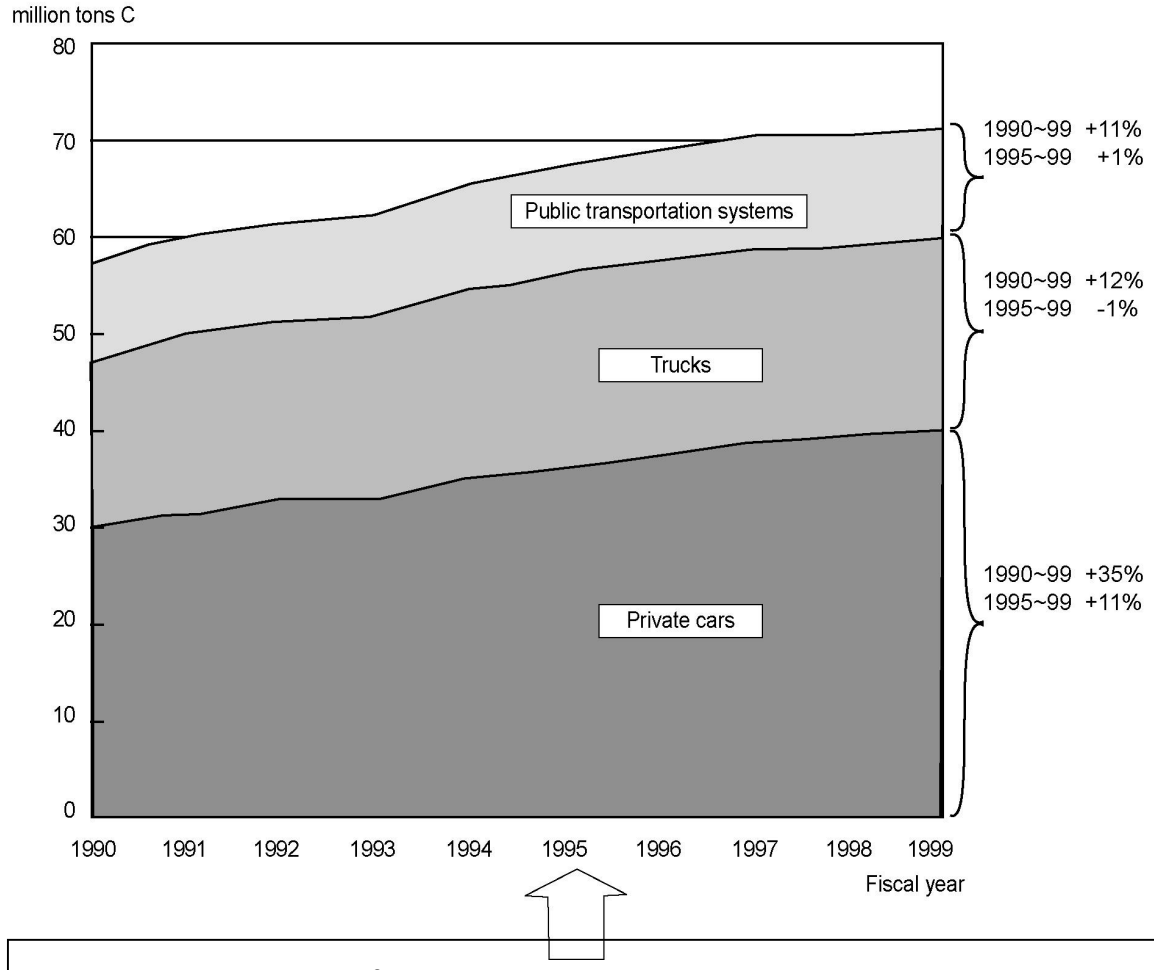


Note: The level of CO_2 emissions for each year shown is based on the 2001 emissions inventory submitted to the UNFCCC Secretariat. As the inventory has been compiled through a fresh review of various factors, the figures do not agree with those released in the past.

Breakdown of c Emissions by Mode of Transportation (FY 1999)



Trends in CO_2 Emissions from Transportation Sector (Carbon Equivalent)



1) Increases in number of units - private cars

1990–99 34.89 million → 50.97 million (+46%)

1995–99 44.81 million → 50.97 million (+14%)

2) Increases in travel distance - private cars

1990–99 346.2 billion km → 485.1 km (+40%)

1995–99 428.4 billion km → 485.1 km (+13%)

3) Increases in vehicle size (trend towards heavier vehicles) — share of regular-size gasoline-fueled passenger cars with an engine displacement of more than 2000 cc, including both private cars and commercial vehicles

1990–99 6% → 19%

1995–99 14% → 19%

Note: Share of regular-size vehicles 1990–99 6% → 26%

1995–99 18% → 26%

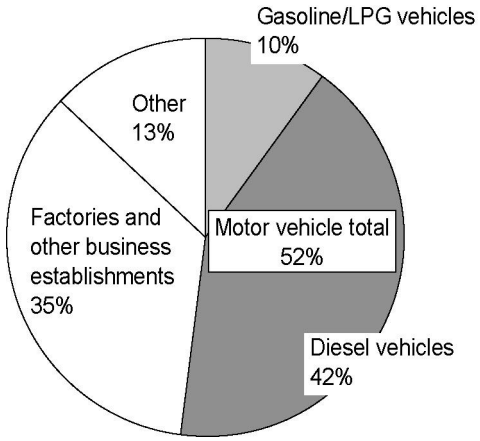
Source: Ministry of Land, Infrastructure and Transport and Japan Automobile Manufacturers Association

2. State of Air Pollution in Large Metropolitan Areas

Motor vehicles are responsible for 52% of nitrogen oxide (NOx) emissions and 43% of particulate matter (PM) emissions occurring in large metropolitan areas, with about 80% of the NOx emissions and all of the PM emissions attributed to diesel vehicles.

As a result of a series of regulatory tightenings, NOx and PM emissions from heavy diesel trucks that meet the latest control standards have fallen by 15% and 70%, respectively, compared to 1989 levels, and the environmental quality standard achievement rate has been improving as a long-term trend. Nevertheless, the problem remains amid ever increasing motor vehicle traffic volumes.

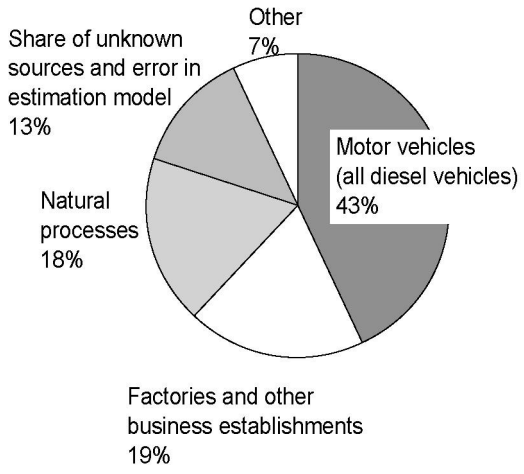
Breakdown by Source of Nitrogen Oxide Emissions in Specified Areas under Automobile NOx Law (FY 1997)



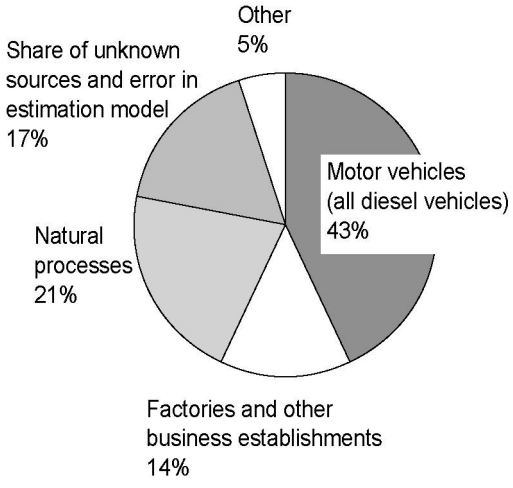
Compiled from the Report of the Discussion Group on Area-wide Motor Vehicle NOx Emission Reduction Measures (March 2000)

Contribution to Atmospheric Particulate Matter Concentration in Kanto and Kansai Regions by Source

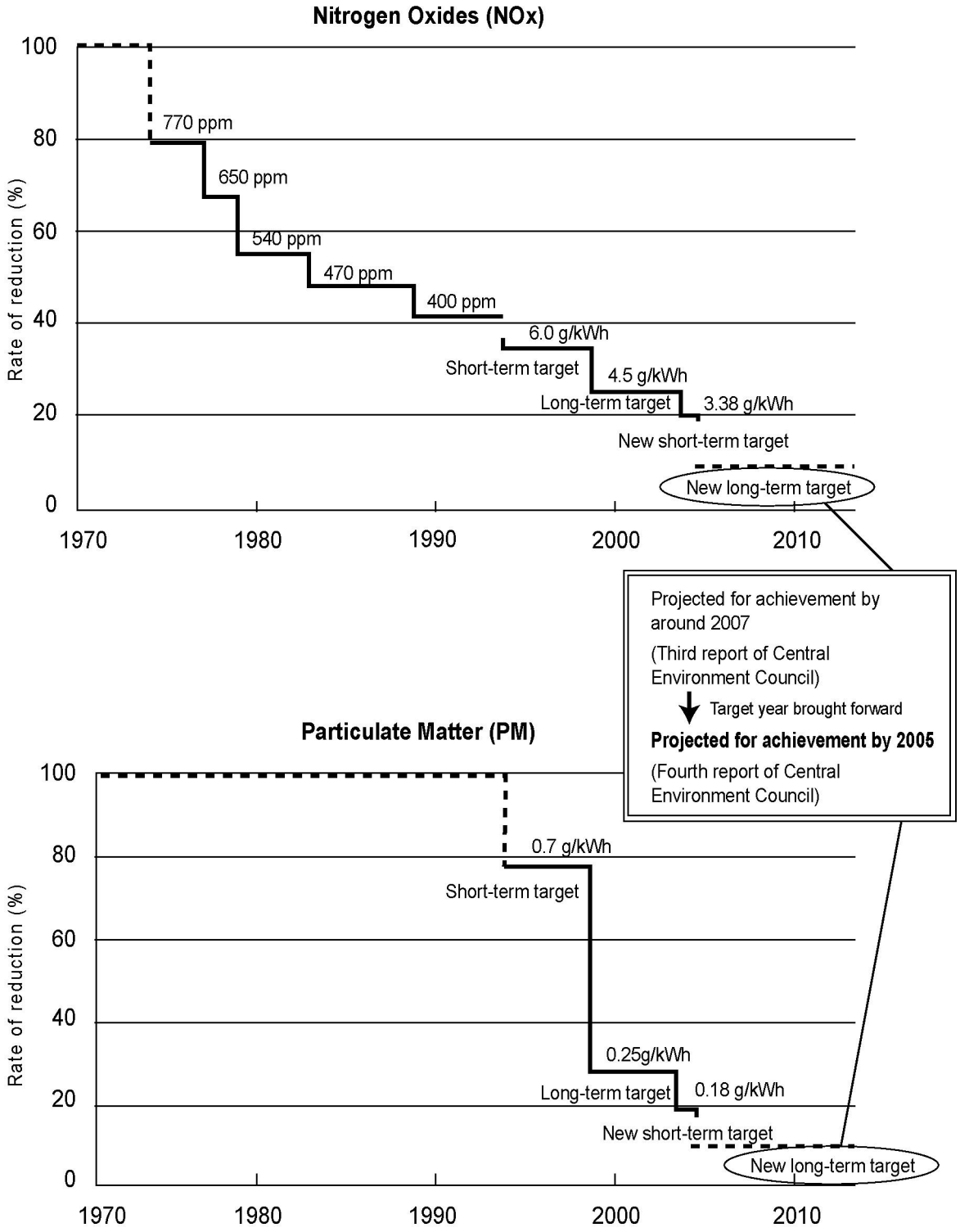
Average of Measurements from Automobile Exhaust Monitoring Stations in Kanto Region, FY 1994



Average of Measurements from Automobile Exhaust Monitoring Stations in Kansai Region, FY 1994



Trends in Diesel Vehicle Exhaust Emission Control Standards (Example of Heavy Trucks)



* Emission levels under the no-control-measures-taken scenario are estimates.

* The method of NOx emission control was changed from concentration-based control (ppm) to weight-based control(g/kWh) in 1994.

* The new long-term control target has been specified as about half the old short-term control target by the third report of the Central Environment Council.

According to the FY 2000 record for the achievement of environmental quality standards for nitrogen dioxide (NO_2), non-achieving air pollution monitoring stations were mostly distributed in Chiba, Tokyo, Kanagawa and Osaka Prefectures, while non-achieving automobile exhaust monitoring stations were often found in Hokkaido, Aichi, Mie, Kyoto and five other prefectures, in addition to the existing specified areas under the Automobile NOx Law. The achievement rate for automobile exhaust monitoring stations in the specified areas under the Automobile NOx Law as a whole reached 33.3% in FY 1996, and remained in the 30s until FY 1998 (35.7%). After this, it rose to 59.1% in FY 1999 and 62.8% in FY 2000. Although the improvement has been substantial, pollution is still severe. Areas where high atmospheric NO_2 concentrations were observed were concentrated in the Kanto and Kansai regions.

Regarding suspended particulate matter (SPM), the achievement rate among air pollution monitoring stations in specified areas under the Automobile NOx Law as a whole was 30.6% in FY 1996, and remained around 30% in subsequent years. More recently, it has shown marked improvements, rising to 74.9% in FY 1999 and 85.5% in FY 2000. The achievement rate has been lower with automobile exhaust monitoring stations as follows: 16.7% in FY 1996, 63.4% in FY 1999 and 52.0% in FY 2000.

3. Spread of Low-Emission Vehicle Use

The number of CNG vehicles, electric vehicles, hybrid-engine vehicles and methanol vehicles (hereinafter referred to as “CNG vehicles, etc.”) in use is about 60,000 as of the end of FY 2000, and this represents a remarkable sevenfold or so improvement over some 9000 recorded at the end of FY 1997, the immediate aftermath of the adoption of the Kyoto Protocol.

The number of low emission vehicles in use as of the end of FY 2000 is about 630,000, of which 570,000 are low-emission gasoline vehicles (excluding light motor vehicles).

However, they only account for about 1% of the total motor vehicle ownership registration*, and hopes are pinned on a surge in their use in the future.

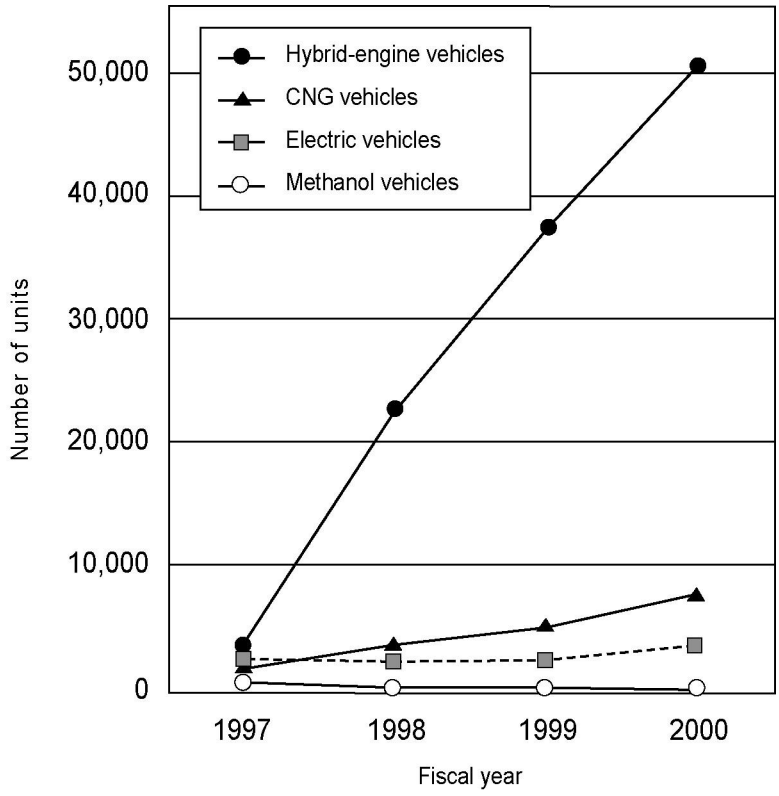
* Excluding light motor vehicles, light motorcycles, etc.

Number of Low-Emission Vehicles in Use in Japan
(Excluding Low-Emission Gasoline Vehicles)

(in units, as of end of fiscal year)

Type	1997	1998	1999	2000
Hybrid-engine vehicles	3,428	22,503	37,168	50,566
CNG vehicles	2,093	3,640	5,252	7,811
Electric vehicles	2,500	2,400	2,600	3,830
Methanol vehicles	328	297	234	176
Total	8,349	28,840	45,254	62,383

(Approximate figures)



Source: Ministry of Land, Infrastructure and Transport

Chapter 2 Basic Strategy for Reduction of CO2 Emissions from Transportation Sector and Direction of Development/Dissemination of Low-Emissions Vehicles

1. Basic Strategy for Reduction of CO_2 Emissions from Transportation Sector

(General direction)

Since the transportation sector forms a basis for people's daily lives and the nation's economic activities, it is desirable that measures aimed directly at restricting traffic volumes, etc. as a means of reducing CO_2 emissions be avoided as much as possible as their adverse impacts are likely to exceed their CO_2 emission reduction benefits.

Taking into consideration the recent advances in the "automobile society", a reduction in CO_2 emissions from the transportation sector needs to be achieved by implementing measures such as the reduction of the environmental load of individual motor vehicles and improvement of motor vehicle travel conditions through congestion reduction and other traffic flow improvement methods focusing on private cars, while making the most of the convenience of the "automobile society". It is also appropriate to pursue the curbing of motor vehicle traffic volumes, etc. by guiding passenger traffic towards public transportation systems, which have a lower environmental load, and improving the efficiency of physical distribution through a modal shift to rail and marine transportation.

(Concrete techniques)

Based on the above general direction, the reduction of CO_2 emissions in the transportation sector should be pursued through concrete techniques as described below, with concrete reduction targets set for each measure as part of the efforts geared towards the ratification of the Kyoto Protocol. The implementation of such measures is premised on steady progress in the development of road networks, elimination of traffic bottlenecks, improvement of road structures, and the like.

(1) To minimize the adverse impact on people's daily lives and the nation's economic activities, it is appropriate to focus on CO_2 emission reduction measures based on voluntary efforts, tax and other incentives and the introduction of new technologies, while avoiding the introduction of restrictive techniques as much as possible.

(2) The key to reducing CO2 emissions from the transportation sector rests with measures aimed at motor vehicles, which are responsible for nearly 90% of these emissions and show no sign of slowing down, particularly private cars, which account for about 64% of that.

The development and dissemination of low-emission vehicles has the potential to reduce CO_2 emissions from motor vehicles without imposing excessive burdens or restrictions on motor vehicle users, and could lead to an improvement in the competitiveness of Japanese industry by stimulating technological development. For these reasons, it should be identified as the main pillar of CO_2 emission reduction measures in the transportation sector.

(3) Alongside CO_2 emission reduction measures aimed at individual motor vehicles, it is important to introduce those targeting their use based on, among other things, the improvement of traffic flow, including curbs on motor vehicle traffic volume, road development, the introduction of ITS, elimination of bottleneck grade crossings, crackdowns on illegal parking, shortening of the duration of road construction work and the optimization of traffic signal control. It is also necessary to develop a system of transportation that is efficient and does not incur a large environmental load on a nationwide basis.

2. Targets for CO_2 Emission Reduction based on Development and Dissemination of Low-Emission Vehicles

(1) Widespread use of low-emission vehicles

Efforts should be made to raise the number of low emission vehicles in use to at least 10 million at the earliest possible time before FY 2010 based on the Low-Emission Vehicle Development and Dissemination Action Plan.

When conducting a review of the Climate Change Policy Program geared towards the ratification of the Kyoto Protocol, CO_2 emission reduction targets should be set by bringing forward the target deadlines for the spread of low-emission vehicle use as much as possible on the basis of manufacturers' and users' voluntary efforts and the provision of incentives and other government assistance at both national and local levels, with due regard given to the demands for exhaust control and safety measures.

(2) Improvement of fuel efficiency

When formulating a new Climate Change Policy Program, CO_2 emission reduction targets for gasoline vehicles should be set on the basis of an early supply of high-fuel efficiency vehicles, which could bring forward the target deadline for the achievement of fuel efficiency standards under the Energy Conservation Law, and the active promotion of the development and dissemination of vehicle types with superior fuel efficiency.

In light of the fact that the FY 2010 fuel efficiency standards are very strict control standards, further improvements in fuel efficiency should be treated as a goal to be

pursued through technological development, so that the strengthening of fuel efficiency control should be made conditional on a reasonable prospect for technological progress.

(3) Approach to achieving targets

Regarding the reduction of CO_2 emissions from the motor vehicle sector, it is desirable to set targets on the basis of (1) and (2) above for the time being. However, if a situation arises where (1) and (2) alone are not expected to be sufficient to set substantial reduction targets, the introduction of measures aimed at guiding potential buyers towards small-size (low-weight) vehicles and high-fuel efficiency vehicles and the like should be investigated.

3. Establishment of Monitoring and Evaluation System for Achievement of CO_2 Emission Reduction Targets and Policy Review Cycle

The Kyoto Protocol does not require that all CO_2 emission reduction measures to be taken in the lead up to and during the first commitment period (2008-2012) be finalized prior to its ratification. Rather, it allows the introduction of additional measures as necessary in light of the progress in the reduction of CO_2 emissions. The period between 2005 and 2007 has been set aside for monitoring purposes, and it is necessary to conduct a policy evaluation during that period, with a review of policy measures also undertaken if necessary.

In the event that CO_2 emission increases attributable to the performance of individual motor vehicles cannot be contained even after the ratification of the Kyoto Protocol, measures such as the inducement of consumers to purchase small-size (low-weight) vehicles and high fuel efficiency vehicles and a review of fuel efficiency standards will have to be introduced, taking into consideration monitoring results, technological development trends on the development and dissemination of low-emission vehicles and other factors.

Chapter 3 Recommendations on Concrete Measures for Development and Dissemination of Low-Emission Vehicles

1. Low-Emission Vehicle Development Promotion Measures

The working group has investigated the direction of the development of low-emission vehicles for the period up to about FY 2010 in terms of both exhaust emissions and fuel efficiency.

It is appropriate that the improvement of fuel efficiency and exhaust emission performance via the development and dissemination of low-emission vehicles be pursued through the provision of incentives, such as the utilization of a green automobile tax scheme, on the basis of voluntary efforts such as motor vehicle manufacturers' corporate efforts towards technological development.

Given that the last few rounds of fuel efficiency control tightenings have been instrumental in accelerating the development of low-emission vehicles in terms of fuel efficiency improvement, it is necessary to look further into this aspect by aiming towards the achievement of fuel efficiency standards that will exceed the FY 2010 fuel efficiency control standards, with a technological development promotion perspective and technological development trends taken into consideration. It is also necessary to advance technological development geared towards a further improvement in exhaust emission performance.

To speed up effective technological development, it is necessary to implement strategic measures in relation to the following:

(1) Overall strategy

1) Clarification of national policy direction

Generally speaking, technological development for a low-emission vehicle requires a long lead time and vast capital investment. For this reason, a firm national policy direction needs to be shown from the earliest possible time in terms of the evaluation of technologies, goals of technological development and the like so as to facilitate technological development by private enterprises.

Example: Clear specification of the level of improvement needed to be achieved in the exhaust emission standards of diesel (passenger) vehicles, which have a superior fuel efficiency, for these vehicles to become a target for government promotion of widespread use.

Technological development is primarily a matter to be pursued by manufacturers based on their management decisions as private enterprises. On the other hand, it is appropriate that the Government provide incentives for development by playing support roles such as the establishment of development targets, development of a suitable environment for the smooth implementation of public road tests, formulation of guidelines on research directions and establishment of a forum to enable companies to exchange information as far as is possible.

However, the Government should play a more active role in areas where there is little hope for adequate progress in research and development if left entirely to private enterprises due to a small demand, etc.

2) Promotion and assistance for technological development based on green automobile tax scheme

One of the purposes of the green automobile tax scheme is to spur manufacturers' efforts towards the development of low-emission vehicles by, among other things, characterizing low-emission vehicles as desired by the Government and encouraging concentrated capital investment in those areas.

Although the low-emission vehicle coverage of the green automobile tax scheme expanded from 79 types in December 2000 to 146 types at the end of September 2001 (an 85% increase), it is still desirable that incentive measures based on the tax scheme be enhanced to achieve dramatic progress in the development and dissemination of low-emission vehicles, with any necessary review of the details of the scheme undertaken by taking into consideration technological development trends.

3) Balanced exhaust emission performance and fuel efficiency improvement

There is a trade-off relationship between exhaust emission performance and fuel efficiency, so that an attempt to improve one tends to make it difficult to improve the other. For this reason, it is appropriate to pursue the improvement of exhaust emission performance and fuel efficiency while ensuring a balance between them by taking into consideration the characteristics of different vehicle types.

Examples A. An increase in the engine air-fuel ratio geared towards improving fuel efficiency would result in an increase in NOx emissions.

B. To control exhaust emissions effectively, it is necessary to remove sulfur and other substances that have been absorbed by the catalyst to prevent its performance from degrading, but this would worsen fuel efficiency due to the need for a greater fuel intake.

Although diesel vehicles naturally have superior fuel efficiency, the improvement of their exhaust emission performance remains an urgent task. It is therefore necessary to continue implementing measures that focus on the improvement of exhaust emission performance.

However, with gasoline vehicles, for which past technological innovations have led to quite high exhaust emission performance, it is appropriate to ensure that any future tightening of exhaust emission control will not interfere with further improvements in fuel efficiency from the viewpoint of simultaneously pursuing CO_2 emission reduction.

4) Improvements in fuel quality as basis of improvement of exhaust emission performance and fuel efficiency

Compliance with FY 2010 fuel efficiency standards for gasoline vehicles and further improvements in fuel efficiency will require improvements in fuel quality to reduce the combustion energy necessary to prevent catalyst performance degradation, and in that manner, exhaust emission performance improvement and fuel efficiency improvement, which are mutually exclusive, can be simultaneously achieved.

To dramatically reduce exhaust emissions from diesel vehicles, the supply of low-sulfur gas oil is essential. From this viewpoint, a decision has been made to start supplying low-sulfur gas oil with a sulfur concentration of 50 ppm or less, instead of the traditional 500 ppm or less, in large metropolitan areas by 2003.

In Europe, however, efforts to improve fuel characteristics even further towards developing zero sulfur fuels (gasoline, gas oil, etc. with a sulfur content of less than 10 ppm) are already under way.

To achieve a dramatic improvement in fuel efficiency and exhaust emission standards in Japan, therefore, it is desirable to step up existing efforts to reduce fuel sulfur content and announce the details of medium to long-term fuel quality improvement measures in advance, with the development of low-emission vehicles undertaken on that basis.

Along with the improvement of fuel quality, it is also necessary to investigate the feasibility of imposing a mandatory use of “fuel with a specified quality level or superior” on motor vehicle users as a safety and environmental protection measure with a so-called “illegal gas oil control” perspective.

5) Life cycle assessment

Technological development not only improves the environmental performance of motor vehicles but also contribute to a reduction in energy consumption and CO_2 emissions in the production stage, so that it must be identified and assessed as a total environmental

protection measure that encompasses the entire product life cycle, including recycling, based on the life cycle assessment (LCA) concept, rather than just a CO2 emission reduction measure.

(2) Strategy for diesel vehicles and diesel-alternative low-emission vehicles

1) Tightening of exhaust emission control for diesel vehicles (new vehicles)

Exhaust emission control for diesel vehicles (new vehicles) has been gradually strengthened since 1973, with NOx, CO, HC and black smoke targeted initially and PM added in 1994.

Control for diesel vehicles will be strengthened through the implementation of a new short-term control program (2002, 2003, 2004 and 2005), with the introduction of a new long-term control program to be brought forward by two years (2007 → 2005). Beyond the new long-term control regime, further strengthening of control should be investigated by taking into account progress in the achievement of environmental quality standards, developmental trends in technologies capable of achieving extremely low exhaust emissions and other factors.

In addition, a reduction in the sulfur content of gas oil (500 ppm → 50 ppm) should be introduced by the end of 2004.

2) Implementation of measures based on Automobile NOx/PM Law

With regard to nitrogen oxide air pollution, centering on large metropolitan areas, despite the range of measures that have been implemented - including emission control targeting factories and other fixed sources and motor vehicles, as well as control based on special emission standards established under the Automobile NOx Law (1992), i.e. vehicle type control, in which the use of vehicles belonging to any type that does not comply with NOx emission standards is restricted - the achievement of the environmental quality standards for NO2 air pollution by the year 2000, as has been targeted previously, now appears difficult.

The situation surrounding SPM air pollution also remains severe, and this has resulted in a need for additional measures targeting emissions from diesel vehicles. Against this background, the Automobile NOx Law has been amended as shown below, and efficient PM emission reduction measures need to be implemented based on the new law.

A Addition of PM as a pollutant targeted for control

B Expansion of areas targeted for control

C Strengthening of motor vehicle exhaust emission control (introduction of vehicle type control for PM, tightening of vehicle type control for other pollutants, and tightening of control measures aimed at businesses)

3) Development and dissemination of DPFs, oxidation catalysts, etc.

PM emissions from existing diesel vehicles need to be reduced by accelerating the development and dissemination of DPFs, oxidation catalysts, etc. designed to be fitted onto relatively new vehicles.

2. Low-Emission Vehicle Popularization Measures

To spread the use of low-emission vehicles at a faster rate, it is necessary to introduce more flexible popularization measures tailored to the needs of motor vehicle users and ensure accurate information supply, while developing a fuel supply infrastructure in a systematic manner, in addition to implementing existing measures geared towards vehicle price reductions and tax breaks.

It is appropriate to promote the use of low-emission vehicles in a manner that is in line with local characteristics and needs by, for example, emphasizing both air pollution control and fuel efficiency improvement in large metropolitan areas and focusing more on fuel efficiency in regional areas.

(1) Administrative and financial assistance measures

To promote the use of low-emission vehicles, it is necessary for the public sector, including the National Government, to take the lead in their introduction, utilize the green automobile tax scheme and boost budgetary and financial assistance measures aimed at encouraging the introduction of low-emission vehicles by private businesses and others.

(2) Implementation of promotion measures tailored to users

It is appropriate to promote the use of low-emission vehicles by introducing two sets of policy measures, one aimed at vehicles to be mainly used by individuals and the other at government, company and commercial vehicles (hereinafter referred to as “commercial vehicles, etc.”).

1) Systematic introduction of low-emission commercial vehicles, etc.

As local governments and businesses own commercial vehicles, etc. in large numbers, this sector is ideal for the systematic mass introduction of low-emission vehicles. In this regard, it is appropriate to foster a concerted effort by the public and private sectors

through, for example, national government purchases under the Green Purchasing Law, similar initiatives by local governments and systematic actions by private businesses.

In this regard, it is necessary to communicate the benefits of the introduction of low-emission vehicles, such as a reduction in fuel costs and discharge of corporate social responsibility through a contribution to the fight against environmental problems, to all parties concerned, particularly in view of the high initial economic cost to private businesses. At the same time, the National Government needs to take the lead in bolstering public education and awareness activities through, for example, the supply of accurate information on the types, performance levels, etc. of low-emission vehicles, including low-emission gasoline vehicles.

2) Promotion of introduction of low-emission vehicles for private use

With private users, measures designed to induce the selection of low-emission vehicles are considered effective, and the provision of incentives, such as tax breaks under the green automobile tax scheme, is a concrete example.

The effectiveness of the green automobile tax scheme, which was introduced in FY 2001, is apparent from the fact that the most widespread low-emission vehicles are those eligible for the tax scheme. Therefore, its active utilization as an effective low-emission vehicle popularization technique needs to continue in the future to facilitate the introduction of cutting-edge vehicle types for their superior environmental performance.

Public education activities need to be enhanced to improve user awareness of environmental problems.

(3) Reduction of prices (net economic burden on users)

To spread the use of low-emission vehicles, it is necessary to ensure that their prices, particularly those of hybrid-engine vehicles and CNG vehicles, are not set at excessively high levels relative to comparable gasoline or diesel vehicles. For this reason, it is necessary to actively utilize the tax breaks under the green automobile tax scheme, introduced in FY 2001, in promoting the purchase of low-emission vehicles to reduce the net economic burden on users, in addition to pursuing price reductions through the economies of scale, which would result from the popularization of these vehicles.

(4) Deregulation, etc. geared towards CNG vehicle price reductions

In some European countries, CNG vehicles that are only about 10% more expensive than comparable diesel vehicles are available. However, the prices of CNG vehicles are still high in Japan, ranging from 1.4 to 2 times those of comparable diesel vehicles in the case of small to medium-size trucks, though they have been falling.

To spread the use of CNG vehicles in large metropolitan areas, etc. at a faster rate, it is necessary to narrow the price gap with diesel vehicles in the future. To this end, it is necessary to reduce prices through: 1) pursuit of the economies of scale made possible by greater popularization, 2) relaxation of restrictions based on the High-pressure Gas Safety Law, and 3) promotion of the importation of overseas CNG vehicles via the international harmonization of CNG vehicle standards.

(5) Development of CNG refueling infrastructure

Of all low-emission vehicles, CNG vehicles require the development of a CNG refueling infrastructure (CNG stations) as a precondition for their widespread use. However, there are only 145 CNG stations throughout the country (as of the end of October 2001), a mere two-fifths of the level achieved in Italy (355 as of August 2001, scheduled to be raised to around 600), where 370,000 units of CNG vehicles are in use. For this reason, it is necessary to build as many CNG stations as possible in large metropolitan areas, which are the target of future selective popularization drives, as well as along arterial roads.

For CNG stations to be profitable, however, certain numbers of users must be secured, and this could add to the challenge of developing a CNG refueling infrastructure. It is therefore desirable that a relaxation of the regulatory restrictions, the rationalization of the operation of CNG stations and other measures designed to make it easier to select appropriate facility sizes and site locations be explored, as well as continuing with the utilization of existing assistance schemes. In addition, it is appropriate to investigate a review of regulations relating to staffing and safety, including the approval of self-serving CNG stations.

(6) Popularization of electric vehicles

Electric vehicles are free from exhaust emissions, including CO_2, and are therefore ideal in terms of environmental performance. However, they have their own setbacks, such as a limited power output, limited mileage between charges and long recharging time. For this reason, it is appropriate to promote their use in short-distance passenger transportation in urban areas and other selected areas where the advantages of electric vehicles can be fully utilized.

Chapter 4 Other Issues — Implementation of Policy Measures with Great Relevance to Development and Dissemination of Low-Emission Vehicles

1. Need for Acceptance of LPG Vehicles as Low-Emission Vehicles

Although liquefied petroleum gas (LPG) vehicles were traditionally not treated as low-emission vehicles, some LPG vehicles now stand shoulder to shoulder with low-emission vehicles in terms of both exhaust emission performance and fuel efficiency.

Such LPG vehicles should therefore be accepted as low-emission vehicles by establishing fuel efficiency standards under the Energy Conservation Law as soon as possible, with appropriate popularization measures, including eligibility for the green automobile tax scheme and the green purchasing program.

2. Introduction of Motor Vehicle Environmental Impact Assessment

So far, the improvement of motor vehicle fuel efficiency and exhaust emissions has been pursued mainly through control measures targeting new vehicles. However, to further reduce NOx and PM emissions, it is necessary to adopt a different approach based on the ascertainment of the quantities of exhaust gas actually emitted from motor vehicles during their use and other measures that reflect the actual behavior of motor vehicles in normal use.

From this point of view, it is necessary to investigate the introduction of “motor vehicle environmental impact assessment” as a tool to evaluate the environmental load of motor vehicles in their life cycles as soon as possible, with the announcement of environmental performance for each vehicle type, evaluation of environment-related parts, such as tires with a low rolling resistance, and the like undertaken.

3. Introduction of Mandatory Speed Limiters and their Utilization for Improved of Fuel Efficiency

Speed limiters, which are to be made mandatory for large trucks, need to be steadily introduced as they are able to cut CO_2 emissions by 10–20% through improved fuel efficiency by keeping the traveling speeds of motor vehicles at 90 km/h or below on expressways.

4. Popularization of Idling Stop System

The mounting of an idling stop system on passenger cars is estimated to achieve a substantial improvement in on-road fuel efficiency, ranging from 5 to 15% depending on travel conditions.

For this reason, it is desirable that idling stop systems be further spread among large buses and trucks (includes automatic models), where substantial inroads have already been made.

In the area of passenger cars, it is desirable that efforts be made to popularize idling stop systems for hybrid-engine vehicles and manual transmission vehicles, which are already more or less technically established, by giving due regard to safety and smooth traffic flow, with the necessary technological development undertaken with regard to automatic transmission vehicles.

5. Promotion of "Green Management" in Road Transportation Industries, etc.

It is desirable that green management, centering on 1) active introduction of low-emission vehicles and diesel vehicles compliant with the latest control standards, 2) observance of eco-driving and 3) adequate vehicle maintenance, be practiced in the truck, bus, taxi and other road transportation industries as a private-sector voluntary effort.

Regarding green management in the road transportation industries, it is appropriate to investigate the introduction of a third-party certification system through the cooperation of environmental organizations/experts and relevant industrial groups.

The environmentally-friendly use of motor vehicles based on, for example, the exercising of self-restraint with regard to private car commuting and the driving home of company cars in urban areas, where public transportation systems are available, and practicing of eco-driving, is required at all companies, including those in the road transportation industries.

6. Promotion of Voluntary Efforts by Private Car Users

Of all CO_2 emission reduction measures, those aimed at private cars are particularly important, as there are so many in use, and this gives rise to the important question of how voluntary efforts leading to an overhaul of their utilization mode can be induced.

It is appropriate to promote motor vehicle use with a low environmental load, including car sharing and carpooling, as well as educating the general public on the fuel saving and CO_2 emission reduction effects of eco-driving by discussing private car use in eco-household account books.

In this regard, it is necessary to investigate institutional frameworks for car sharing, etc., with their legal status in relation to existing systems, such as the rent-a-car business, clarified.

7. Improvement of Motor Vehicle Travel Conditions through Traffic Streamlining Methods

Enabling efficient motor vehicle travel through the elimination of traffic bottlenecks, etc. is a priority consideration in the development of transportation infrastructure, including roads and traffic signals, while the implementation of some “software-side” measures, such as the optimization of traffic signal control and elimination of illegal parking, is desired for its expected immediate benefits.

8. Curbing of Motor Vehicle Traffic through Streamlining of Physical Distribution via Modal Shift, etc.

To streamline physical distribution through a modal shift to rail and marine transportation, it is necessary to make such alternative modes of transportation easier to use, and for this to happen, government support for the boosting of transportation capacities, shortening of transportation time, streamlining stevedoring, etc. and cargo owner understanding and cooperation on modal shift are essential.

To effectively carry out the streamlining of physical distribution, it is necessary to devise measures along those lines and actively implement them.

Basic Strategy for Promoting the Development of Next-generation Low Emission Vehicles

December 2001

Next Generation Low Emission Vehicle Working Group

Committee on Comprehensive Strategy for the Development and Dissemination of Low Emission Vehicles

Introduction

The Japanese government is promoting a range of measures aimed at solving the problem of air pollution in the major urban areas, and achieving the CO_2 emission reduction targets set for the transport sector to meet the greenhouse gas reduction targets adopted by the Kyoto Protocol. These measures include toughening motor vehicle emission controls, improving motor vehicle fuel efficiency, promoting the greater use of LEVs, improving traffic flow, enhancing distribution efficiency, and encouraging the use of public transport.

Measures such as these, though, are not enough. To solve the problem of air pollution caused by motor vehicle emissions, and preserve the global environment so we can pass on an environment in which future generations can live in comfort, the government must also promote the development and commercialization of next-generation LEVs with zero or almost zero exhaust emissions and that cut CO_2 emissions drastically, and create a climate that facilitates the full-scale adoption and use of such vehicles.

It is therefore critical to find solutions to the technological challenges presented by next-generation vehicles so they can be running on our roads as soon as possible, and examine effective measures to this end.

To tackle these issues, the government established the Committee on Comprehensive Strategy for the Development and Dissemination of Low Emission Vehicles. The Next Generation Low Emission Vehicle Working Group set up within the Committee has been evaluating the various types of next-generation LEVs, and examining their fields of application, exhaust emission and other development targets, and policies for addressing development issues.

This report puts forward basic strategies for promoting the development of next-generation LEVs based on the results of these extensive evaluations and examinations.

The Low Emission Vehicle Working Group was also established under the Committee, and its role has been to examine strategies for the development and dissemination of LEVs currently at the practical use stage.

The term next-generation LEV referred to here indicates vehicles that deliver vastly improved exhaust emission performance and fuel efficiency compared to conventional vehicles through anticipated far-reaching technological breakthroughs from 2010, and not through merely an extension of existing technologies. It is not meant to indicate the use of any specific kind of fuel.

Here, hybrid vehicles, CNG vehicles, electric vehicles, methanol vehicles and certified fuel-efficient or low-emission vehicles currently being used are classified simply as LEVs.

Chapter 1 Environment Surrounding the Development of Next-generation LEVs

1. Air pollution and global warming

(1) Air pollution

Although vehicle emission monitoring stations throughout Japan have been showing steady improvements in the rates at which environmental standards for NO_2 and suspended particulate matter (SPM) have been met over the past few years, the rate is still quite low especially in the major cities (regions specified in the Motor Vehicle NOx and PM Law [1]).

Moreover, with air pollution litigation instituted in Tokyo, Nagoya and Osaka pointing to the liability of the state, air pollution has become a serious social issue.

(2) Global warming

CO_2 emissions from the transport sector accounts for about 20% (fiscal 1998) of Japan's total emission of 324 million tons (carbon equivalent), and of this, 90% is from motor vehicles. Considering substantial increases are expected in the future, more far-reaching measures to control transport-related CO_2 emissions are absolutely crucial.

The Kyoto Protocol adopted by delegates at the COP3 [2] held in December 1997 set greenhouse gas reduction targets for developed countries, and in it, Japan's target was set at a 6% reduction from the 1990 level of overall domestic greenhouse gas emissions by the period 2008–12. To achieve this target, the transport sector has to cut CO_2 emissions to the 1995 level (a reduction of 13 million tons from the amount expected to be emitted in 2010 if no effective countermeasures are enforced).

We must also keep in mind the need for ongoing measures that can bring about further cuts in greenhouse gas emissions beyond that period as well.

(3) Energy resources

World reserves of crude oil as at the end of 2000 were 1,028 billion barrels, and were expected to last 42 years. Japan depends almost entirely on imports for crude oil (99.7% in 1999), so a range of measures including energy conservation and adoption of alternative fuels are essential for Japan's future energy security.

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[1] Special Measures Law Concerning the Reduction of the Total Amount of Nitrogen Oxides and Particulate Matter Emitted by Motor Vehicles in Specified Regions

[2] Third Conference of Parties to the Framework Convention on Climate Change

2. LEV development and dissemination

(1) History of LEV development and dissemination in Japan

Japan was a world leader in introducing emission controls for gasoline vehicles from the latter half of the 1960s, and since then the range of vehicles and substances covered has been expanded while the controls themselves have steadily been made tougher.

The government also introduced a certified low emission vehicle system aimed at promoting the development and dissemination of vehicles with lower levels of exhaust emissions than the latest controls, and the technologies developed under this system have led to the development and dissemination of "super LEVs."

Japan has also long been involved in R&D for vehicles that use alternative fuels and power systems formed from a myriad of technological innovations. Growing demand for more environmentally friendly vehicles has seen the emergence of CNG and hybrid vehicles in the commercial market for passenger cars and other relatively light vehicles, and the development of various new technologies including fuel cell systems and dimethyl ether (DME) engines, though the spread of these vehicles and technologies is still quite limited.

(2) LEV dissemination

At the end of fiscal 2000 there were 570,000 certified fuel-efficient and low-emission vehicles (excluding light vehicles), about 50,000 hybrid vehicles, and a total of about 10,000 other LEVs such as CNG and electric vehicles.

CNG vehicles are mainly commercial vehicles such as city buses and courier vans, while hybrid vehicles are mainly passenger cars. Most certified fuel-efficient and low-emission vehicles are also passenger cars.

Fuel supply facilities for LEVs are on an upward trend. As of the end of November 2001 there were 148 natural gas supply points, 15 methanol supply points, 32 electricity supply points, and 1,865 LPG supply points.

(3) Current state of and future plans for international exhaust emission controls

Compared to the long-term controls currently in force (1997–99 controls), the new short-term controls (planned 2002–04 controls) for diesel vehicles require significant cuts in diesel exhaust emissions; e.g. about a 30% cut in NOx to 3.38 g/kWh and in PM to 0.18 g/kWh for vehicles with a gross weight of more than 3.5 tons. The new long-term controls (2005 controls), which have yet to be firmly set, will aim at reducing NOx by about half and PM by at least half from the levels set in the new short-term controls.

Similarly, new short-term controls (2002–04) are also planned for gasoline vehicles, and new long-term controls will set targets of at least a 50% reduction in the levels in the new short-term controls.

Europe and the U.S. are also planning to tighten controls in phases up to about 2010 through measures such as EURO5 (Europe) and 2007 controls (U.S.).

To date Japan has focused its controls on reducing NOx, while in Europe and the U.S. focus has been on PM, but from now on, Japan too will substantially toughen PM controls so they are generally at the same level as those in Europe and the U.S.

3. Current state of and prospects for next-generation LEV development

(1) Next-generation LEV development

Recent discussions with domestic and overseas vehicle manufacturers reveal almost all are engaged in further R&D and improvements to CNG and hybrid vehicles.

They are also looking into fuel cell vehicles as next-generation LEVs, and some are conducting road evaluations of passenger cars and route buses with a view to their market introduction. There are, however, many problems with fuel cell vehicles that need to be resolved, such as the performance of the fuel cells themselves, so a considerable amount of basic and elemental research still remains.

Few manufacturers have embarked on elemental technology or development research into GTL [3] or DME vehicles, but from the viewpoint of reducing the level of oil dependency and producing cleaner exhaust gases, these technologies show great potential.

(2) Technological issues facing the development and dissemination of next-generation LEVs

Technological issues facing next-generation LEVs include extending vehicle range and improving vehicle endurance and reliability. Reducing parts and vehicle costs is also a key challenge, and as well as incentives through the green tax system, the government must promote common use and mass production of parts by standardizing parts etc., and bringing CNG tank controls into line with international controls.

There are also other issues specific to vehicle types, such as designing smaller and lighter systems, reducing recharging times, and developing control systems.

[3] Gas to liquid; Liquid composite fuel made from natural gas etc.

(3) Prospects for next-generation LEV development

Discussions with manufacturers indicated that R&D aimed at further expanding the range of CNG and hybrid vehicle types being sold will continue, and the broad expectation is that by 2020 large numbers of next-generation hybrid vehicles will be on the road.

Manufacturers are also planning to continue their research into fuel cell vehicles, and while many believe that fuel cells will play a key role in the future, mainly in passenger cars and light vehicles, there is also a widely held view that considering the great difficulty in establishing fuel supply systems and significantly reducing costs, their reach is likely to be still quite limited in 2020.

As for large vehicles, there is an urgent need to drastically reduce the level of diesel emissions, so some local and overseas manufacturers are moving ahead with the development of super-clean diesel vehicles and vehicles that run on alternative fuels, such as DME.

Chapter 2 Basic strategy for Promoting the Development of Next-generation LEVs

1. Basic strategy for the development of next-generation LEVs

As stated in the preceding chapter, to effectively resolve air pollution, global warming and other environmental issues associated with the motor vehicle, a basic strategy for the commercialization and widespread use of next-generation LEVs by 2020 is essential.

Passenger cars and small vehicles account for the majority of vehicles on the road, and most run on gasoline. Although their exhaust emission performance is outstanding, priority for development should be given to improving fuel efficiency in an effort to drastically reduce emissions of CO_2, a major factor in global warming.

Most large vehicles are diesel-powered and therefore one of the main causes of air pollution, so development should give priority to reducing exhaust emissions as a means of comprehensively solving the air pollution problem, while maintaining or even improving their present outstanding fuel efficiency.

There is also a need for measures that can facilitate a shift away from petroleum to ensure the effective use of finite oil resources and future energy security.

In this light, there is a need for strategies to develop LEVs that correspond to the characteristics of each motor vehicle type.

In particular, considering such factors as investment efficiency, it would be valuable to develop alternative fuel vehicles and low emission diesel vehicles that can use the existing infrastructure to replace large diesel vehicles, and the development of next-generation LEVs is expected to be further accelerated by the synergy arising from the parallel technological development of such diesel vehicles and vehicles that run on alternative fuels.

With their energy regeneration functions, hybrid systems are effective for route buses and city courier vehicles that travel at low speeds and stop frequently.

For the future, it would be beneficial to incorporate information technology into next-generation LEVs to further cut exhaust emissions and improve fuel efficiency.

2. Fields of application

A) Passenger cars

Passenger cars have the lowest power output and range requirement, and development is simpler than for trucks and other heavy vehicles, so fuel efficiency should be improved and CO_2 emissions reduced even further with the ultimate aim of an emission level close to zero.

Therefore fuel cell vehicles, hydrogen-powered vehicles that have no exhaust emissions when travelling, and next-generation hybrid vehicles with dramatically improved exhaust emission performance and fuel efficiency through precision controls are considered to be the most promising next-generation LEVs.

Electric vehicles can be adapted for common use limited to short distances within city areas by reducing vehicle size.

Diesel vehicles have great potential for improvement in limiting CO_2 emissions, and here the aim should be an exhaust emission performance on a par with the virtually zero emission gasoline vehicles.

B) Small and medium vehicles

Small and medium vehicles are and will continue to be indispensable for intra-regional goods distribution.

The requirement for power output and range is relatively low, so various kinds of LEVs can be considered, such as next-generation hybrid vehicles, next-generation natural gas vehicles with a fuel efficiency equal to that of diesel vehicles, next-generation LPG vehicles and fuel cell vehicles.

Next-generation natural gas vehicles show great promise from a low pollution and alternative fuel perspective, but there is a need to establish a network of natural gas supply points, so for the time being, their development should be carried out in parallel with next-generation hybrid vehicle development.

Diesel vehicles can be considered in measures for controlling emissions in small and medium vehicles provided an exhaust emission performance equal to that of gasoline vehicles can be achieved.

There is also a need to continue pursuing the development of hybrid and fuel cell technologies to facilitate the shift to fuel cell vehicles and other ultimate clean vehicles from 2020.

C) Large vehicles

Technological development of next-generation LEVs with almost zero emissions that can replace the current range of high-polluting large vehicles must be given a high priority.

Next-generation LEV types considered suitable are those with a drastically improved exhaust emission performance while maintaining the traditional advantages in fuel efficiency, such as next-generation natural gas vehicles, next-generation hybrid vehicles, DME vehicles, and super clean diesel vehicles.

Many issues need to be resolved before alternative fuel vehicles will be used extensively in this area, including the development of the necessary infrastructure that can support long distance transportation, so super clean diesel vehicles incorporating advanced electronic control technology, highly efficient exhaust after-treatment systems and high quality fuel that can completely transform the conventional image of diesel vehicles should also be developed in parallel.

Limitations such as the requirement for range and power output are lower for buses than they are for trucks, so as well as the vehicle types mentioned above, there is also a need to develop fuel cell buses with zero or almost zero exhaust emissions and greatly reduced levels of CO_2.

3. Exhaust emission and fuel efficiency targets for next-generation LEVs

The development of next-generation LEVs must take into account the need for safety, reliability, comfort, convenience, and economic efficiency, and strive for the following environmental performance targets appropriate to these vehicles.

(1) Exhaust emissions targets

Next-generation LEV exhaust emission targets should move away from the idea of control values with clearly defined achievement periods, and be set at the ideal considering not merely extensions of existing technologies but technological break-throughs, and the complete achievement of environmental standards.

Emission targets should therefore be either zero, or extremely close to zero.

Fuel quality has to be improved to achieve zero emission, so next-generation LEV development should be premised on drastic improvements in fuel quality through cleaner fuel, such as sulfur-free or low-aroma [4] fuel, appropriate distillation properties, development of CHF [5], and the formulation of quality standards for DME and CNG.

Specifically, passenger cars and small and medium vehicles should maintain exhaust emission values at the new long-term control level of almost zero emission.

The ultimate target for large vehicles, which pose the main exhaust emission problem, should be to cut nitrogen oxides to less than one tenth the level of the new long-term controls, and particulate matter emission to zero or close to zero. Development must also

[4] Aromatic organic compounds such as benzene.

[5] Clean hydrocarbon fuel — refined fuel without impurities.

take into account measures to control PM2.5 [6], whose effect on health is currently being studied, and unregulated substances.

(2) Fuel efficiency targets

Measures to improve the fuel efficiency of passenger cars, which account for the majority of vehicles on the road and are responsible for more than half of the CO_2 generated by the transport sector, are essential.

It is more effective to give priority to achieving significant improvements in the fuel efficiency of passenger cars and small and medium vehicles, while maintaining exhaust emission values lower than the level of the new long-term controls.

Specifically, considering the energy efficiency of fuel cell vehicles is 2–3 times as great as that of gasoline vehicles, and the level of CO_2 emission is generally correlated to fuel efficiency, development should aim at about half the current level of CO_2 emissions.

For large vehicles, development should aim at maintaining and improving upon the current outstanding levels of fuel efficiency of diesel vehicles.

In using alternative fuels or improved quality fuels, well to wheel [7] comparisons that include CO_2 emissions at the fuel production and refining stages should be examined.

(3) Other environmental performance targets

Next-generation LEVs must deliver outstanding performance not just in exhaust emissions and fuel efficiency, but in other environmental aspects as well, such as low noise and recyclability.

(4) Comprehensive environmental performance indicators

In addition to the conventional assessments of environmental load during vehicle operation, it is desirable to establish development and design methods that can minimize the environmental load over the life cycle of the vehicle through the introduction of processes for assessing environmental load at the time of vehicle production and disposal using the LCA[8] concept, and exhaust emission and fuel efficiency corresponding to the various vehicle use patterns, e.g. during high-speed driving or traffic congestion.

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[6] Particulate matter of 2.5 microns or less; poses a greater health risk than SPM of 10 microns or less. Its effects are currently being studied.

[7] Assessment method based on the required energy efficiency from fuel production through distribution to consumption.

[8] Life cycle assessment. All-inclusive assessment of environmental load from production, to use and final disposal.

4. Government role in development and dissemination of next-generation LEVs

Next-generation LEVs are currently at the research stage, so there is a need to clarify the roles of the industrial, government and academic sectors, and systematically create an environment that can facilitate their efforts in their respective areas of technological development and promotion.

The government through close cooperation among the relevant ministries and agencies should promote the early development of next-generation LEVs and create an environment that will facilitate their widespread acceptance and use.

Large next-generation low emission trucks in particular is a field in which it is difficult to expect a great deal from independent development because of the high development costs and limited market size. The government should therefore extend financial support for developing next-generation LEVs, open the R&D processes and the results to the public, and make the basic technologies developed from this as widely available as possible. This will enable motor vehicle manufacturers to use intellectual resources effectively and avoid overlaps in their development investments, resulting in a shortening of development time and lower costs, which in turn will accelerate the development of the necessary technologies.

At the same time, the government should provide support for establishing fuel supply facilities, for reducing parts and vehicle costs, and for implementing field trials of prototype vehicles.

The government must also consider the need for next-generation LEV guidelines and technological standards covering safety and environmental preservation (exhaust emission and fuel efficiency targets and measurement methods, and safety of equipment and systems that are not used in present-day motor vehicles, such as reformers in fuel cell vehicles).

In the future, the government should look into making the use of fuel of at least a certain quality obligatory in an effort to eliminate the use of improper fuel and facilitate the introduction of low emission technology that is premised on improved fuel quality.

Chapter 3 International Initiatives

1. Basic idea

To promote the development of next-generation LEVs, it is both beneficial and necessary for countries to engage in active exchanges of information and technologies, and search for common areas of policy cooperation, such as promoting joint research and uniform standards.

The open exchange of information among countries can be expected to have a significant effect in the prompt introduction of appropriate measures to facilitate the development and dissemination of next-generation vehicles using financial support and various kinds of incentives.

It is also important to carry out basic research on the basis of common technological targets agreed upon by governments and private-sector vehicle manufacturers, and to share the achievements of that research.

2. International conferences

To ensure all countries are heading in the same direction, there is a need hold international conferences on next-generation low emission technology where countries can exchange information on national measures and strategies, and, where necessary, examine technological or policy aspects that may require a joint approach. Care must be taken to ensure these conferences do not overlap with other conferences, and where possible, every effort should be made to utilize existing conferences (e.g., WP29 [9] etc.).

This will accelerate the technological development of vehicles, while the lower development and production costs will be reflected in cheaper parts and vehicles. It will also result in the more economical usage of community resources relating to technological development.

3. Standardization

To promote the world-wide spread of LEVs, national standards should be uniform so that resources can be more effectively channeled into technological development with no divergence of any individual country's development effort. In this light, when a certain direction for technological development becomes clear, frameworks such as the effective WP29 should be utilized to promote uniform standards.

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[9] World Forum for Harmonization of Vehicle Regulations, United Nations Economic Commission for Europe

4. Technical cooperation for developing countries

To solve air pollution and global warming issues in the developing countries of Asia where motorization is expected to move ahead at a rapid pace, there is a need to extend technical cooperation and support relating to LEV technology, checks, maintenance and management technology, and the know-how to use these technologies.

Through cooperation in this field, Japan can make an important international contribution toward addressing some of the various problems facing the global environment.

Conclusion

This report discusses basic strategies for promoting the development of next-generation LEVs with a view to their commercialization and widespread use by 2020.

We hope the strategies highlighted in this report together with the LEV development and dissemination strategies raised by the Low Emission Vehicle WG will help to promote the development and dissemination of next-generation LEVs more efficiently now and into the future.

Developments relating to Ratification of Kyoto Protocol and Implementation of Anti-Global Warming Measures

1. Past Government Actions

At a February 13 meeting of the Global Warming Prevention Headquarters, the following matters were decided on in preparation for the ratification of the Kyoto Protocol by the end of 2002:

I Ratification Schedule

All-out efforts to ensure Diet approval of the ratification of the Kyoto Protocol at its next ordinary session and the like

A review of the current Climate Change Policy Program

II Basic Direction of Domestic Measures

1 Basic approach

1) An implementation mechanism that will ensure compatibility between the environment and the economy to be aimed for by taking advantage of the ingenuity and inventiveness of the business community.

2) A review, etc. to be conducted at key stages of progress.

2 All-out efforts to ensure the passage of the Anti-Global Warming Measures Promotion Law Amendment Bill and all related bills.

III International Cooperation in Fight against Global Warming

Earnest efforts will be made to establish a level playing field where all countries take action under the same rules, particularly in terms of persuading the United States to take a constructive approach to the issue.

2. Outline of New Climate Change Policy Program

Greenhouse gas emissions to be cut by 6% from 1990 levels by 2010.

–2.5%	Control of the emissions of CO_2, methane and other gases 1) Energy-related CO_2 (transportation, industrial and residential/commercial) .....±0% 2) Methane, nitrous oxide, etc. .....–0.5% 3) Development of innovative technologies and efforts of all sections of society .....–2%
+2.0%	Emissions of CFC-substitutes, etc.
–3.9%	Absorption by forests and other sinks
–1.6%	Utilization of Kyoto mechanisms (emissions trading, etc.)

3. Latest Developments

March 19 Decision on an overhaul of the Climate Change Policy Program (a new policy program)

March 29 Cabinet approval of the Kyoto Protocol and the Anti-Global Warming Measures Promotion Law Amendment Bill

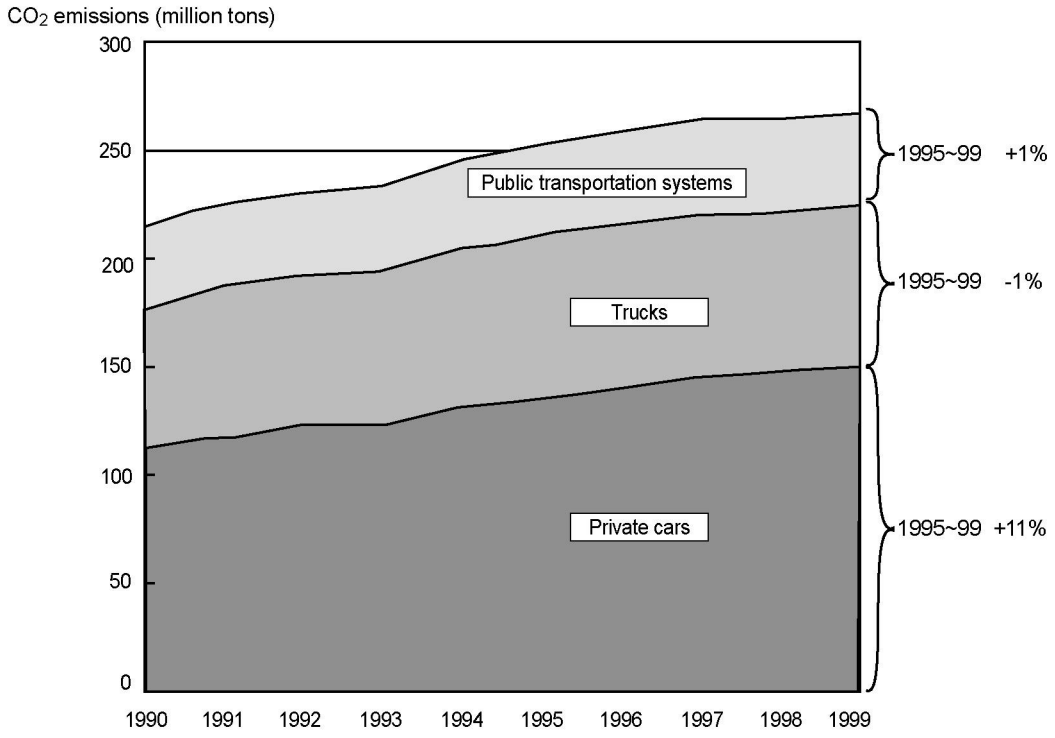
CO_2 Emission Reduction Plan of Ministry of Land, Infrastructure and Transport geared towards Ratification of Kyoto Protocol

1. Reduction of CO_2 emissions from transportation sector

To bring transportation sector CO_2 emissions in 2010 down to 1995 levels, measures capable of reducing them by about 46 million tons CO_2 need to be put in place.

- Motor vehicles are responsible for 88% of CO_2 emissions from the transportation sector.
- Although emissions from public transportation and freight transportation have stabilized in recent years (1995–99), emissions from private cars have been steadily rising.
- The reduction of CO_2 emissions from private cars is an urgent task.

Trends in CO_2 Emissions from Transportation Sector



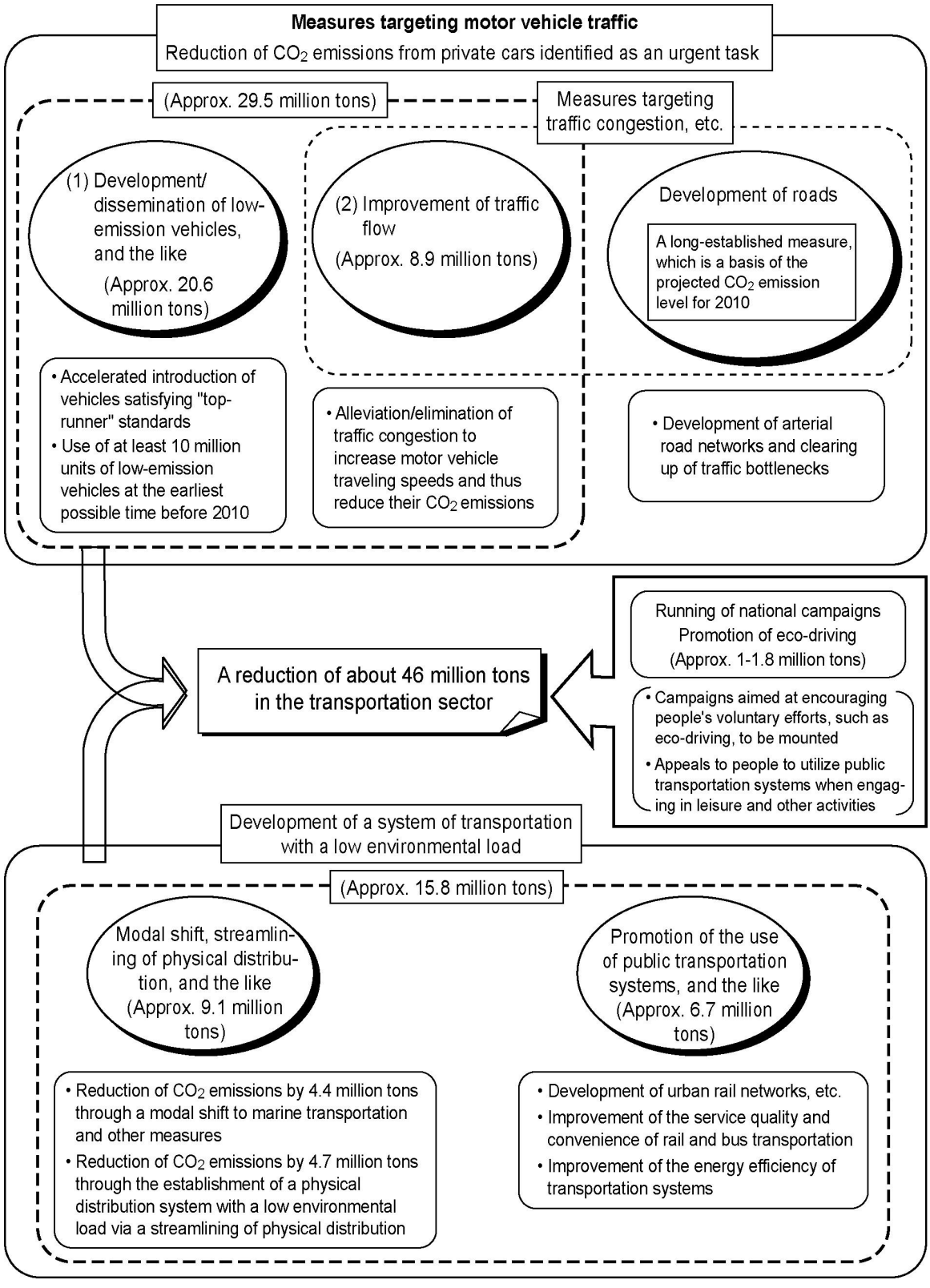
Note: The net change in CO_2 emissions from transportation sector from 1999 to 2000 is estimated to have been a 2% decrease.

	Transportation volume	CO_2 emissions (estimate)	Main contributing factors
Passenger transportation	–0.3%	–1.6%	• Reduction of passenger car emission intensity by about 0.9% • Fall of private car passenger transportation volume by about 0.3%
Freight transportation	+3.2%	–2.8%	• Rise of the volume of efficient commercial truck transportation by about 4.1% and fall of the volume of inefficient private truck transportation by about 6.5% for a net increase in overall truck transportation volume of about 1.9% • Rise of domestic marine transportation volume by about 5.3%

Source: Estimates by the Ministry of Land, Infrastructure and Transport based on FY 2000 Energy Supply and Demand Records (Preliminary Report), released on January 31

Concepts behind Anti-Global Warming Measures in Transportation Sector

Measures center on **voluntary efforts**, **incentives** and **the development/introduction of new technologies** so as not to adversely affect the nation's economic activities and people's daily lives.

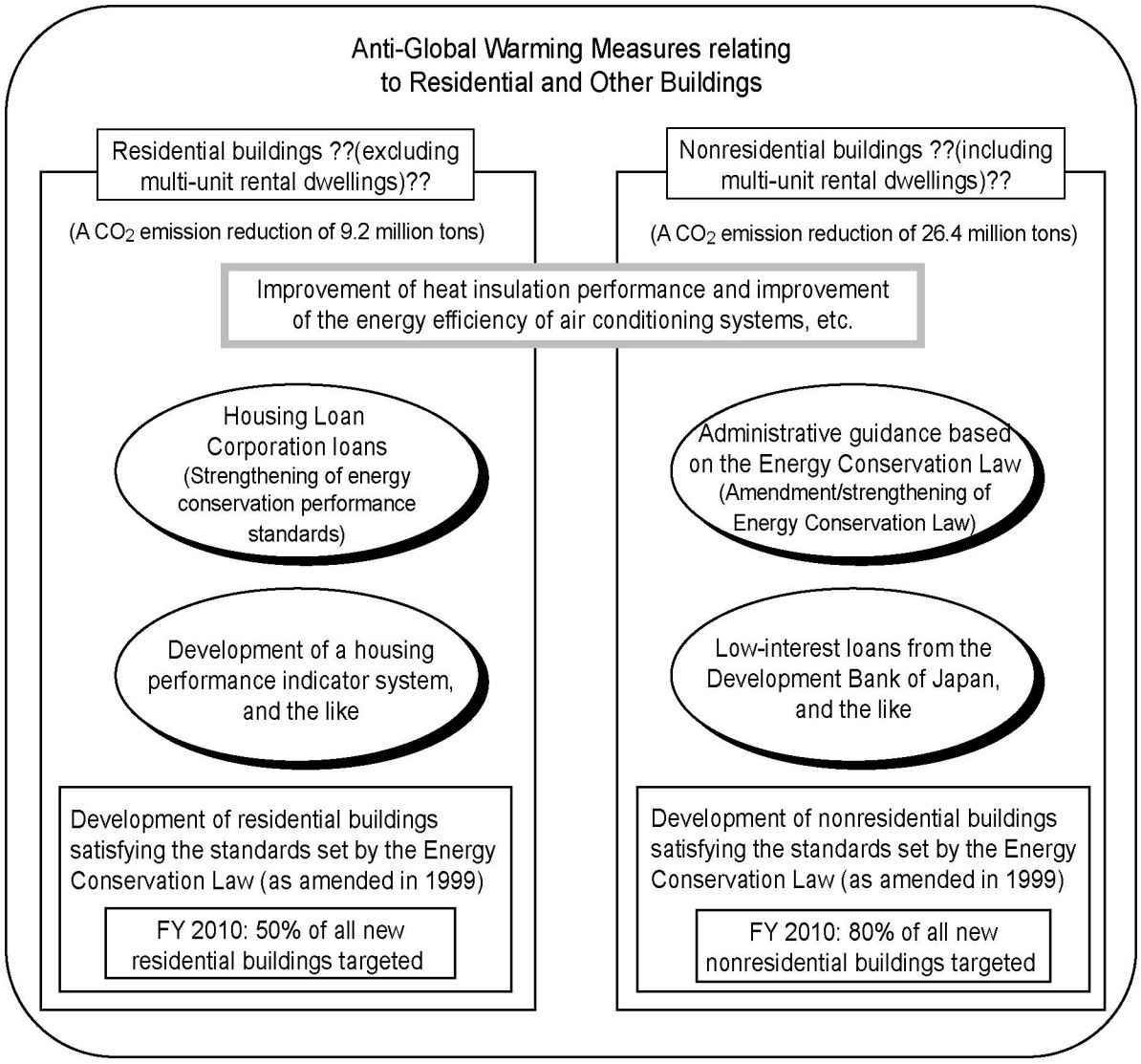


2. Plan for Reduction of CO2 Emissions from Residential and Commercial Sector (Houses and Other Buildings)

Efforts in the residential and commercial sector focus on the reduction of CO_2 emissions resulting from energy consumption through measures targeting the design and construction of houses and other buildings, improvements in the energy efficiency of appliances and equipment, and the like.

The Ministry of Land, Infrastructure and Transport will implement measures targeting the design and construction of houses and other buildings, encompassing, among other things the improvement of their heat insulation performance and improvement of the energy conservation performance of air conditioning, lighting and hot water supply systems and other building service equipment.

(A CO_2 emission reduction of 35.6 million tons)



3. Nitrous Oxide Emission Control Measures

— Sophistication of combustion at sewage sludge incineration plants, and the like

Sewerage systems treat and dispose of human waste, domestic wastewater, commercial wastewater, etc. resulting from urban living. Sewage contains organic matter, nitrogen and other materials which could turn into non-energy-related greenhouse gases. To actively contribute to the fight against global warming, it is proposed to reduce nitrous oxide emissions through a sophistication of sewage treatment/disposal and improvement of treatment/disposal methods.

Reduction of Nitrous Oxide Emissions through Sophistication of Combustion at Sewage Sludge Incineration Plants and Like

● Sophistication of combustion at sewage sludge incineration plants

Approx. 1.4 million tons CO_2

● Introduction of high-temperature combustion to all polymer-dewatered-sludge fluidized- bed incinerators by stipulating “appropriate combustion temperature control” in the Sewerage System Planning and Design Guidelines

Introduction of high-temperature combustion (850°C)

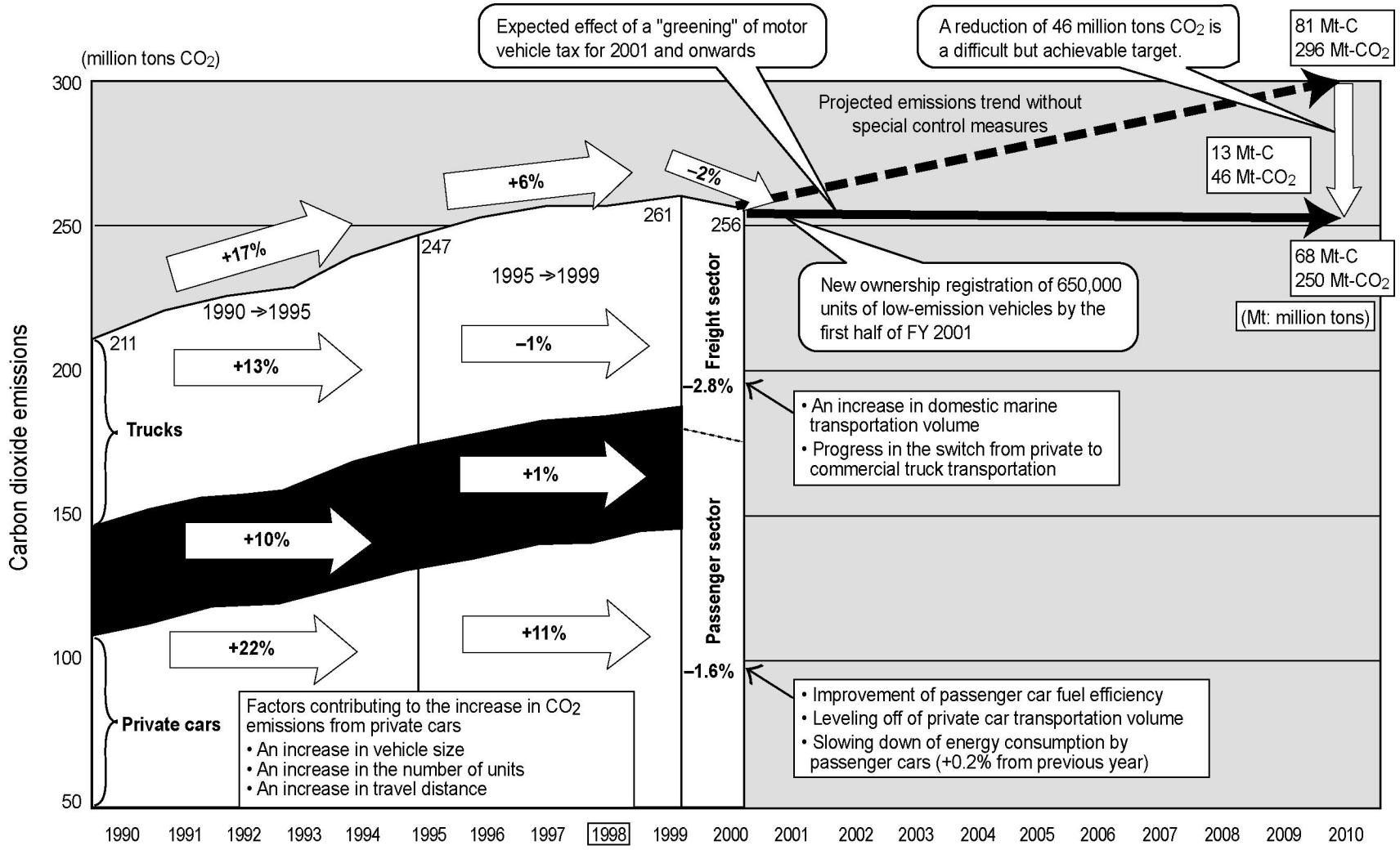
● Thorough education on compliance with A Guide to the Formulation of Global Warming Action Plan for Sewerage Systems

● Sophistication of sewage treatment/disposal

Approx. 600,000 tons CO_2

● Curbing of N_2O emissions attributable to human waste and domestic wastewater, particularly those generated in areas without access to a sewerage service, through the development of sewerage systems and sophistication of their management

Trends in Carbon Dioxide Emissions from Transportation Sector



The CO_2 emissions figure for year 2000 is an estimate by the Ministry of Land, Infrastructure and Transport based on the FY 2000 Energy Supply and Demand Records (Preliminary Report), released on January 31.

Public transportation systems: buses, taxis, railways, passenger ferries, domestic marine transportation and domestic air transportation