Chapter 3
Policy Measures Taken by Japan to Create a Low Carbon Society and Japan's International Contributions

As mentioned in Chapter 2, the world is moving towards a low carbon society. In view of this global trend, Japan must achieve the target set forth by the Kyoto Protocol and enhance policy measures to facilitate the creation of a low carbon society. This chapter will elucidate the basic concepts of the measures that Japan is taking to arrest global warming, focusing especially on the transportation area, which requires measures that match regional characteristics, and the area that utilizes nature's blessings, such as solar power. It will introduce the development and dissemination of technology in the industrial sector, which will be a major player in Japan's endeavor to create a low carbon society. Finally, it will describe the measures that Japan is taking to assist developing countries, especially in Asia, in curbing their rapidly rising GHG emissions.

Section 1 Achieving the Target of Kyoto Protocol's First Commitment Period

1 Status of GHG Emissions in Japan

According to the Kyoto Protocol, Japan is required to make a 6% reduction in GHG emissions from the base year (FY 1990 for carbon dioxide, methane, and nitrous oxide, and 1995 for the three CFC substitutes, including HFC, PFC, and SF_6) by the end of the Protocol's first commitment period (2008-2012). Japan's GHG emissions in FY 2006, however, reached 1,340 million tons (carbon dioxide equivalent), an increase of 6.2% from the base year.

Although progress has been made in the reduction of methane, nitrous oxide, and the three CFC substitutes, carbon dioxide emissions from energy use in FY 2006 increased drastically compared to the base year (12% increase from the base year). They account for approximately 90% of Japan's GHG emissions and totaled 1,186 million tons in FY 2006. The rise in carbon dioxide emissions is partly due to the lowered utility rate of nuclear power generating facilities after nuclear power generation was shut down in late 2002. In addition to such special event, it is also the result of economic expansion of China, change in the industrial structure, an increase in office floor areas, the increase in energy consumption in offices and households due to a rise in the ownership of computers and household electrical appliances, and so on.

Changes in carbon dioxide emissions by sector show that emissions from the industrial sector, which accounts for 30% of the total carbon dioxide emissions, have leveled off. Although emissions from the transportation sector, which accounts for approximately 20%, have increased by approximately 20% compared to FY 1990, they are on a downward trend. On the other hand, emis-

Table 3-1-1 State of GHG Emissions in Japan

(Unit: Mt- CO_2)

	Base year (percentage to total)	FY2005 results (difference from base year in %)
CO_2 emissions from energy use	1,059 (84%)	1,186 (+12.0%)
Industrial	482 (38%)	460 (-4.6%)
Commercial and others	164 (13%)	229 (+39.5%)
Residential	127 (10%)	166 (+30.0%)
Transportation	217 (17%)	254 (+16.7%)
Energy conversion	67.9 (5%)	77.3 (+13.9%)
CO_2 emissions from non-energy use	85.1 (7%)	87.7 (+3.1%)
CH_4	33.4 (3%)	23.6 (-29.2%)
N_2O	32.6 (3%)	25.6 (-21.7%)
Three CFC substitutes	51.2 (4%)	17.3 (-66.2%)
Total	1,261 (100.0%)	1,340 (+6.2%)

Source: Ministry of the Environment

sions from the commercial and others sector, which represents approximately 20%, and the residential sector, which represents approximately 10%, have increased substantially (Table 3-1-1).

In order for Japan to take the lead in the international community in realizing a low carbon society, we must take the initiative to assuredly achieve the 6% reduction target set forth by the Kyoto Protocol.

2 Achieving the Target of Kyoto Protocol's First Commitment Period .....

(1) Kyoto Protocol Target Achievement Plan

Pursuant to the Law Concerning the Promotion of Measures to Cope with Global Warming (Law No. 117 of 1998), the Kyoto Protocol Target Achievement Plan (approved by the Cabinet on April 28, 2005, hereinafter referred to as "Target Achievement Plan") stipulates the necessary measures for assuredly achieving the 6% emissions reduction target set forth by the Kyoto Protocol. Japan has made concrete efforts to meet this target by improving the efficiency of air-conditioners, televisions, and other appliances and increasing the fuel efficiency of automobiles. The Global Environment Committee of the Central Environment Council and the Global Environment Subcommittee under the Environment Division of the Industrial Structure Council deliberated in a joint meeting to revise the Target Achievement Plan in order to ensure achievement of the target. In response to the final report of the joint meeting, the Global Warming Prevention Headquarters agreed to revise the Target Achievement Plan (Figure 3-1-1) in March 2008, which was later approved by the Cabinet. The revised Target Achievement Plan incorporated additional and strengthened policies and measures to further encourage the industrial sector to formulate voluntary action plans; to further improve the energy efficiency of houses and buildings; to enforce the Top Runner Program for machinery and equipment; to step up energy conservation measures at factories and business establishments; to improve the fuel efficiency of automobiles; to formulate and issue emissions control guidelines for businesses based on the amended Law Concerning the Promotion of Measures to Cope with Global Warming*; to introduce a system of calculation and reporting of GHG emissions by business unit or franchise unit based on the revised system of GHG calculation, reporting and disclosure; to expand and improve implementation plans of local governments; etc. (Fig. 3-1-1).

With respect to the revised Target Achievement Plan (hereinafter referred to as "Revised Target Achievement Plan"), actors in various sectors must make full effort to carry out not only the policies and measures in the original Target Achievement Plan but also the additional and enhanced policies and measures of the Revised Target Achievement Plan (Figure 3-1-1). Furthermore, to achieve the target of the Kyoto Protocol's first commitment period, Japan will also combine forest management to secure carbon sinks and use of the Kyoto Mechanism (Figure 3-1-2).

The longer we delay implementation of these policy measures, the greater the reduction we will have to make within a short time in order to meet the 6% emissions reduction target of the Kyoto Protocol. It is important that we immediately implement the policy measures that can be carried out at this time to secure the reduction. Achievement of the 6% reduction target is premised on steady implementation of the existing and additional measures. We must monitor the progress of the plan's implementation closely, be spontaneous in making adjustments, and add or enhance policy measures speedily whenever necessary to ensure fulfillment of the 6% emissions reduction target.

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* Note: Amendment to the Law Concerning the Promotion of Measures to Cope with Global Warming

In order to meet the 6% emissions reduction stipulated by the Kyoto Protocol, Japan needs to step up measures drastically to curb the continuously rising emissions from the commercial and others sector and the residential sector. As one of the measures to ensure the steady implementation of reduction measures set forth in the Target Achievement Plan, the Cabinet approved a bill amending the Law Concerning the Promotion of Measures to Cope with Global Warming in March 2008 and submitted it to the 169th regular session of the Diet. The amended law was then enacted in June 2008.

The amended law incorporates the following provisions:

(1) To formulate and issue guidelines for controlling emissions to encourage businesses to carry out environmentally friendly business activities voluntarily and proactively.

(2) To change the system for calculating, reporting, and disclosing GHG emissions by emitter to a system of calculation and reporting by business unit or franchise unit.

(3) To encourage prefectures, designated cities, core cities, and special cities among local governments to formulate measures for controlling GHG emissions in their implementation plans in accordance with the natural and social conditions of the local society.

(4) To review the way in which information on GHG emissions of businesses is provided to users, such as investors, and implement any measures deemed necessary.

Figure 3-1-1 Outline of the Revised Target Achievement Plan

Measures and Policies for Target Achievement

1. Measures and policies concerning reduction, absorption, etc. of GHG emissions

(1) Measures and policies concerning reduction of GHG emissions

[Examples of major additional measures]

- Promotion of voluntary action plans
- Improvement of energy conservation performance of houses and buildings
- Measures for Top Runner equipments
- Strengthening of energy conservation measures at factories and business establishments
- Improvement of automobile fuel efficiency
- Promotion of measures to reduce GHG emissions of small and medium sized businesses
- Measures for agriculture, forestry and fisheries; water and sewage; traffic flow, etc.
- Urban greening and measures for wastes, three CFC substitutes, etc.
- Promotion of measures for new energies

(2) Measures and policies concerning absorption of GHGs

- Forest improvement including thinning of wood, and development of national campaigns to create sound forests

2. Cross-sectoral policies

- Systems for calculation, reporting and public disclosure of GHG emissions
- Development of national campaigns

Issues to be reviewed immediately:

- Domestic emissions trading scheme
- Environmental taxes
- Reviewing of late-night lifestyle/work style
- Introduction of daylight saving time

GHG Emissions Reduction and Absorption Targets

	Outlook for GHG emissions in FY2010*	
	Mt- CO_2	Ratio to base year's total emissions
CO_2 emissions from energy use	1,076～1,089	+1.3%～+2.3%
Industrial	424～428	−4.6%～−4.3%
Commercial and others	208～210	+3.4%～+3.6%
Residential	138～141	+0.9%～+1.1%
Transportation	240～243	+1.8%～+2.0%
Energy conversion	66	−0.1%
CO_2, CH_4 and N_2O emissions from non-energy use	132	−1.5%
Three CFC substitutes	31	−1.6%
GHG emissions	1,239～1,252	−1.8%～−0.8%

* The emissions outlook is for both cases in which measures produce the maximal and minimal envisioned effect. While Japan aims at producing the maximal effect, Japan's reduction commitment shall be achieved even with the minimal effect.

Japan will steadily achieve the 6% reduction commitment under the Kyoto Protocol by including GHG absorption measures and Kyoto Mechanisms to reduce GHG emissions.

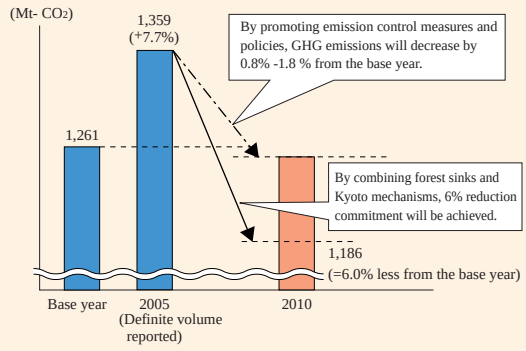
Review of Progress of Target Achievement Plan

- Check strictly the state of each measure's progress around June and December every year
- In addition, forecast the total emissions of the first commitment period and comprehensively evaluate the progress in FY 2009.

→ Revise the Plan flexibly and reinforce and add measures and policies as needed.

Source: Global Warming Prevention Headquarters

Figure 3-1-2 Outlook of GHG Emissions in FY 2010 in Japan



Source: Global Warming Prevention Headquarters

The developed countries' fulfillment of the emissions reduction commitment stipulated by the Kyoto Protocol will be a milestone on the road to achieving the ultimate goal of the United Nations Framework Convention on Climate Change, which is to stabilize the concentrations of greenhouse gases in the atmosphere. To contribute proactively to the fulfillment of the long-term goal set forth in Cool Earth 50, we must first meet the 6% emissions reduction stipulated by the Kyoto Protocol and then work on making a long-term, continuous, and drastic emissions reduction.

(2) Adaptation Measures

The Fourth IPCC Assessment Report pointed out that in order to cope with the inevitable short-term and long-term effects of global warming that are expected to occur, we must not only take mitigation measures to curb GHG emissions but also adaptation measures. In the face of natural disasters and unavoidable consequences of climate change in the future, all concerned parties must be able to carry out measures effectively and efficiently, more so than ever, in order to adapt to the situations.

The Ministry of the Environment established the Committee on Climate Change Impacts and Adaptation

Research in October 2007. It reviews what is necessary to cope with the long-term impacts of global warming on national life between 2020-2030, identifies the impact of global warming on Japan and the developing countries in the future, assesses our vulnerability, and examines the direction of research needed to promote adaptation measures.

In their related council or committee meetings, the Cabinet Office, the Ministry of Agriculture, Forestry and Fisheries, and the Ministry of Land, Infrastructure, Transport and Tourism are reviewing adaptation measures designed for office works and operations under their jurisdiction, including water resources management, and disaster prevention, as well as public works and projects related to rivers, sea coast, ports and harbors, and agriculture, forestry, and fisheries.

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Public Sector's Initiative to Control Greenhouse Gas Emissions

As an actor of economic activity, the position that the government holds in the national economy is very large, and it is very important that they take the initiative to control greenhouse gas emissions related to government operations.

Each ministry has developed policies related to specific measures to be executed in order to control the emission of greenhouse gases, and is implementing measures such as purchasing goods and services, including low-emissions vehicles, and thorough energy conservation efforts for buildings. For FY 2006, the total greenhouse gas emissions from government operations were about 1.71 million tons, which represents a 14.4% reduction in emissions from the FY 2001 level, exceeding the target of 7% reduction. For example, during FY 2006 the Ministry of the Environment implemented measures such as attaching reflective plates to the fluorescent lights in the Ministry offices to reduce electricity consumption by regulating the illumination, as well as implementing a 8 p.m. lights out policy and energy-saving operation guidelines for air-conditioners and heaters in regional environmental offices. These measures resulted in a 9.7% reduction of greenhouse gas emissions in FY 2006 over FY 2001.

In addition, to promote green contracting (environmentally considerate contracts) to reduce environmental impact as much as possible when purchasing goods and services, the Green Contract Law (Law concerning the Promotion of Contracts Considering Reduction of Greenhouse Gases and Others Emissions by the State and Other Entities.) was enacted in November 2007. This law has created a system of comprehensive evaluation that includes environmental concerns in addition to costs in order to contract with suppliers of superior goods and services when the public sector (national and local governments, independent administrative institutions, etc.) purchases electricity, automobiles or buildings. It also extended the duration of national subsidies for ESCO project contracts to 10 years. The proactive involvement of the public sector, including at the national level, in green contracting coupled with the Green Purchasing Law enacted in FY 2001 has not only reduced the environmental impact from the public sector but is also expected to encourage suppliers to provide products with less environmental impact products and to change the entire economy and society to be more environmentally considerate.

Section 2 Drastic Reduction of Greenhouse Gas Emissions in the Mid-to-long Term

1 Status on Efforts to Create a Low Carbon Society

To achieve the ultimate objective of the United Nations Framework Convention on Climate Change, which is "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system," we must balance carbon dioxide emissions with carbon dioxide absorption.

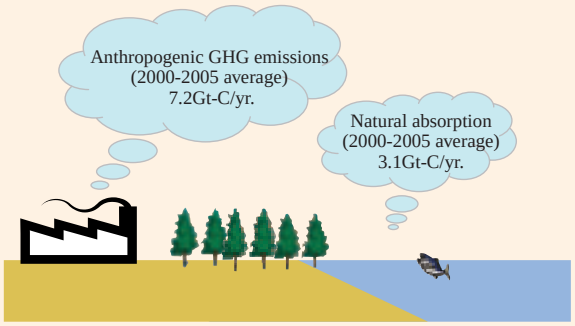
Currently, the world's carbon dioxide emissions are over double the volume that can be absorbed by nature (Figure 3-2-1). In view of the fact that the concentrations

of carbon dioxide in the atmosphere are soaring, Cool Earth 50 puts forth the goal of first halving the world's carbon dioxide emissions of the current level by 2050. To this end, we need to "build a low carbon society" and "develop innovative technology".

The 21st Century Environment Nation Strategy approved by the Cabinet in June 2007 underscored the need to realize in an integrated manner "a low carbon society," "a sound material-cycle society," and "a society in harmony with nature" in order to aim at a sustainable society that can overcome global crises such as global warming.

To clarify the direction for measures "to create a low carbon society," the Global Environment Committee of the Central Environment Council reviewed the basic concepts of a low carbon society, the specific image of such a society, and the strategies for realizing it. Since September 2007, it has held twelve meetings. The Committee issued the report "Towards the Creation of a Low Carbon Society," which incorporated the comments of experts and discussions on the basic principles and other topics.

Figure 3-2-1 CO_2 Emissions and Absorption Results



Note: Atmospheric CO_2 concentration in 2005 was up at 379 ppm (its natural concentration is 280 ppm).
Source: Compiled by the Ministry of the Environment from the data of *IPCC Fourth Assessment Report (AR4)* (2007)

2 Basic Principles of a Low Carbon Society

In its report "Towards the Creation of a Low Carbon Society," the Global Environment Committee of the Central Environment Council named the following three as the basic principles:

(1) Minimize Carbon Dioxide Emissions

Putting in place a social system that gives full consideration to minimizing carbon dioxide emissions is the key. To this end, all sectors of the society, including industries, the government, and citizens, must realize the finite nature of the earth; exercise the volition to break away from a society of mass production, mass consumption, and mass disposal; promote the use of energy efficient products and low carbon energy sources when making purchase decisions; and increase the productivity of resources through the implementation of the 3Rs, and so on.

(2) Create a Simple Lifestyle that Gives a Sense of Richness

We must renounce the uniform society championed by developed countries that seeks richness in life through mass consumption. People's decision to renounce such society and values and to seek spiritual fulfillment will transform the social system and help create a rich, but low-in-carbon society. Manufacturers also need to carry out reforms voluntarily to meet such consumer needs. For example, businesses shall develop environmentally friendly products actively to respond to a market trend favoring products that are friendly to the environment.

(3) Realize Harmony with Nature

It is important to establish venues and create opportunities for the public to come in contact with nature, restore the rich and diverse natural environments, such as forests and oceans; and promote the use of "nature-oriented technology," such as the use of biomass in local communities, in order to secure carbon sinks; and adapt to global warming, which is inevitable in the future.

3 Relationship between a Low Carbon Society, a Sound Material-Cycle Society, and a Society in Harmony with Nature

As mentioned in Chapter 1, for the realization of sustainable development, the international community today is facing an urgent call to build a low carbon society and to drastically cut GHG emissions.

However, sustainable development is achieved not just by means of a low carbon society, it must be pursued in conjunction with the realization of a sound material-cycle society through the 3R resource management and a society in harmony with nature, which enjoys and passes on nature's blessings.

(1) Low Carbon Society and Sound Material-Cycle Society

Through the 3Rs, measures to build a sound material-cycle society will also help mitigate global warming. In March 2008, the Fundamental Plan for Establishing a Sound Material-Cycle Society was revised pursuant to the Fundamental Law for Establishing a Sound Material-Cycle Society (Law No. 110 of 2000). Since measures for building a sound material-cycle society and a low carbon society both necessitate changes to the socio-economic system and lifestyle, it called for the implementation of interdisciplinary measures to optimize synergetic effect. To this end, efforts shall be made to observe the material cycle as much as possible by first reducing waste (Reduce), and then by reusing (Reuse) and recycling (Recycle) through prevention of improper waste treatment to reduce the impact of waste on the environment. Finally, the remainder of waste shall be used for generating electricity through heat recovery to aid the reduction of GHG emissions.

In the reduction of waste, municipal solid waste decreased by approximately 2.8% in the two years from FY 2003 to FY 2005. In terms of reuse, the used products market had expanded steadily to almost 3.7 trillion yen in FY 2004. On the other hand, recycling has been on a gradual rise in recent years. In FY 2005, the recycling rate of municipal solid waste was 19% and the recycling rate of industrial waste was 52%. In the use of waste for power generation, electricity generated in FY 2005 at incineration facilities for municipal solid waste amounted to 7,050 GWh.

(2) Low Carbon Society and Society in Harmony with Nature

As global warming advances, more damage will be done to biodiversity, making the realization of a society in harmony with nature more difficult. The loss and deterioration of forests and wetlands also harm biodiversity. As a result, carbon dioxide retained by their ecosystems will be released into the atmosphere, aggravating global warming. In other words, there is a close link between a low

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Let's Reduce "Wood Mileage" Using Local Timber!

Kyoto Prefectural Kitakuwada High School is promoting efforts focused on reducing CO_2 emissions by consuming locally produced timber. This reduces the "wood mileage" (i.e., the distance the timber is transported), and results in far less CO_2 emissions when compared to using imported timber. Specifically, with the slogan of "Let's reduce 'Wood Mileage' Using Local Timber!" the school, in collaboration with research institutes, manufactures and provides log houses and furniture made of locally-grown Japanese cedar/Japanese cypress.

This effort has been highly praised as maintaining a good balance between the application of the silvicultural technology that has a long history of over 1200 years in the Kyoto Kitayama area and has supported the world-class architectural culture in Kyoto, and measures to reduce global warming. Their effort was rewarded with the grand prize for the "Stop Global Warming – One Village, One Product Project" launched by the Ministry of the Environment of Japan in FY 2007 to recognize excellence in local measures to counter global warming.

A made-to-order log house (bus stop) built by Kitakuwada High School
(Photo: courtesy of Japan Center for Climate Change Actions (JCCCA))

carbon society and a society in harmony with nature, and it is important to implement policy measures that consider both.

Forests, wetlands, and plains store large volumes of carbon dioxide. Besides protecting and restoring them, utilizing recyclable biological resources in the community, such as lumber, biomass from the maintenance of countryside, and nature's blessings, such as sunlight, as energy can make our daily lives sustainable. They can also serve as substitutes for non-renewable resources, including fossil fuels. These measures contribute to the establishment of both a low carbon society and a society in harmony with nature.

4 Promoting Policy Measures That Match Regional Characteristics .....

The scope of policy measures to facilitate the transition to a low carbon society is extremely wide, both from the fact that GHG emissions originate from activities involving the entire economic society and from the perspective that a low carbon society shall be realized in conjunction with the realization of a sound material-cycle society and a society in harmony with nature. We will introduce here specific examples of measures that have incorporated regional characteristics, including transportation measures that are effective in curbing carbon dioxide emissions and measures that utilize nature's blessings such as green space, wind power, and sunlight.

(1) Transportation Measures

Carbon dioxide emissions from automobiles are especially high in the transportation sector, accounting for 90% of the sector's emissions. In the future transition to a low carbon society, while it is of course necessary to improve the fuel efficiency of individual automobile units and introduce clean energy vehicles, it is also desirable to reexamine the aspect of car dependency from a wider perspective of the movement of people and goods in relation to regional characteristics, to choose the appropriate public transport modes, including railways and buses, and to use them in an integrated manner. For this purpose, it is necessary to pursue policy measures for building compact cities that have short transport distances to minimize environmental impact and establishing sustainable regional transport systems with a long-term perspective.

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Hottest Cities in Japan

The summer of 2007 saw a large number of hot days in Japan, with temperatures on August 16 rising to 40.9 ˚C, the highest temperature observed in Japanese history, in Tajimi City, Gifu Prefecture, and Kumagaya City, Saitama Prefecture.

Since 2006, Tajimi City has undertaken efforts to prevent heatstroke. They include displaying signboards in public areas and facilities and issuing precautions to pre-registered citizens by e-mails when the indices for temperature, humidity, etc. exceed a specified level. Also, the City has sponsored the "Acchicchi-Summit" (http:www.acchicchi-summit.com/) since FY 2003 under the concept of "Understanding Global Warming Prevention while Having Fun" in cooperation with other local governments of areas known for their extreme heat, and has raised public awareness through events and experiential activities on the theme of global warming.

Similarly, Kumagaya City initiated the "Project to Disseminate Preventive Information for Heat-related Illness such as Heatstroke" in cooperation with the Japan Weather Association to forecast the risk level for heatstroke occurrence. In addition, the City has implemented a variety of efforts, such as engaging communities to encourage citizens and businesses to create and carry out projects with the catchphrase of "VERY HOT! Kumagaya."

A Signboard to draw public attention to heatstroke
(Photo: courtesy of Tajimi City)

A Environmentally Sustainable Transport Concept

Currently, Environmentally Sustainable Transport (EST) is pursued as a measure to facilitate the transition to a sustainable transport system. EST refers to environmentally sustainable transport, for which a vision is formulated with a long-term perspective, and transportation and environmental policies are drawn up and implemented to realize the vision. It was first reviewed by the OECD in the mid-1990s and has been adopted actively by European countries.

To put EST into practice, we need to use a multifaceted approach that includes implementing traffic flow measures, upgrading public transportation modes, improving the fuel efficiency of automobiles, reducing dependency on fossil fuels, as well as raising public awareness to facilitate change to transport activities that exert a lower environmental impact. It is necessary for the government, businesses, and the public to form a consensus on a long-term vision, formulate strategies and policy measures to achieve the vision, and implement the strategies and measures in a steady and decisive manner.

B Example: Measures Undertaken by Toyota City, Aichi Prefecture

Currently, 27 municipalities are receiving assistance for EST model projects undertaken in conjunction with the Ministry of Land, Infrastructure and Transport and Tourism, the National Police Agency, and the Ministry of the Environment. Toyota City in Aichi Prefecture is carrying out one of the model projects. The project aims at building a forward-looking city that is friendly to its residents and the environment. It formulated the "Vision for 2025 Toyota City Transportation & Town Development Project" to reduce carbon dioxide emissions by easing traffic congestion, increasing the ridership of public transportation, revitalizing the downtown area, encouraging the use of public transport, promoting ecologically friendly driving, etc.

Using technologies such as Traffic Demand Management (TDM) and Intelligent Transport System (ITS), Toyota City was able to increase average daily ridership of public transport in FY 2005 by approximately 18%, which translates into an emissions reduction of 60,000 tons (carbon dioxide equivalent) in one year.

(2) Measures to Utilize Nature's Blessings

To advance to a low carbon society, we must control the emission of carbon dioxide from energy use. To help accomplish this, we must adopt measures that utilize renewable energy, including solar, wind and biofuel, as well as efforts to incorporate nature such as by expanding green space, restoring waterfront areas, creating paths to facilitate wind and air circulation, etc.

It is also important to build an infrastructure to facilitate the combined use of these low carbon energies and efforts and to expand their applications according to regional characteristics.

A Using Green Space to Cope with the Heat Island Phenomenon

The heat island phenomenon is triggered by an increase in man made surfaces, such as concrete roads, in cities. The high summer temperatures in both day and night (sultry nights) cause heatstroke and other problems. Large and mid-sized cities are securing wind paths for air circulation, green space, and waterfront to alleviate the heat

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Generating Electricity from Vehicle Vibration and Body Motion

While speakers convert electrical current into sound vibration, an effort aimed at the practical application of technology that converts the kinetic energy of vibration into electricity is being promoted.

If we could convert our unconscious acts, such as walking, or vehicle vibration into electricity, we would be able to generate electricity by converting our day-to-day activities into energy.

While this technology has yet to be applied, some pilot projects, such as generating electricity to light up a bridge on an expressway or generating electricity from the simple act of walking through a station have been conducted.

A bridge on an expressway lighted up using electricity from vehicle vibration
(Photo: courtesy of the Metropolitan Expressway Co., Ltd.)

island phenomenon.

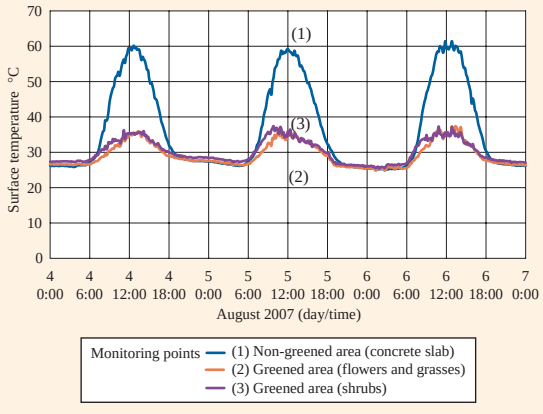
The “Pilot Programs for Inventing Cool City” launched in FY 2007 is a program that uses an integrated approach to combine multiple heat island countermeasures, such as planting trees at buildings to reduce carbon dioxide emissions, installing earth thermal heat pumps, etc., in the central districts of cities with notable heat island characteristics.

In FY 2007, eleven areas in the nation, including Tokyo’s Otemachi-Marunouchi-Yurakucho area (OMY area), were designated as model areas with notable heat island characteristics. Based on measures carried out on the rooftops of commercial buildings in the OMY area, we found that temperatures at rooftops that had planted greenery are over 25 ˚C lower than the rooftops with a concrete surface (Figure 3-2-2). Rooftop gardening not only ameliorates the rooftop surface but also has the benefit of cooling the air that passes through the rooftop.

B City Development Using Solar Power

Many municipalities are implementing progressive measures in regard to the use of solar power to generate electricity. One of these municipalities, Iida City in Nagano Prefecture, utilized the Megawatt Solar Share-Use Model Program sponsored by the Ministry of the Environment that employed funds invested by citizens to install solar power generating systems on the rooftops of day care centers, civic centers, etc. The City has been working on a new system to popularize the Program. The Program aims at providing a channel for citizens to participate in projects through financing, rather than donations, to raise awareness and to promote the Program.

Figure 3-2-2 Changes in Surface Temperature during Thermal Image Monitoring at the Rooftops of Commercial Buildings in OMY Area



Note: OMY area = Otemachi-Marunouchi-Yurakucho Area in Tokyo, Japan
Source: Compiled by the Ministry of the Environment from the data of Mitsubishi Estate Co., LTD.

Other projects are also being carried out. Stoves using wood pellets are installed in many day care centers in the city. This project aims at reducing the use of fossil fuels by utilizing natural energy and building a system to recycle wood pellets within the local community.

C City Development Using Wind Power

Various wind-power generation projects are carried out in different regions according to the local wind conditions. Wind-power generation is expected to increase especially in small cities and mountain villages where there are not as many tall and big buildings as in large cities and where the natural wind flow can be fully utilized.

Kuzumaki township of Iwate Prefecture formulated the “Kuzumaki New Energy Vision” in March 1999 to actively promote the use of new energy, such as wind-power and solar power, for electricity generation. As a result, electricity produced from new energy can be supplied to approximately 16,000 households and reduce carbon dioxide emissions by approximately 34,000 tons annually. Wind-power generation accounts for over 90% of the electricity produced. Taking into consideration the protection of birds and animals, the township utilizes the wind that passes through a farm at an altitude of 1,000m. In addition, it also supports residents’ activities in making the township eco-friendly by providing subsidies for the purchase of firewood and installation of solar power generation and heat utilization systems.

Day care center using solar power to generate electricity
(Photo: courtesy of Iida City)

Wind turbines in Kuzumaki Township
(Photo: courtesy of Kuzumaki Township)

5 Development and Dissemination of Low Carbon Technology .....

(1) Development and Dissemination of Innovative Technology

In order to achieve the long-term goal of halving the world's GHG emissions from the current level by 2050 as proposed in Cool Earth 50, we must take political action to improve and popularize the existing technology and at the same time, research and develop innovative technology. As examples of innovative technology, the Cool Earth 50 mentioned zero-emission coal-fired power generation and advanced nuclear power generation. With this backdrop, the Low Carbon Technolgy Plan was formulated to seek breakthroughs in related innovative scientific technologies and to promote improvement and dissemination of existing technologies in order to find a fundamental solution to the energy and global warming problems. The Plan was reviewed by a working group and approved by the Council for Science and Technology Policy of the Cabinet Office in May 2008.

(2) Popularization and Development of the Existing Highly Efficient Technologies

The world economy in the future is expected to experience continued high economic growth in the Asian region. High economic growth is accompanied by an increase in industrial activities and construction of infrastructure; and in general, energy consumption will go up and GHG emissions will increase. If this chain reaction is not stopped, global warming cannot be arrested. For this reason, it is imperative for the developed countries to share with the world, including developing countries, their existing technology of controlling GHG emissions while continuing production. This can substantially enhance the effectiveness of GHG emissions reduction. Japan has experienced two oil crises and has developed and adopted many highly efficient technologies. Thanks to these technologies, Japan is able to maintain its international competitiveness. These technologies become a very effective tool for decoupling economic growth and GHG emissions.

If technological transfer of these highly efficient technologies is carried out under the Clean Development Mechanism (CDM), the developed countries can not only support the sustainable development of developing countries but also share the achieved GHG emissions reduction credits with the developing countries. The developed country can add the Certified Emission Reduction (CER) credits to its own emissions reduction amount or trade the CERs received from CDM. The CDM Executive Board established under the United Nations Framework Convention for Climate Change (UNFCCC) has 1,056 registered projects on its registry as of May 8, 2008. Technological transfer from developed countries to developing countries through CDM is an effective means to reduce GHG emissions. In a future world where transition to a low carbon society is necessary, the country that has many highly efficient technologies will have a relatively advantageous position. Compared to other developed countries, Japan has many highly efficient technologies. Fully utilizing their merits, Japan can create business opportunities through technological transfers to developing countries.

As shown above, transfer of low carbon technology will bring tremendous benefits to Japan. However, as seen in the thermal efficiency of thermal power plants, Japan was surpassed by the United Kingdom and Ireland in FY 2002 and FY 2003 in the weighted average of thermal efficiency at the generating end, which combines the heat efficiency of coal, oil and gas, because the two countries have adopted the latest natural gas thermal power generation (Figure 3-2-3). To continue to be an environmental nation, Japan must devote its greatest effort to developing technology. To maintain our lead in this and other environmental technology fields, we must always seek the latest cutting-edge technology.

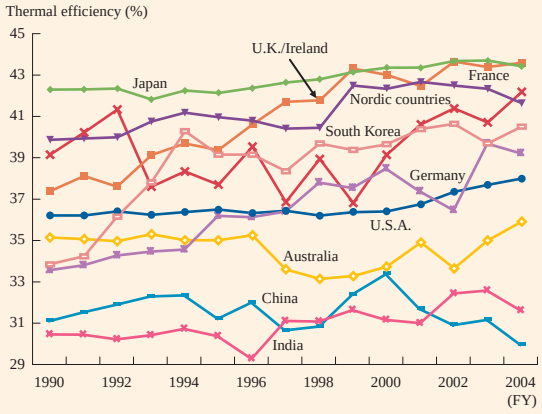
(3) Development and Dissemination of Low Carbon Technology for Power Generation and Industry

In our transition to a low carbon society in the future, the industrial sector shall contribute by seizing global warming as a business opportunity and actively taking measures to develop technology, improve the efficiency of production processes, and transfer technology to developing countries.

The energy conversion sector, including power generation, accounts for approximately 6% of the carbon dioxide emissions in Japan. Of emissions from power generation, those emitted from electricity consumption, etc. by sectors other than the energy conversion sector are also counted as indirect emissions (see Chapter 2, Section 2, Column 4, Figure 2-2-13).

The development and dissemination of low carbon technology shall be embraced not only by the energy conversion sector and the industrial sector but also by all sectors

Figure 3-2-3 International Comparison of Thermal Efficiency of Thermal Power Plants



Note: Thermal efficiency is the gross generating efficiency based on the weighted averages of efficiencies for coal, petroleum and gas (based on low heating value).

Source: ECOFYS, *INTERNATIONAL COMPARISON OF FOSSIL POWER EFFICIENCY*, (2007)

of the society including transportation and households. Here, we will introduce examples of low carbon technologies used by the energy conversion sector and the industrial sector, which together account for a large percentage of Japan's carbon dioxide emissions. Regarding the development of innovative energy technology, prior to the "Innovation Plan for Environmental Energy Technology," the Ministry of Economy, Trade and Industry has put together the "Cool Earth–Energy Innovative Technology Plan" in March 2008. Of the 21 technologies selected by the Plan, we will introduce advanced nuclear power generation, high efficiency coal-fired power generation, carbon capture and storage (CCS), high efficiency natural gas thermal power generation, and an innovative iron-making process as well as the commercialized energy conservation technology.

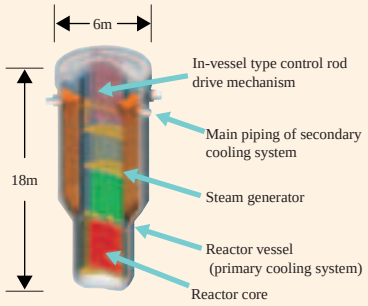
A Development and Dissemination of Power Generation Technology

(A) Advanced Nuclear Power Generation Technology

Nuclear power generation, which does not emit carbon dioxide during the power generation process, is the only clean energy source that has the potential to become Japan's major electricity source at this time. Therefore, it has an extremely important role in the fight against global warming. Premised on the assurance of safety, the government and citizens must continue to cooperate in steadily promoting nuclear power as a major electricity source. To this end, it is necessary to improve the light-water reactor technology, which is the prevailing technology in

"Monju" fast breeder reactor
(Photo: courtesy of Japan Atomic Energy Agency)

Figure 3-2-4 Medium Small Reactor (350MWe-IMR)



Source: Ministry of Economy, Trade and Industry, *Cool Earth - Innovative Energy Technology Program*

Japan and overseas today, and develop innovative power generating technologies such as the fast breeder reactor and so on, with a view toward 2050. Specifically, focus shall be placed on the development of the next-generation light-water reactor technology that will substantially enhance safety, affordability, and reliability; the fast breeder reactor cycle technology that will drastically increase the efficiency of uranium use; and "medium small reactor" system that can meet the electricity needs of developing countries and island states (Figure 3-2-4).

(B) High Performance Coal-fired Power Generation Technology Combined with Carbon Capture and Storage

Compared to other fossil fuels, coal has the advantage of superior supply stability and high economic efficiency. On the other hand, it also has many environmental factors that limit its use, such as the large CO_2 emission volume per unit of heat it produces. To resolve such issues from the environmental standpoint, clean coal technologies shall be promoted to control CO_2 emissions.

Since coal is abundant and inexpensive, its use in the developing countries is likely to increase in the future. For this reason, enhancing the efficiency of coal-fired power generation–so that more electricity can be generated with

less coal–is also highly effective in reducing GHG emissions.

So far, Japan has conducted many studies on coal-fired thermal power generation technology and has enhanced the efficiency of power generation. Currently, research and development are being carried out on advanced ultra-super critical thermal power generation, integrated coal gasification combined cycle system, integrated coal gasification fuel cell combined cycle system, etc.

Advanced ultra-super critical thermal power generation is a technology used to improve power generation efficiency by tweaking the steam condition of the current pulverized coal thermal power generation method to produce high temperature and high pressure. The integrated coal gasification combined cycle system is an integrated technology that generates electricity using coal gasification, gas turbines, and steam turbines. The integrated coal gasification fuel cell combined cycle system is a technology that further adds fuel cells.

If the power generation efficiency can be raised from the current 42% to 65% by adopting and popularizing these technologies, carbon dioxide emissions can be reduced by approximately 40%. Furthermore, by combining these technologies with CCS, carbon dioxide emissions can be reduced to almost zero.

CCS is a technology that separates/captures carbon dioxide from exhaust gas emitted from large point emission sources, such as thermal power plants, and stores or sequestrates the carbon dioxide underground in geological formations or in deep ocean masses for long periods of time to prevent carbon dioxide from being released into the atmosphere. This technology is composed of four components, namely, separation/capture, transport, compression, and storage. Separation/capture technology and storage technology are at the core of this technological development. Japan started basic research on this in the late 1980s. To date, small verification tests using compression up to the 10,000-ton level have been carried out to study storage stability. One of the major hurdles for the commercialization of CCS is cost reduction. To lower the cost of separation/capture, which accounts for approximately 60% of the CCS cost, Japan has been developing elemental technology such as a highly efficient absorbing solution. To popularize CCS, we need to have environmentally effective and efficient methods to manage CCS. Japan is also developing such methods.

Overview of a long-term pilot plant for CO_2 capture
(Photo: courtesy of Mitsubishi Heavy Industries, Ltd.)

(C) High-efficiency Natural Gas Thermal Power Generation Technology

Compared to other fossil fuels, natural gas is a clean energy that exerts relatively little environmental impact. Therefore, in line with the "Basic Energy Plan," Japan continues to promote the adoption and increased use of natural gas while making efforts to strike a balance with oil, coal, nuclear energy, and other energy sources.

When burning fuel, gas from the fuel can be used to turn the turbine and generate electricity. Such internal-combustion turbines are small and lightweight, and have many merits including high output and quick activation. The combined cycle system combines the thermal generation and steam power generation, in which the residual heat from internal combustion is used to produce high temperature and highly pressurized steam to turn the steam turbine. Because natural gas thermal combined cycle power generation uses the two kinds of turbines for power generation, its heat efficiency reaches the 50% or more level. One way to raise the efficiency of natural gas thermal power generation even higher is to raise the temperature at the entrance of the gas turbine. Since Japan developed and installed a gas turbine with a temperature of 1100 ˚C at its entrance in the 1980s, the heat resistance performance has improved. The current commercialized gas turbine has reached a temperature of 1500 ˚C at its entrance.

Development of the next-generation gas turbine, which has a temperature of 1700 ˚C at the entrance, is being pursued as a national project. When this gas turbine is developed, high-efficiency natural gas thermal power generation, which uses such turbines, will have a heat efficiency up to 56%, delivering even higher performance. The development of the high performance gas turbine is expected to increase the performance of the integrated coal gasification combined cycle system as well.

B Innovative Iron-making Process and Energy Conservation Technology Used in the Iron and Steel Industry

(A) Innovative Iron-making Process

Iron is an indispensable metal in daily life, used in various kinds of products ranging from building frames, ships, and automobiles to office supplies such as staples. To extract iron, oxygen must be removed from iron oxide in the iron ore. The process requires maintaining a temperature over approximately a thousand degrees for a long time. During the first oil crisis, the iron and steel industry was one of the industries hardest hit in Japan. By actively adopting energy conservation technology, it was able to overcome the crisis, and in the aftermath, it has kept up its steady effort in technological development.

However, in order to reduce carbon dioxide emissions more drastically, the industry must approach technological development with a long-term perspective. It needs to develop (1) technology to separate/capture carbon dioxide from the gas emitted from shaft furnaces, also known as blast furnaces at iron works, and (2) technology to use hydrogen reductant to replace some of the cokes. Specifically, with a view to commercialization in 2030-50, Japan will pursue development of a new type of absorbing solution that can efficiently separate carbon dioxide from gas emitted from shaft furnaces, which has high concentrations of carbon dioxide, and development of technology to regenerate absorbing solution. Japan will also promote the development of technology to use catalysts to change the property of gaseous by-products from coke production and technology to reduce iron ore utilizing increased hydrogen as a reductant. The goal is to reduce about 30% of carbon dioxide emissions from the iron-making process by combining the use of these technologies.

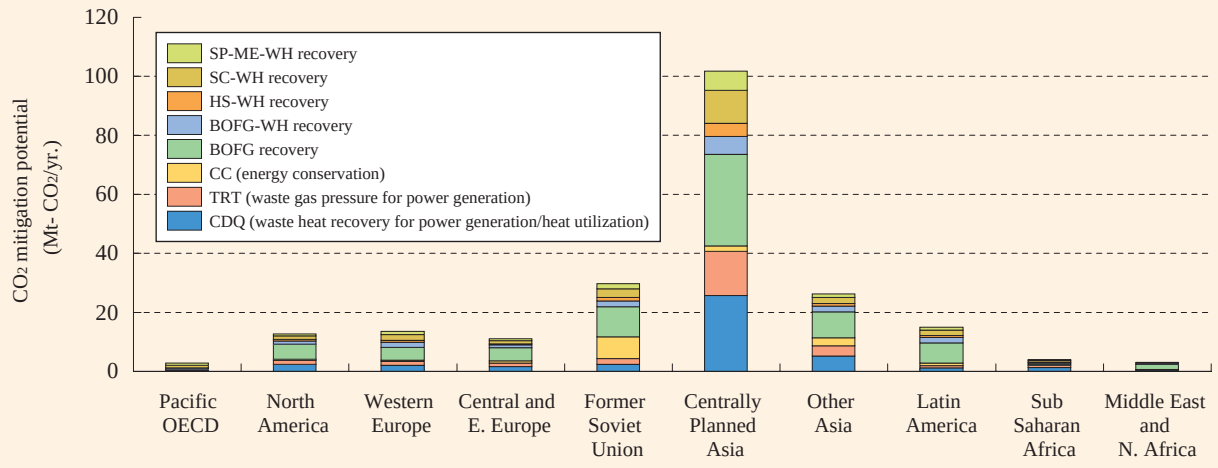
(B) Energy Conservation Technology

The iron and steel industry in Japan boasts the highest level of energy efficiency in the world. This is attributed to the widespread use of equipment to recover exhaust energy, in addition to superior production technology and operation techniques.

For example, the top-pressure recovery turbine (TRT) utilizes gas recovered from the blast furnace to generate electricity. In the blast furnace, iron oxide in the iron ore is reduced to iron, which is the most important process in iron making. The high-temperature, high-pressure gas, which is generated secondarily from the process, rises up to the top of the furnace. Rather than releasing it into the atmosphere, the gas is recovered at the top of the furnace and the exhaust energy is used to operate a turbine to generate electricity.

When coal is baked in a coke oven to generate coke, hot coke at a temperature of approximately 1200 ˚C is quenched in an enclosed coke dry quenching system (CDQ) using inert gases such as nitrogen. The heat absorbed by the inert gas is then used to power a steam boiler to generate electricity. Similar to TRT, CDQ is an effective means for utilizing exhaust energy.

Figure 3-2-5 CO_2 Reduction Potential of Energy Efficient Technologies in Iron and Steel Industry (Forecast for 2030)



Note: 1. Centrally Planned Asia includes China, Mongolia, North Korea, and Vietnam.
2. SP= sinter plant, ME=main exhaust, WH=waste heat, SC=sinter cooling, HS=hot stove, BOFG=basic oxygen furnace gas, CC=continuous casting, TRT=top pressure recovery turbine, CDQ=coke dry quenching

Source: Compiled by the Ministry of the Environment from the data of Kanako Tanaka, Ryuji Matsuhashi, Masahiro Nishio, Hiroki Kudo, *Industry Expert Review Meeting to the Fourth Assessment of Working Group 3 IPCC, Cape Town, 17-19 January 2006*

Although these technologies had been introduced actively in Japan in the 1990s and their use is now widespread, they have not made inroads into iron works in other countries. Popularizing these technologies worldwide can substantially reduce carbon dioxide emissions (Figure 3-2-5).

C Energy Conservation Technology of the Cement Industry

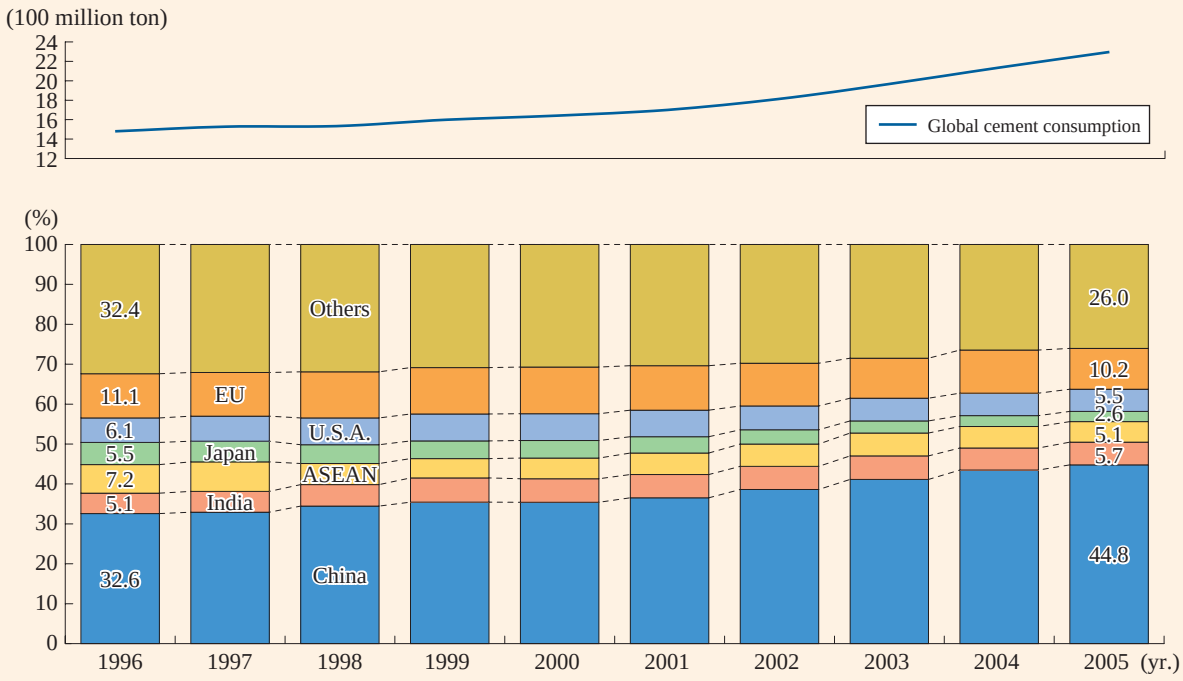
In terms of strength, cost, and ease of use, concrete is one of the superior construction materials today, and is a main material used most frequently in various kinds of constructions, roads, dams, port facilities, etc. The global consumption of cement, which is the material for concrete, has increased because of a rising need for the construction of infrastructure in Asia, especially China, which is experiencing rapid economic growth. This trend is expected to continue for the mid-to-long term into the future (Figure 3-2-6).

Cement is produced in the following processes: the material process in which materials such as limestone, clay, and silica rock are mixed and pulverized, the sintering process in which the mixed and pulverized materials are baked, and the finishing process in which the materials are made into product after being ground into powder form. Each process consumes large volume of energy. The cement industry is one of the most energy-intensive industries, with energy cost representing a high percentage of the production cost. Carbon dioxide emissions from the cement industry in Japan account for approximately 4% of its total emissions. Carbon dioxide emitted from the world's cement industry accounts for approximately 5% of the emissions said to have been caused by human activities. For this reason, energy conservation in the production process of cement will directly contribute to the reduction of carbon dioxide emissions worldwide.

The vertical roller mill used by the cement industry in material processing is an energy conservation technology that Japan can contribute to the world. Generally, a tube mill is used for the process. It is a mechanism used to crush raw materials by rotating a long horizontal tube with iron balls inside serving as a grinding media. The mechanism consumes a large volume of electricity. In the case of a vertical roller mill, a disk-shaped turntable and the vertical roller are used to grind materials into powder efficiently. Compared to the tube mill, the productivity can be increased by 60-80% and the electric power consumption can be reduced by approximately 30% (in terms of electric power intensity).

During the sintering process, the powdered materials, prepared from material processing, react chemically with heat to produce clinker, which has the characteristic of becoming hardened when mixed with water. For this process, the materials are heated up to a high temperature

Figure 3-2-6 Changes in Global Cement Demand and Composition Ratio by Region



Source: Compiled by the Ministry of the Environment from the data of Japan Cement Association, Cement Demand and Supply as of March 2007

of 1450 ˚C in a rotary kiln. In Japan, an energy efficient dry kiln is used. This method utilizes the combustion exhaust gas from the rotary kiln's burner to dry and preheat the materials before firing. Compared to the wet kiln, which does not dry or preheat the materials, this method can cut the heat quantity needed by about 36-37% for making one ton of clinker.

6 Meetings of the Council on the Global Warming Issue Held

In line with the policy address delivered by Prime Minister Fukuda at the 169th Diet in January 2008, meetings of the Council on the Global Warming Issue, attended by experts, have been held since March to explain to the public the concept of a low carbon society and ways to facilitate a transition to such a society. With a view to shifting to a low carbon society, the Council reviews production systems, lifestyles, and ways to bring about fundamental changes to cities and transportation. To curb GHG emissions drastically, the Council has chosen ten cities, which will take on the challenge of becoming model environmental cities by setting ambitious goals and implementing progressive measures. The Council will discuss as quickly as possible basic principles for these model cities, ways to mobilize the citizens to help steadily achieve the Kyoto Protocol, and measures for Japan to provide leadership in international discussions of the next framework. Emissions trading systems, environmental taxes, and other policy measures to facilitate emissions reduction will also be discussed in depth.

As we have seen so far, in order for us to advance to a low carbon society, all sectors of the society must make efforts to minimize carbon dioxide emissions. In order to achieve the long-term goal of halving the global GHG emissions from the current level by 2050 as proposed in Cool Earth 50, Japan as a developed country must proactively and significantly reduce its emissions of GHGs by that year. There seems to be a general perception that unless we impose tight restrictions on our daily lives, we will not be able to realize a low carbon society. However, as Chapter 2 shows, there is a gathering momentum in the world to view the transition to a low carbon society as a new business opportunity and the world is responding to it positively by developing renewable energy and expanding the eco-business market.

The objective for the launch of the Council on the Global Warming Issue also indicates that to overcome global warming, the society and the economy must advance to a new level that views the global warming crisis as an opportunity for the world as a whole to realize growth.

In relation to this, Japan has proposed to invest approximately 30 billion dollars in the next five years for the research and development in the fields of the environment and energy.

At the same time, for the world trend of viewing the global warming crisis as an opportunity to take root in Japan, it is important that we research and analyze the environmental and socio-economic trends and backgrounds of global warming measures in Japan and overseas, raise public awareness, and implement various policy measures systematically and with a long-term perspective.

Council on the Global Warming Issue
(Photo: courtesy of Cabinet Office, Government of Japan)

Section3 Japan's Contribution to Global Warming Measures in the Asian Region

1 State of the Environment in the Asian Region and Future Forecast

As we have seen in Chapter 1, any full-fledged measures to reduce GHG emissions in the future must be carried out not only by the developed countries but also in cooperation with the developing countries. The Asian

region, in particular, will hold the key to global warming initiatives in the future. Since it has a huge population and it has witnessed tremendous economic growth in recent years, Asia will be the region with the highest carbon dioxide emissions. Within the Asian region, local environmental issues such as air pollution, which accompanies economic development, and cross-border issues, such as acid rain, are becoming serious. All countries concerned must cooperate in tackling and overcoming these problems.

(1) Economic Growth and GHG Emissions in China and India

Today, countries in Asia are experiencing continuous and rapid economic growth that is unprecedented in the world (Figure 3-3-1).

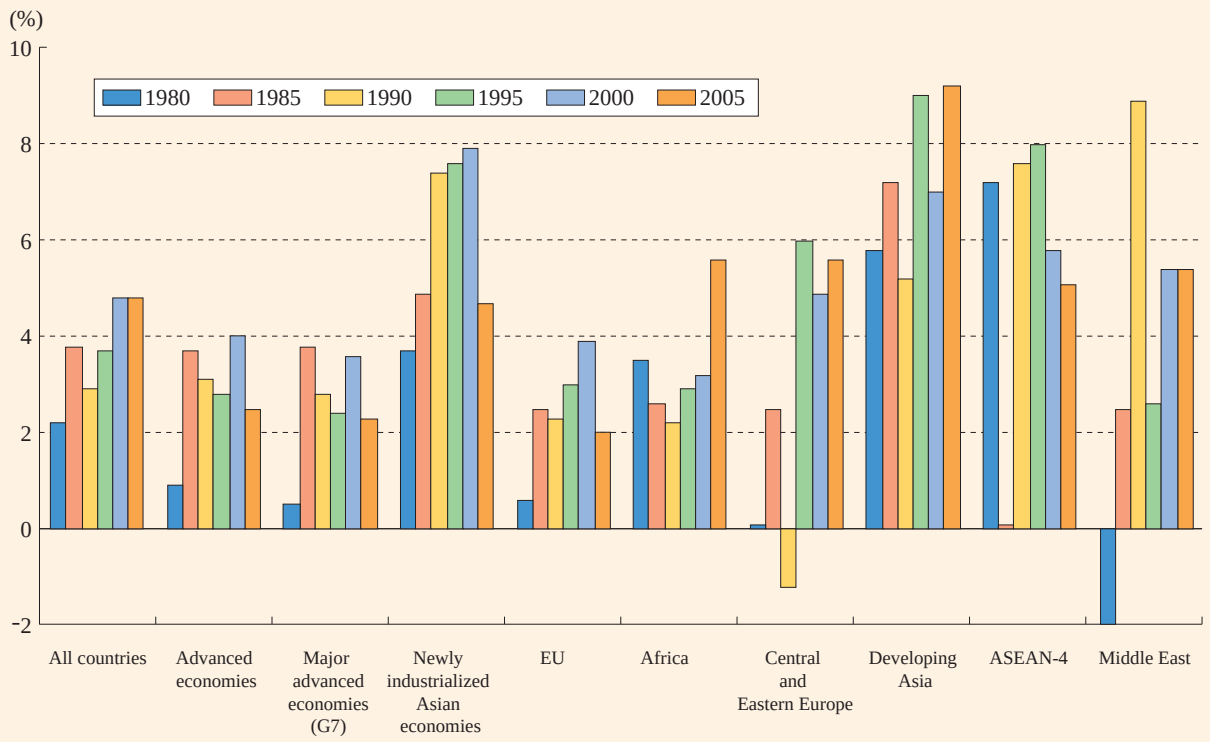
Against this backdrop of economic growth that continues at a high level, energy consumption is also increasing rapidly. Primary energy consumption in the Asian region was 13.7% of the world's total in 1971 but it rose to 31.1% in 2005. Carbon dioxide emissions are no exception. They increased from 15.1% of the world's total in 1971 to 35.8% in 2005.

Within the Asian region, economic growth in China and India is especially remarkable. Since 1979, China's average real GDP growth rate was about 9.7%; and since 2003, over 10% for five consecutive years. India has also taken up economic reform since 1991. It had an average annual growth of 6% in the 1990s and realized a GDP growth rate of 9.4% in FY 2006. In terms of primary energy consumption, China was No. 2 (14.5%) in the world in 2005, following the United States and India was No. 5 (3.7%), following Japan. In terms of carbon dioxide emissions, China was already the largest emitter in Asia and was No. 2 (19.0%) in the world, following the United States (22.0%). India has also seen a steady increase in emissions since the 1970s, reaching the same level as Japan (Figure 3-3-2).

In terms of per-capita energy consumption as of 2005, compared to the 7.9 TOE of the United States and 4.2 TOE of Japan, it was still low at 1.1 TOE in China and at 0.3 TOE in India. This means that the energy consumption of both countries is likely to continue to rise in tandem with their economic growth. Consequently, the carbon dioxide emissions will also increase.

The "World Energy Outlook 2007," published by IEA in 2007, predicted that the primary energy demand would increase 55% (annual average of 1.8%) between 2005 and 2030 and that China and India would account for 45% of that increase. It pointed out that China's primary energy

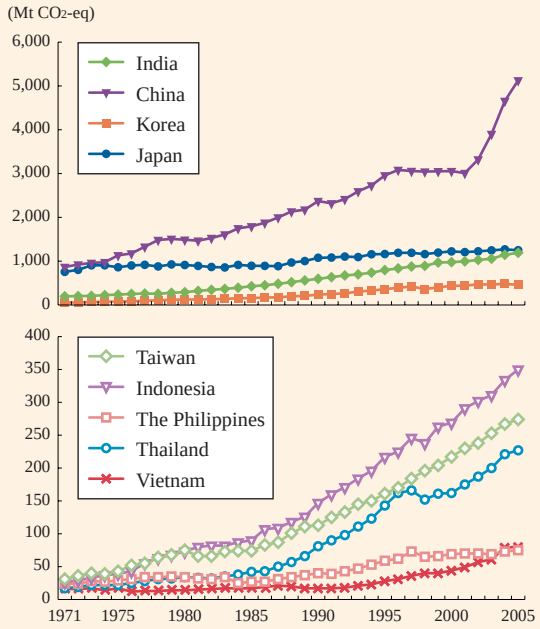
Figure 3-3-1 Changes in World Economic Growth by Region



Note: ASEAN-4 includes Thailand, Indonesia, Malaysia, and the Philippines

Source: Compiled by the Ministry of the Environment from the data of IMF, World Economic Outlook Database (October 2007)

Figure 3-3-2 Changes in CO_2 Emissions in Asian Countries



Source: Source: Compiled by the Ministry of the Environment from the data of IEA, *CO_2 Emissions from Fuel Combustion 2007*

demand would more than double from 1,742 million TOE in 2005 to 3,819 million TOE in 2030. Around 2010, China would surpass the United States as the world's No. 1 country in energy consumption. India's primary energy consumption is likely to more than double by 2030. In tandem with the increase in energy consumption, carbon dioxide emissions will also increase substantially. It is predicted that in 2030, China will surpass the United States and become the world's largest emitter and India will be in the third place, after the United States (Figure 3-3-3).

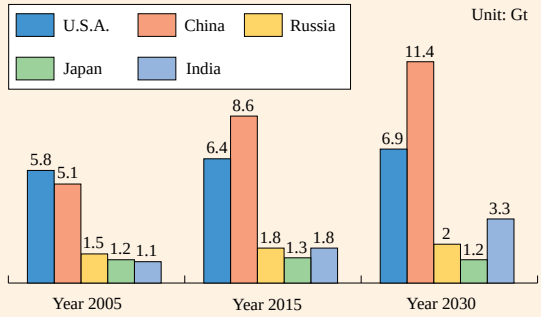
(2) State of Pollution in China and India

Due to rapid economic growth and changes in the industrial structure, the Asian region is faced with simultaneous and multiple environmental problems, making the implementation of anti-pollution measures an urgent task.

For example, the increase in the burning of coal and oil at thermal power generation plants and factories and surge in the number of automobiles led to a rise in the emissions of air pollutants such as sulfur oxide (SOx) and nitrogen oxide (NOx). Pollution in the city areas is especially severe. In 2004, the concentrations of particulate matter in the atmosphere in Chongqing, Tianjin, Calcutta, Delhi, and Jakarta were extremely high, at over 100μg/m^3, which is five times the WHO standard value (Figure 3-3-4).

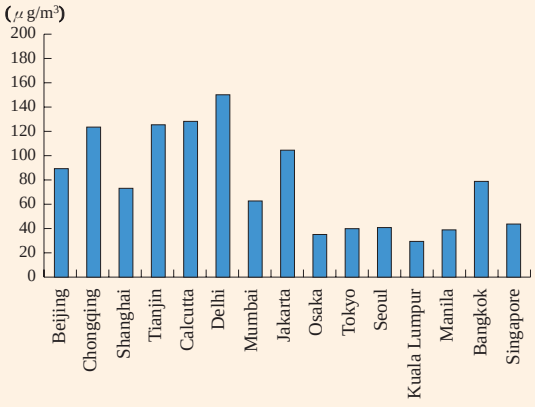
Such air pollution problems may not only pose health hazards domestically but also affect other countries through cross-border pollution. The Asian region must tackle the problem as a whole.

Figure 3-3-3 Future Prospect of CO_2 Emissions in Top Five Countries



Source: Compiled by the Ministry of the Environment from the data of IEA, *World Energy Outlook 2007*

Figure 3-3-4 Particulate Matter (PM) Concentration in Major Asian Cities (2004)



Source: Compiled by the Ministry of the Environment from the data of the World Bank, World Development Indicators 2007

2 Sharing Japan's Experience in Overcoming Pollution with Asia

(1) Basic Concept

As explained in Section 2, the two oil crises prompted Japan to adopt energy conservation measures, in addition to pollution prevention measures. In the face of severe environmental and energy constraints, the government and citizens joined forces in undertaking measures. As a result, Japan was able to improve energy efficiency by approximately 35% in the period between the first oil cri-

sis in 1973 and 2005. Today, Japan's pollution prevention technology and energy conservation technology are at the highest level in the world.

On the other hand, Asian countries must take immediate measures to tackle pollution resulting from rapid economic growth as well as energy conservation measures to mitigate global warming. By disseminating pollution prevention technology, which Japan developed from its experience of overcoming pollution, and energy conservation technology and systems to the Asian countries and prompting them to take actions, Japan can show Asian countries the way to a low carbon society. We will introduce here how Japan utilizes its experience to assist Asian countries.

(2) Co-benefit Approach to Global Warming Mitigation

Co-benefit means an activity that delivers two different benefits at the same time, referring here to the need of developing countries to pursue development and the need to mitigate global warming (Figure 3-3-5).

Despite the rising interest in environmental issues, developing countries in general tend to place the highest priority on development, which brings economic growth, but a relatively low priority on measures that mitigate global warming. Therefore, measures that fulfill the need for development while mitigating global warming are useful in motivating developing countries to curb GHG emissions actively, the effectiveness of which is also highlighted in the Working Group III Report of the IPCC Fourth Assessment Report.

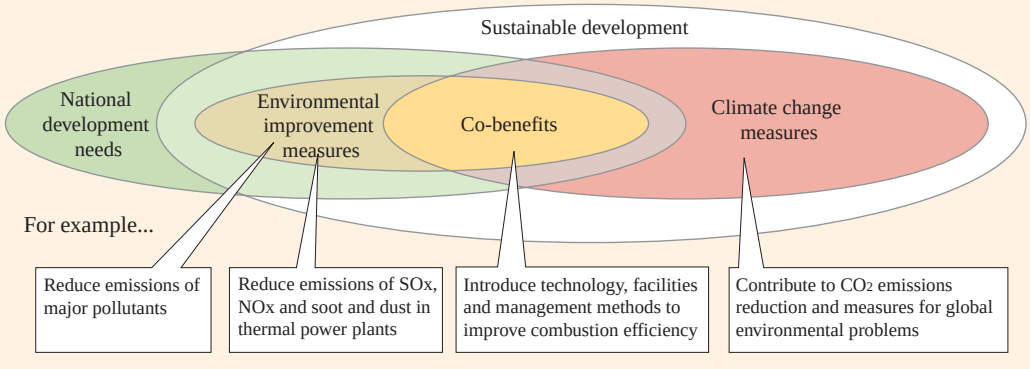
For the developing countries, pollution resulting from development is especially an important issue that needs to be addressed within the regions. A co-benefit approach to arrest global warming, which undertakes anti-pollution measures to resolve such regional environmental problems while implementing measures to mitigate global warming, is an effective means for advancing proactive measures to arrest global warming (Figure 3-3-5).

Air pollution, water contamination, and other environmental problems have become increasingly evident in developing Asian countries that are witnessing spectacular economic growth. Due to the countries' pressing need to address these environmental problems, helping these countries to adopt co-benefit measures to tackle both pollution and global warming at the same time will be an extremely effective way to diffuse global warming mitigation measures in the Asian region.

Co-benefit-type assistance for developing countries is already being carried out under the framework of Japan's Official Development Assistance (ODA) and by private companies in the form of development activities. For example, the comprehensive environmental improvement project in Guiyang, China is carried out under the "Sino-Japanese Environmental Model City Program" advocated at the 1997 Sino-Japanese Summit. It is reported that the project's measures focusing on equipment upgrade and anti-pollution have not only drastically reduced the emissions of pollutants such as SOx and NOx but also reduced carbon dioxide emissions by 1,067,400 tons.

To advance the co-benefit approach of global warming mitigation measures in the future, we need to step up efforts to raise awareness in the developing countries and provide financial assistance to support joint activities as well as research and development. To this end, Japan and China announced in December 2007 that the two countries would cooperate in implementing a co-benefit type joint research model project from 2008 onward to reduce pollutants and consequently GHG emissions. In the Bali Conference, Japan and Indonesia issued a joint statement

Figure 3-3-5 Concept of Co-benefit Approach to Global Warming Mitigation



Source: Ministry of the Environment

that the two countries would cooperate in environmental protection through co-benefit measures. To pave the way for the formulation of specific projects, we would draw up joint programs to transfer environmental technology and knowledge.

In addition, the Ministry of the Environment has started to implement CDM projects as model projects beginning in 2008 to meet the need for anti-pollution measures in developing countries in Asia.

(3) Environmentally Sustainable Transport (EST) in Asia

Due to rapid urbanization in recent years, many Asian cities are beset with various problems including air pollution from automobiles, noise, traffic congestion, and an increase in energy consumption in the transport field. At this time, per-capita car ownership in Asian cities is dramatically low compared to the developed countries. However, coupled with a rise in income from economic growth, if motorization advances rapidly, these problems will become more pronounced.

Motorization has progressed in Japan at a rapid speed since the late 1960s, and transport-related pollution problems, such as air pollution, also started to become conspicuous. Thanks to the strengthening of regulations to control exhaust gas, development of technology to reduce exhaust gas, and the popularization of low-emission vehicles, transport-related pollution problems have been ameliorated substantially. Nevertheless, as explained in the previous section, we must scale up efforts to build transportation systems and cities that will exert minimum environmental impacts in order for us to advance to a low carbon society.

Against this backdrop, Japan and the United Nations Centre for Regional Development (UNCRD) established the initiative “Regional EST Forum in Asia” beginning in 2005 with a view to resolving transport-related environmental problems in Asian countries. In the Third Meeting of the Regional EST Forum in Asia held in March 2008 in Singapore, besides the reporting of EST activities by various countries, a discussion was held focusing on using the co-benefit approach to advance global warming mitigation measures and economic development, an approach championed by Japan. The discussion resulted in the recognition that countries should avoid over-dependence on automobiles by improving public transport systems and that it is important to combine economic development with pollution prevention measures to reduce GHG emissions. Japan announced its intention to support collaborative schemes in Asia to promote EST in an integrated manner and co-benefit type measures in Asian countries.

It will become increasingly important for the Asian countries to share their issues and knowledge and work together to realize EST in the future.

Column Water Problems in the Asia-Pacific Region and the Global Warming

It is estimated that approximately 1.1 billion people worldwide are without continuous access to safe drinking water, and around 600 million people, notably the largest number of them, are in the Asia-Pacific region. It is acknowledged that one of the UN Millennium Development Goals aims at a 50% reduction of the number of people who are without access to safe drinking water by the year 2015. In addition, over 80% of casualties of water disasters such as floods and windstorms worldwide are concentrated in this region, further aggravating the water environment in the region. The global warming has grave impacts on human beings through water problems, and is already affecting water resources and water management, raising concern that this situation will worsen more severely in the future.

In December, 2007, the 1st Asia-Pacific Water Summit, the first international meeting where the heads of state from Asia and Pacific countries discussed the region’s water-related problems, was held, organized by Asia-Pacific Water Forum and the Steering Committee of the 1st Asia-Pacific Water Summit. Participating countries gave presentations on damage and crisis, including glacial lake outbursts and flash floods caused by the large-scale retreat of Himalayan glaciers, and sea-level rise in small island countries and low-lying areas posing a threat to water resources and their management. The importance of cooperation among the Asia-Pacific countries to tackle these water problems was recognized.

Our country has been working on the solution of global water problems. Water Environment Partnership in Asia seeks to promote good water management in Asia monsoon area through maintenance of information infrastructure related to water environment and human resource development.

(4) Financial Assistance through "Cool Earth Partnership"

As explained in Chapter 1, Prime Minister Fukuda proposed in the Davos Meeting that Japan would establish the "Cool Earth Partnership," a new funding mechanism that would provide a cumulative total of approximately 10 billion dollars over a period of five years to support developing countries committed to stabilizing the climate by pursuing both reduction in GHG emissions and economic growth. Through this mechanism, Japan will provide financial and technological support to help these developing countries to implement measures to reduce GHG emissions as well as assist countries susceptible to climate changes (island nations, Africa, etc.) in the implementation of adaptation measures. This will also pave the way for developing countries to participate actively in an effective post-2013 international framework for climate change.

In accordance with the Cool Earth Partnership, Japan and Indonesia are engaging in talks on the provision of yen loans for climate change measures.

It was agreed upon during the January 2008 visit by Japan's Minister of the Environment, Mr. Kamoshita, to Tuvalu, an island nation in the South Pacific, that Japan would review specific assistance measures. Japan also indicated then that it would take a leadership position among developed countries in providing assistance to developing countries. In addition, Japan has decided in February 2008 to provide grant aid to Senegal and Madagascar in Africa and Guiana in South America.

(5) Assistance in Human Resources Development

Human resources development with a long-term perspective is also an important tool in helping developing countries to become sustainable societies. Many developing countries do not have adequate monitoring techniques and implementation systems to track air pollution and other problems. Because they fail to monitor the state of pollution accurately, they also at times fail to take the appropriate remedial measures. Japan has experience in overcoming the abovementioned pollution and many baby boomers, in particular, have experience and expertise in monitoring and other fields. A system has been put in place through the Japan International Cooperation Agency (JICA) to dispatch these people to developing countries to monitor local conditions and to transfer the technologies of monitoring and analysis to the local people. More efforts should be made in the future to scale up the program.

Furthermore, to develop human resources (environmental personnel) who can lead social reforms to work towards a sustainable Asia from a long-term perspective, the Ministry of the Environment formulated the "Vision for Environmental Leadership Initiatives for Asian Sustainability in Higher Education" in March 2008. Based on this vision, Japan has formed a network with graduate schools in Asia to start providing support from FY 2008 to train environmental personnel in universities in Asian countries. The Scientific Capacity Building/Enhancement for Sustainable Development in Developing Countries (CAPaBLE) has been implemented since 2003 through funding provided for The Asia-Pacific Network for Global Change Research (APN) formed by 21 countries in the Asia-Pacific region. The program is contributing to the development of human resources by providing education and training to researchers of developing countries.

Conclusion

The World at a Turning Point in Building a Low Carbon Society

Without doubt, global warming is progressing and our Earth is now in crisis. If no actions were taken, the ecosystems would deteriorate on a global scale, aggravating the world's various problems, including water shortage, food crisis, and poverty. The foundation of human existence would be at risk and the sustainable development of our social economy would be hampered. Global environmental problems are closely related to human security. They pose the greatest challenge to humankind. Whether we can overcome this challenge, avert global crisis, build a low carbon society, and pass it on to the next generations depend precisely on the decisions we make and the actions we take today.

Taking the opportunity of the agreement arrived at in the Bali Action Plan at the 13th Conference of the Parties to the United Nations Framework Convention on Climate Change in December 2007, countries in the world are stepping up efforts to overcome their conflicts of interest and to join forces in forming effective agreements to tackle global warming. However, differences in stance and opinion among countries have surfaced, making it a challenge for the world to work together to realize a framework for the period after the end of the Kyoto Protocol's first commitment period, as agreed upon in the Bali Action Plan.

In order for the world to tackle this problem, Japan must take the lead as an environmentally advanced country in implementing global warming mitigation measures through international cooperation. Japan has a lifestyle and history that are in harmony with nature. It has also accumulated technologies for overcoming environmental and energy problems. To reduce GHG emissions on a global scale, Japan must accelerate global warming mitigation measures and at the same time, step up international cooperation to share Japan's experience with the developing countries. In July this year, the G8 Hokkaido Toyako Summit will be held, with environmental problems, including global warming, as its main agenda. As the chair of the Summit, Japan will take the lead in forging a framework that has the participation of all major emitting countries in order to make a concrete reduction in the world's GHG emissions.

The global warming issue forces us to make an effort to use resources and energy efficiently and to reexamine our socio-economic activities and lifestyle of mass production, mass consumption, and mass disposal. To build a low carbon society, all sectors that make up the society must realize the finite nature of the earth and give the utmost consideration to minimizing GHG emissions. To avert global crisis, every one of us who makes up the society today is asked to treat global warming as his or her own problem and start taking action now.