Japan's Sixth National Communication

Under the United Nations Framework Convention on Climate Change

The Government of Japan

Dec. 2013

Chapter 1

National Circumstances Relevant to Greenhouse Gas Emissions and Removals

1.1 National Land Use

Japan, located on the east side of Eurasia, is a long, thin archipelago that lies approximately between latitudes 24 and 46 north, and consists of four major islands—(from north to south) Hokkaido, Honshu, Shikoku, and Kyushu—as well as more than 6,800 other islands.

As of FY2010 Japan's land area equaled 37.79 million hectares, or 0.3% of the total global land area, of which nearly 80% is accounted for by 24.97 million hectares (66.1%) of forests and 3.94 million hectares (10.4%) of agricultural land. Current land use statistics indicate that forests, agricultural land, and marshes are declining, while grasslands and developing areas are increasing.

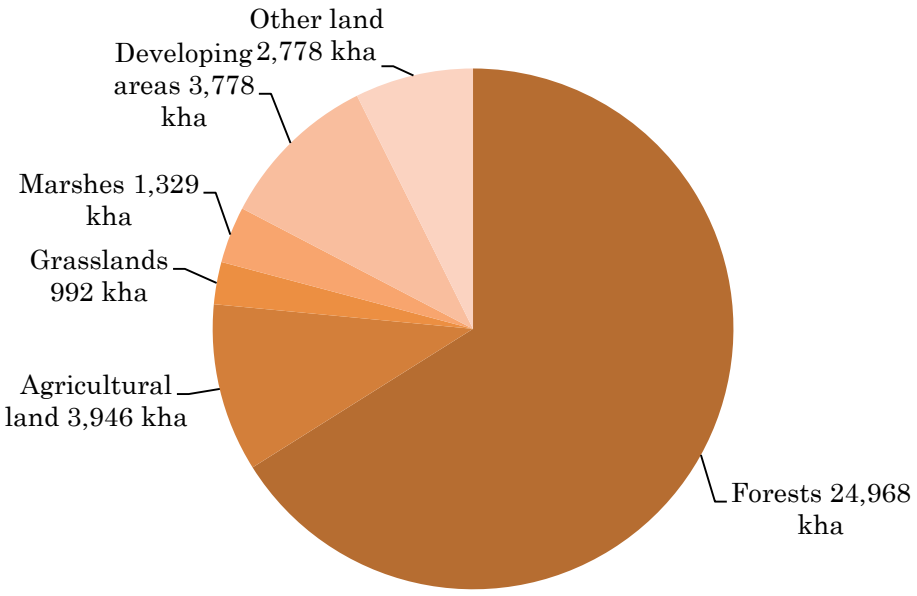


Figure 1.1 Current Land Use in Japan[1]

Source: National Greenhouse Gas Inventory Report of Japan (NIR) (April 2013)

[1] "Developing areas" are urban regions that do not correspond to forests, agricultural land, grasslands, or marshes. Figures are from the National Institute for Environmental Studies and consist of those directly assessed using existing statistics and those estimated for a portion of lands that could not be directly assessed.

1.2 Climate

Japan stretches over a great distance from north to south, with subtropical zones in the south and subarctic zones in north. In addition, Japan has rich seasonal changes. Topographically, mountain ranges stretching from south to north also serve to produce significant climatic diversity between different regions of Japan. In winter, seasonal cold winds from Siberia bring a large amount of snowfall to the coastal areas facing the Japan Sea, while seasonal warm winds from the south make summer hot and humid.

With such a varied natural environment, Japan is home to a wide variety of species. With regard to fauna, about 4,800 vertebrates and about 55,500 invertebrates have been identified, while amongst the flora, some 8,800 vascular plants and approximately 25,400 other plants have been found.

The major climate statistics averages (30-year averages for the period 1981–2010)[2] are shown in Table 1.1 for several meteorological stations which are considered to have been only slightly affected by urbanization.

Table 1.1 Major Climate Components of Japan

		Latitude	Longitude	Elevation (m)	Annual Mean Temperature (℃)	Annual Mean of Daily Maximum Temperature (℃)	Annual Mean of Daily Minimum Temperature (℃)	Annual Precipitation (mm)
Northern Japan	Abashiri	44° 01.0'	144° 16.7'	37.6	6.5	10.4	2.9	787.6
	Nemuro	43° 19.8'	145° 35.1'	25.2	6.3	9.5	3.3	1,020.8
	Yamagata	38° 15.3'	140° 20.7'	152.5	11.7	16.7	7.5	1,163.0
	Ishinomaki	38° 25.6'	141° 17.9'	42.5	11.6	15.5	8.1	1,066.9
Eastern Japan	Fushiki	36° 47.5'	137° 03.3'	11.6	13.9	18.0	10.5	2,226.0
	Mito	36° 22.8'	140° 28.0'	29.0	13.6	18.7	9.2	1,353.8
	Choshi	35° 44.3'	140° 51.4'	20.1	15.4	18.4	12.5	1,659.8
	Iida	35° 31.4'	137° 49.3'	516.4	12.8	18.6	8.0	1,611.5
Western Japan	Sakai	35° 32.6'	133° 14.1'	2.0	15.1	19.3	11.4	1,895.7
	Hamada	34° 53.8'	132° 04.2'	19.0	15.5	19.4	11.8	1,663.8
	Hikone	35° 16.5'	136° 14.6'	87.3	14.7	18.8	11.1	1,570.9
	Miyazaki	31° 56.3'	131° 24.8'	9.2	17.4	22.0	13.2	2,508.5
	Tadotsu	34° 16.5'	133° 45.1'	3.7	16.2	20.3	12.5	1,068.4
Nansei Islands	Naze	28° 22.7'	129° 29.7'	2.8	21.6	24.8	18.8	2,837.7
	Ishigakijima	24° 20.2'	124° 09.8'	5.7	24.3	26.9	22.2	2,106.8

Source: Japan Meteorological Agency
http://www.data.jma.go.jp/obd/stats/etrn/index.php

In order to examine the long-term changes in temperature and precipitation in Japan, the average of anomalies from the normal for annual mean surface temperatures and annual precipitation ratios to the normal at observation stations of the Japan Meteorological Agency in the period 1898–2012 were taken, and the results[3] of the analysis of the data are presented here.

[2] Average mean temperatures, annual means of daily maximum, and minimum temperatures are obtained by calculating monthly mean normals over a 30-year period and then calculating a 12-month average from that figure.

[3] For the analysis of surface temperature, we used 17 stations for which the observed data maintained homogeneity over the long term and for which changes in the environment due to urbanization, etc., were relatively minor. For the calculation of precipitation, we used 51 stations for which the observed data maintained homogeneity over the long term. It should be noted that, in the calculation of surface temperature, although 17 stations that are only impacted to

The annual mean surface temperature in Japan has repeatedly fluctuated, but over the long term it is on a rising trend, and is currently increasing at a rate of about 1.15ºC per century (Figure 1.2). In particular, markedly high temperatures have been frequently recorded since the 1990s. The temperature anomaly in Japan for 2012 was +0.06°C, which was the twentieth-highest figure since statistics began in 1898. The cause of recent frequent high temperature years in Japan, and the rest of the world, is considered to be the coinciding of the impact of global warming, which accompanies increases in greenhouse gasses (such as CO_2), with cycles in nature that repeat every decade or so. Japan had a hot summer in 2013 across the country. In particular, the average summer temperature anomaly in western Japan increased 1.2°C, which was the highest since statistics began in 1946. The Pacific high pressure (low-level high pressure) and Tibetan high pressure (upper-level high pressure) that influence Japanese summers were higher than the normal-year values in both July and August. Particularly the Pacific high pressure was very strong in Okinawa, Amami, and western Japan as the strong pressure continued to project westward. Due to these intensified high pressures, Japan had high temperatures throughout the country, and especially in western Japan. Sea temperatures of Japanese coastal waters went far higher than a normal year because of factors including the increased intensity of solar radiation.

a minor degree by urbanization were selected for this analysis, the impact of urbanization has not been completely eliminated from the analysis.

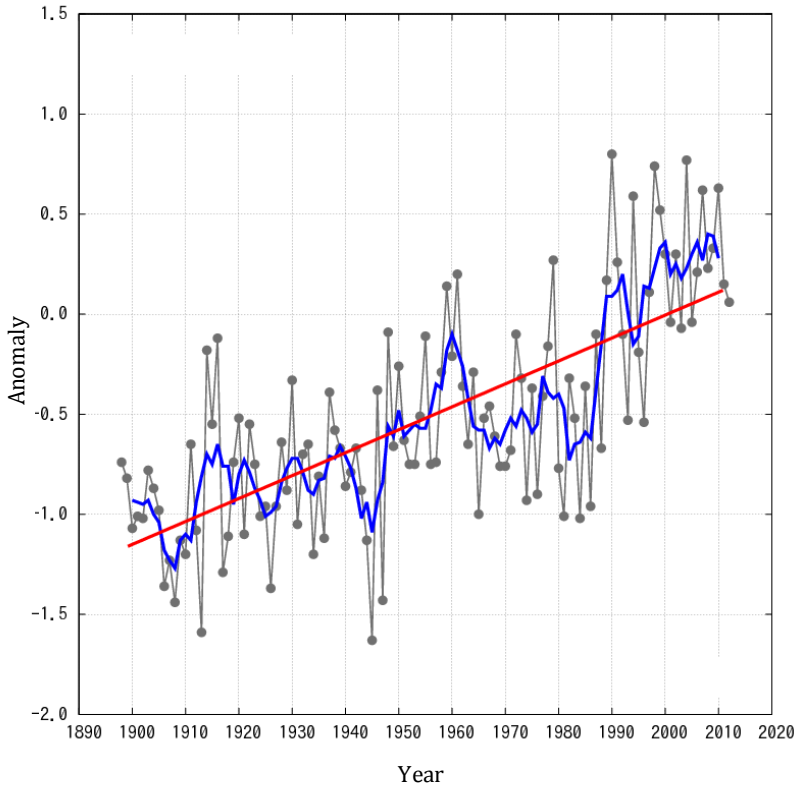


Figure 1.2 Variations in Annual Mean Surface Temperature in Japan (1898–2012)

The bar graph shows anomalies from the normal; the thick line (blue) indicates the five-year running mean, and the straight line (red) represents the long-term trend. The normal is derived from the average of the 30 years between 1981 and 2010.

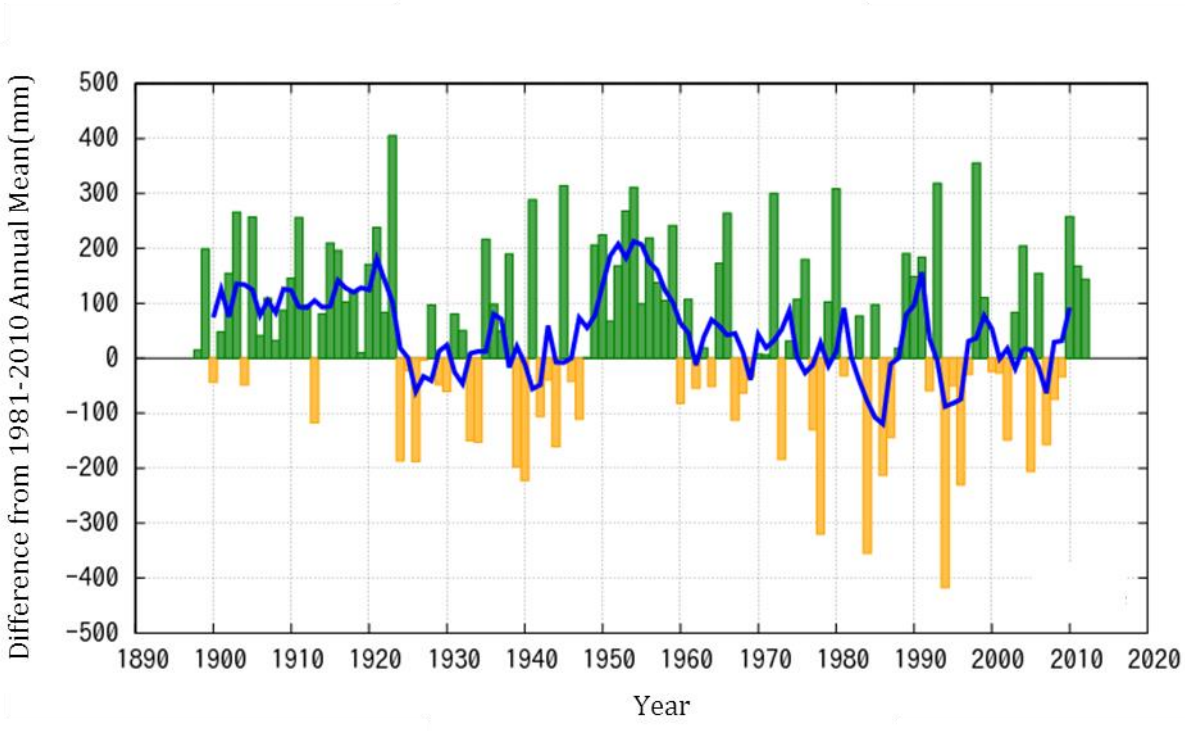


Figure 1.3 Variations of Annual Precipitation Ratios in Japan from 1898–2012

The bar graph shows averages of annual precipitation ratios to normal for 51 stations in Japan (expressed in percentages compared to annual means); the thick line (green) represents the five-year running mean. The normal is derived from the average of the 30 years between 1981 and 2010.
Source: Japan Meteorological Agency

The annual precipitation of Japan (Figure 1.3) does not provide any clear long-term trend. On the other hand, the variations between years have widened since records began in 1898. It is noticeable that there are both more years with a lot of rain as well as years with little rain.

1.3 Population and Households

According to the Population Census, as of October 1, 2012, Japan's population was 128,057,352, representing a 0.2% increase over the October 2005 Population Census. The population density was 343 inhabitants per square kilometer. In line with the falling birthrate and increased average longevity, the proportion of the elderly amongst the population is rapidly increasing at a higher rate than ever, and the population segment aged 65 or older as of 2010 reached 23%. This rate is the highest level in the world.

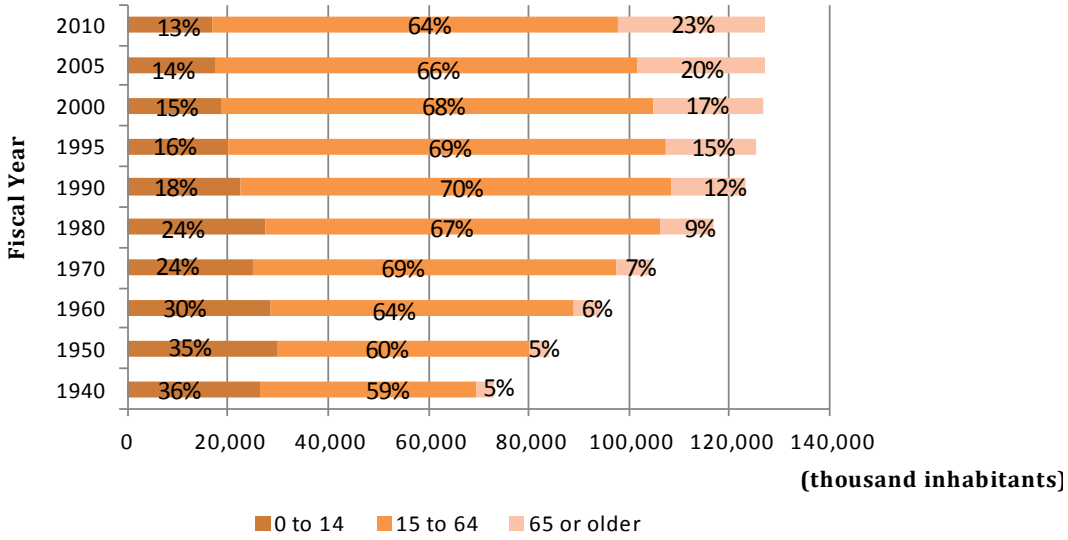


Figure 1.4 Population for Three Age Segments

Source: Ministry of Internal Affairs and Communications, "Population Census"
* (Note) Figures in 1940: Total population excluded foreigners (39,237) except the people in former Japanese territories as Korea, Taiwan, Karafuto and Kanyo-gunto.

One of the major factors behind the aging of the population is the decline in the number of births. The number of births generally increased during the 1960s but peaked in 1973, and has continued to gradually decline ever since. In 2005, the number of births reached the lowest-ever level, and the number of deaths exceeded the number of births, creating a natural decline of 21,266 people. Although 2006 showed a positive figure, natural decline has continued since 2007, resulting in a

record-low natural decline of 125,708 people in 2010. Japan is facing an era of a declining population.

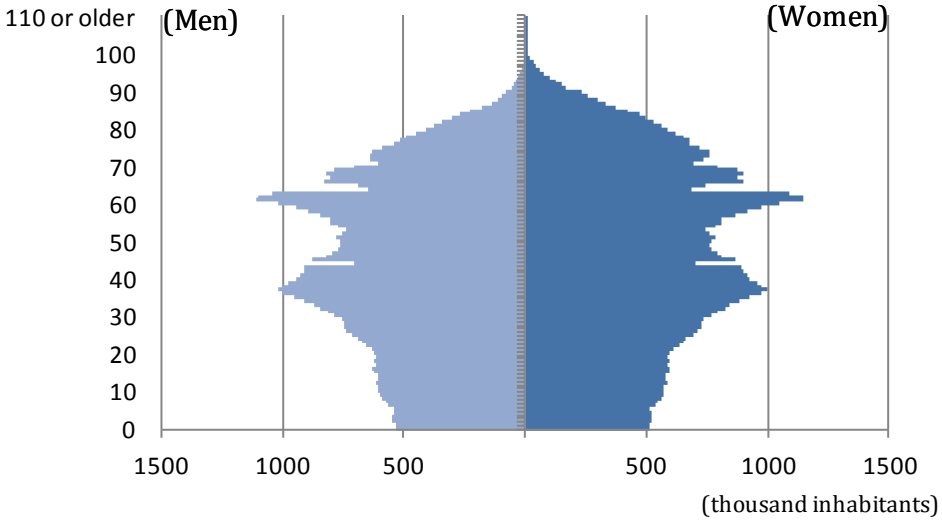


Figure 1.5 Population Pyramid for Japan in 2010

Source: Ministry of Internal Affairs and Communications, "Population Census"

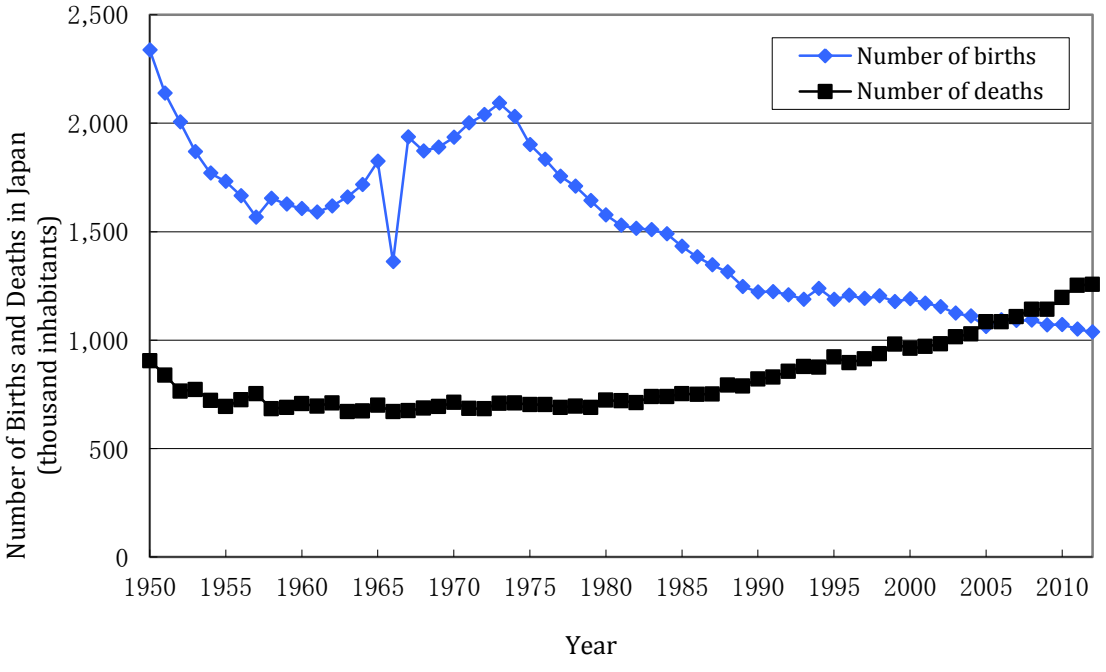


Figure 1.6 Changes in the Number of Births and Deaths in Japan

Source: Ministry of Health, Labour and Welfare, "The Vital Statistics 2012"

During the 1960s, when the economy grew very rapidly, the number of people migrating into Japan's three metropolitan areas substantially exceeded the number leaving, with a net excess immigration into such areas of approximately 500,000 people per year. Further excess immigration has been seen

again since 1996, and since 2004 this excess has been markedly increasing. In addition to the three metropolitan areas, as of October 2010 67.3% of Japan's total population was concentrated in densely inhabited districts,[4] indicating that the concentration of Japan's population in urban regions is advancing.

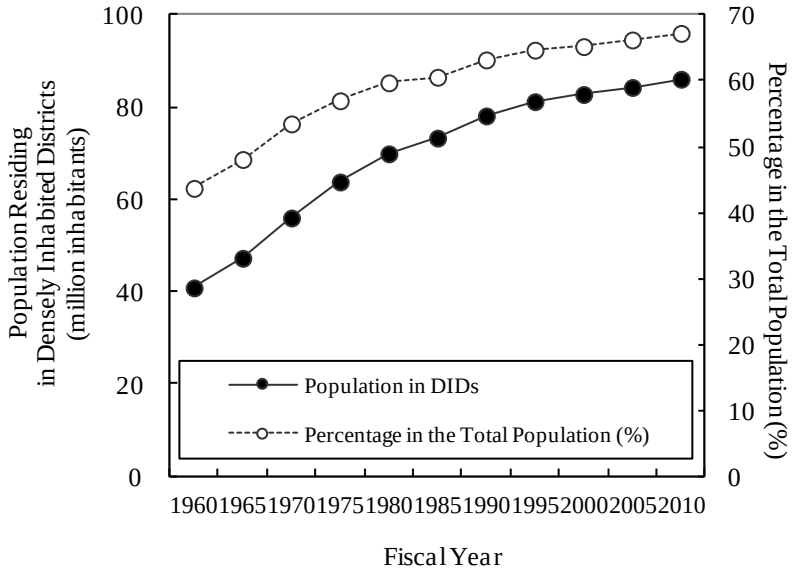


Figure 1.7 Population Residing in Densely Inhabited Districts

Source: Ministry of Internal Affairs and Communications, "Population Census"

In 2010, there were 51.84 million households in Japan, which was the highest level since records began, and 5.7% more than that recorded in the 2005 Population Census. In 2010, the average number of people per household was 2.42 persons. Since 1970, the number of households has continued to increase and the average number of people per household has continued to decline, reflecting changes in household formation patterns, such as a shift from extended families to nuclear families, an increasing number of single-person households, and a reduction in the number of children as a result of the falling birthrate.

[4] Regions within a city, town, or village and adjacent to basic unit districts with a high population density (a population density of at least 4,000 people per square kilometer in principle), and with a population of at least 5,000 people.

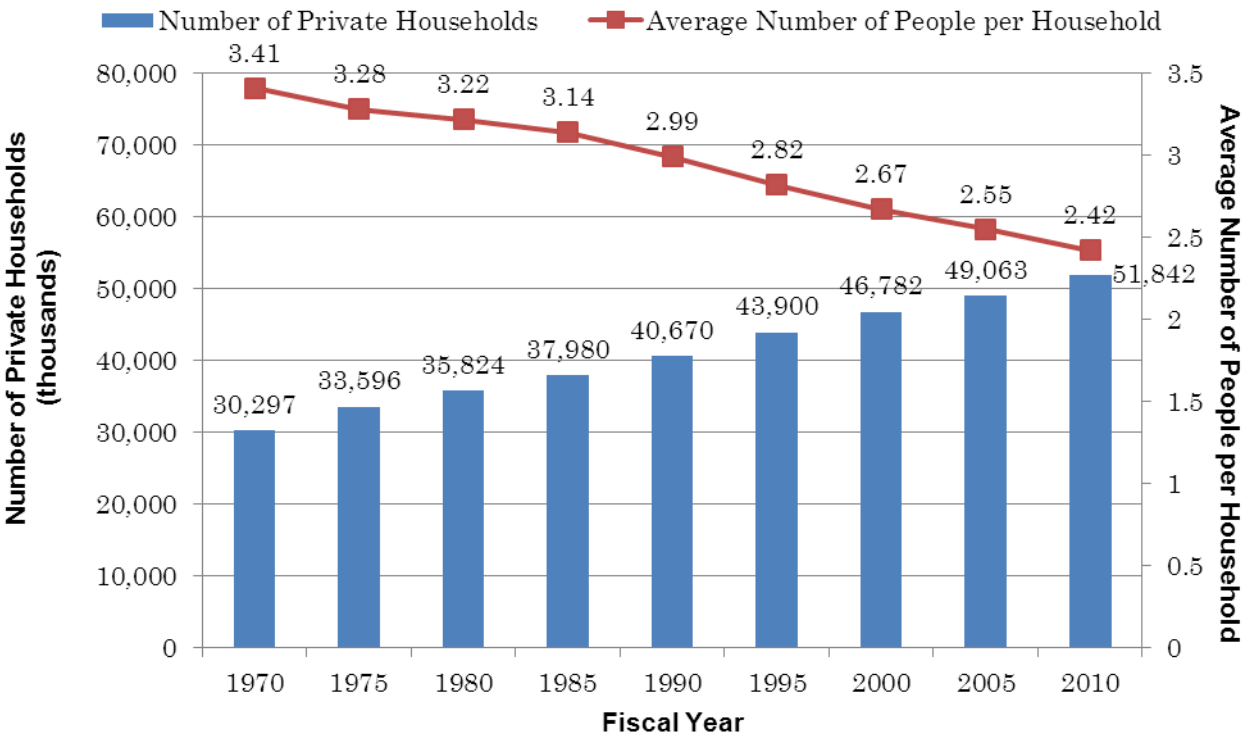


Figure 1.8 Number of Private Households and Average Number of People per Household
Source: Ministry of Internal Affairs and Communications, "Population Census"

1.4 Houses and Commercial Facilities

According to the "2008 Housing and Land Survey of Japan," the total number of houses has reached 57.59 million for a total of 49.97 million households. As a result, the number of houses per household has reached 1.15, representing a continuing improvement.

Meanwhile, in terms of the quality of such accommodations, the average area of floor space per home has risen to 94.13 square meters, demonstrating a steady improvement overall; but when the details are analyzed, a stark contrast can be seen between owned houses (122.63 square meters) and rented houses (45.49 square meters), illustrating the prominence of small rented houses.

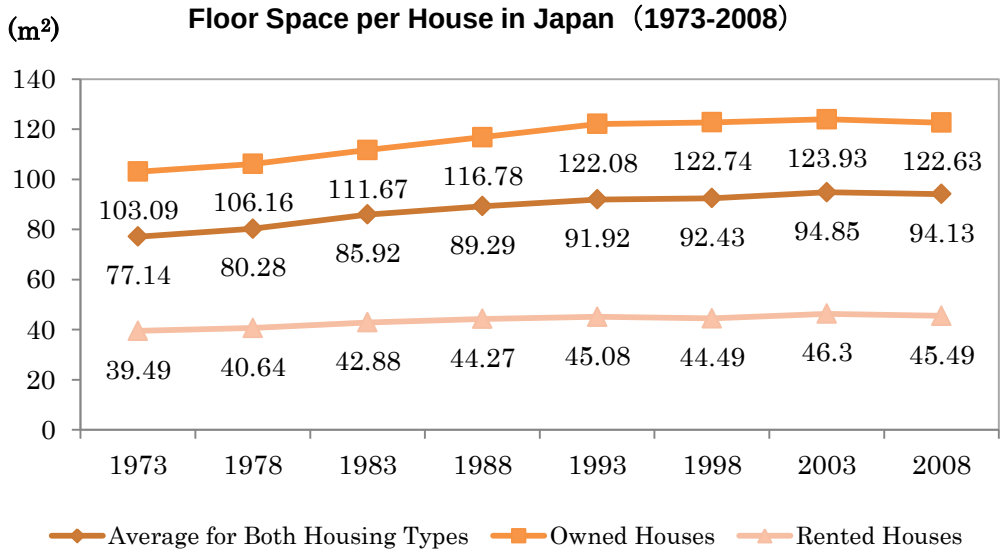


Figure 1.9 Floor Space Area per House in Japan

Source: Ministry of Internal Affairs and Communications, "2008 Housing and Land Survey of Japan"

Since the period of rapid economic growth, the ratio of tertiary industries in Japan has increased in terms of the industrial structure and particularly with regard to employment. The importance of "soft" work, including technology, information, planning, and design, has also increased in each industry, and the weight of indirect sectors has increased. In line with this shift towards service and other tertiary industries, the amount of floor space devoted to the commercial sector has steadily increased. Since 1965, it has increased at an average of 4.1% annually. However, between 2000 and 2011 the annual rate of increase has been in decline, with an annual average of 1.0%.

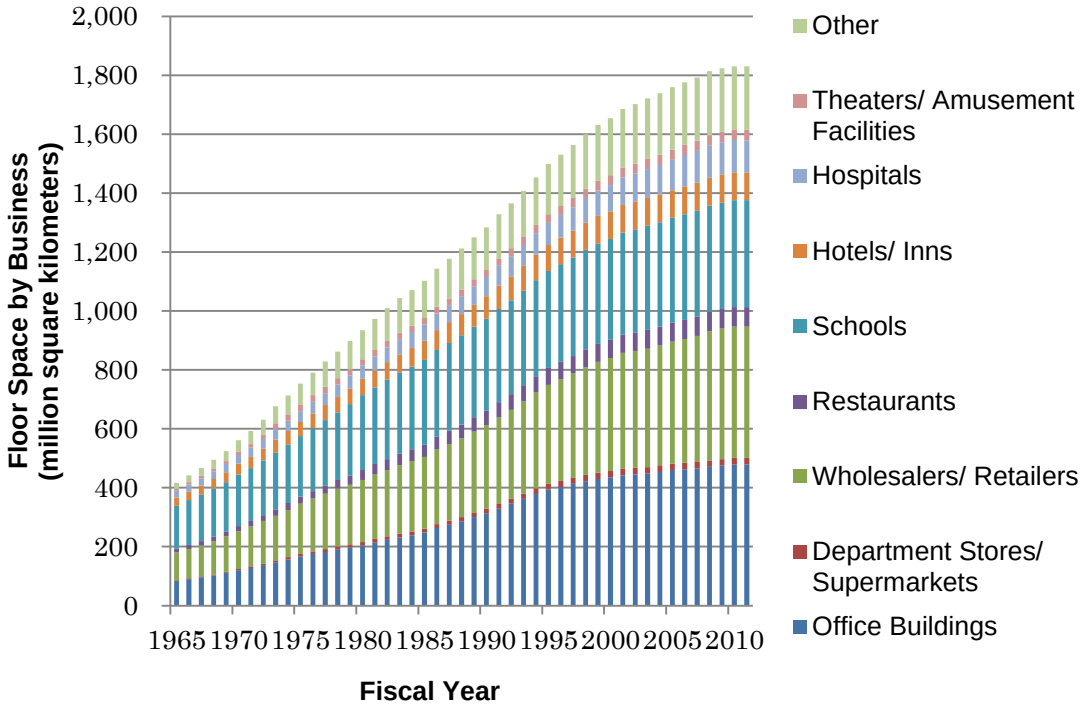


Figure 1.10 Change in the Amount of Floor Space in the Commercial Sector by Business Type

Source: The Institute of Energy Economics, Japan, "Handbook of Energy & Economic Statistics in Japan"

1.5 Japan's Industry and Economy

Japan's real gross domestic product (GDP)[5] became 520 trillion yen in 2012, and per capita real GDP was 4.02 million yen. The process of the growth of the Japanese economy up until the present day is explained below.

Japan's economy grew extremely rapidly in the 1960s, resulting in the significant development of heavy industry, producing such essentials as steel and petrochemical materials. As a result, the Japanese economy increased its consumption of resources and energy. During the same period, the workforce shifted from primary to secondary and tertiary industries. Agricultural production increased despite a reduction in the number of agricultural laborers. Nevertheless, because of the growing income gap compared with other industries, along with depopulation and other factors, the number of younger laborers working in agriculture decreased while the average age of the nation's farmers increased. Japanese forestry was primarily practiced by dispersed, extremely small businesses operating in steep mountainous areas. It was therefore difficult to improve labor productivity, so forestry faced various problems including a price differential versus imported lumber and income disparity with other domestic industries. As a result, depopulation of mountain villages continued, the average age of forestry workers increased, and production stagnated.

[5] Real GDP according to the fixed base year method (base calendar year 2005).

In the 1970s, following the first oil shock (1973), in 1974 Japan's real economic growth rate recorded its first contraction since the Second World War. Economic growth remained sluggish for some time thereafter. At the same time, the impact of the oil shock caused energy-intensive basic industries, such as the steel and petrochemical industries, to lose speed, while high value-added processing and assembly industries, such as electrical appliances and machinery, developed further. As income levels rose, the economy's services and software components expanded. Tertiary industry came to account for over 50% of gross domestic product and total employment. In agriculture, the ratio of vegetables and dairy products increased as Japanese dietary habits changed, and the nation ended up with a surplus of rice.

Following the Plaza Accord of 1985, the yen began to grow ever stronger, severely impacting Japanese export industries in particular. The subsequent structural adjustment of the Japanese economy, however, expanded domestic demand, which in turn enlarged the economy, increased the sector shares of the financial, wholesale and retail industries, and made the prices of land, securities and other assets skyrocket.

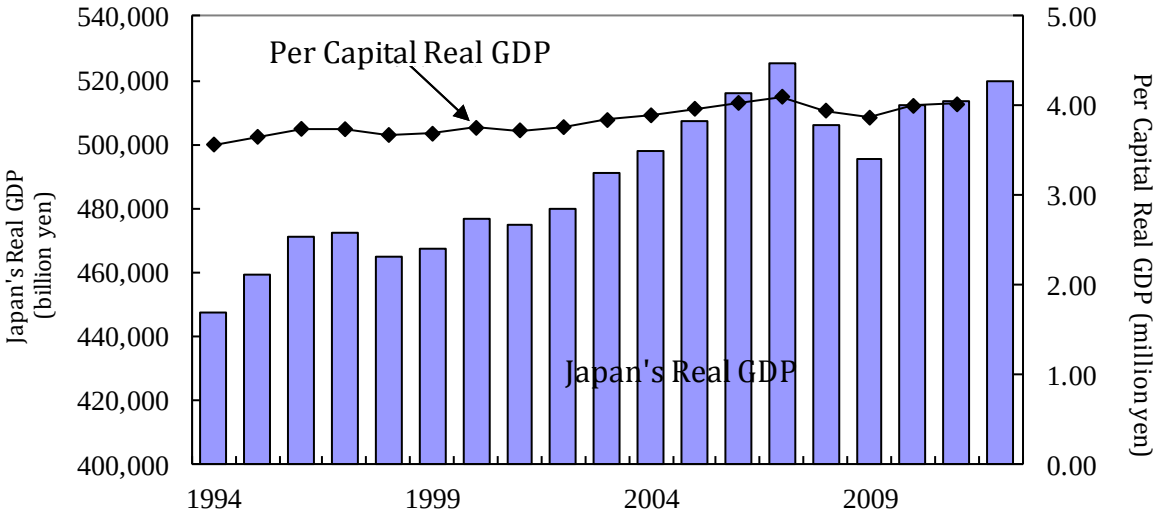


Figure 1.11 Change in Real Gross Domestic Product
(Fixed Base Year Method, Base Calendar Year 2005)

Source: Economic and Social Research Institute, Cabinet Office, Government of Japan, "Annual Report on National Accounts of 2011"

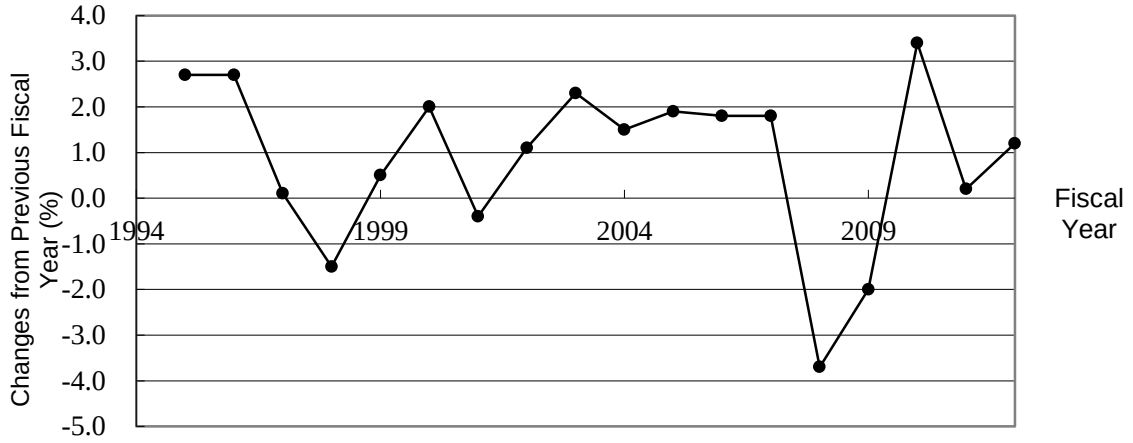


Figure 1.12 Change in Year-on-Year Real Gross Domestic Product Growth Rate (Fixed Base Year Method, Base Calendar Year 2005)

Source: Economic and Social Research Institute, Cabinet Office, Government of Japan, "Annual Report on National Accounts of 2011"

Then, in the early 1990s, the prices of land, securities, and other assets collapsed due to monetary tightening, among other factors. The collapse in asset prices led to a reduction in expenditures on consumables as well as to adjustments in consumer durables and capital stock. These in turn led to the stagnation of economic activities and to irrecoverable debts among the nation's financial institutions. The Asian economic and currency crises also had an impact, and the economy continued to be marked by low growth. For example, in 1998, Japan recorded negative growth. This difficult period for the economy lasted approximately ten years. However, the three excesses – excessive employment, excessive capital stock, and excessive debt – were largely eliminated, and as the financial position of companies strengthened, investment and consumption also began to rise. In addition, at the beginning of 2002, an increase in exports served to revive production, leading to the greatest period of economic recovery since the Second World War, which was longer than the expansion period of the "Izanagi boom" (57 months between October 1965 and July 1970). During this period, the annual mean real growth rate surpassed the 2% level. However, in 2007, during the sixth year of economic recovery, changes in the financial and capital markets originating from the United States subprime housing loan crisis, as well as skyrocketing crude oil and material prices, put pressure on corporate earnings and business confidence, thereby making corporate and household spending behavior more cautious. The direct impact of the economic downturn in the United States became real, and began to impact even exports from Japan. An anticipated wave of economic recovery being transmitted from corporations to households has not been realized, as the corporate sector has been losing its strength.

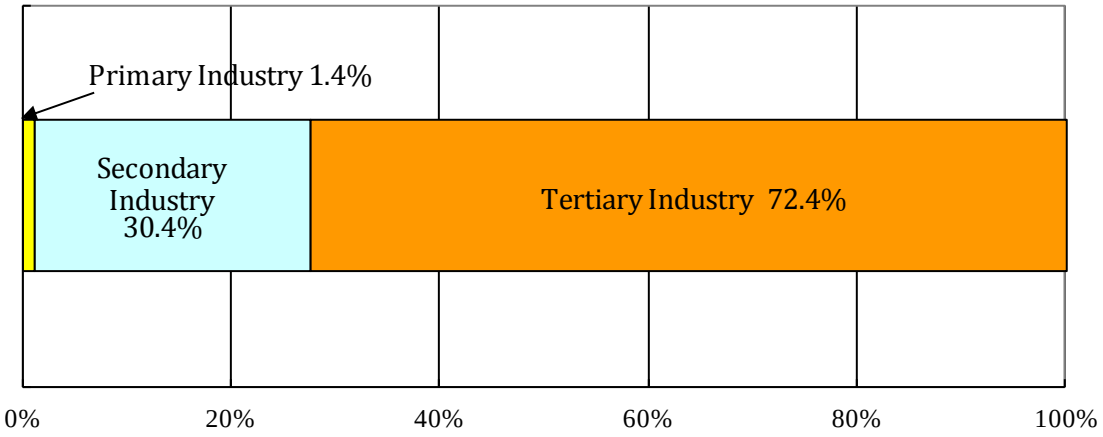


Figure 1.13 Gross Domestic Product by Economic Activity in 2011
(Real Base, Base Calendar Year 2005)

Source: Economic and Social Research Institute, Cabinet Office, Government of Japan, "Annual Report on National Accounts of 2011"

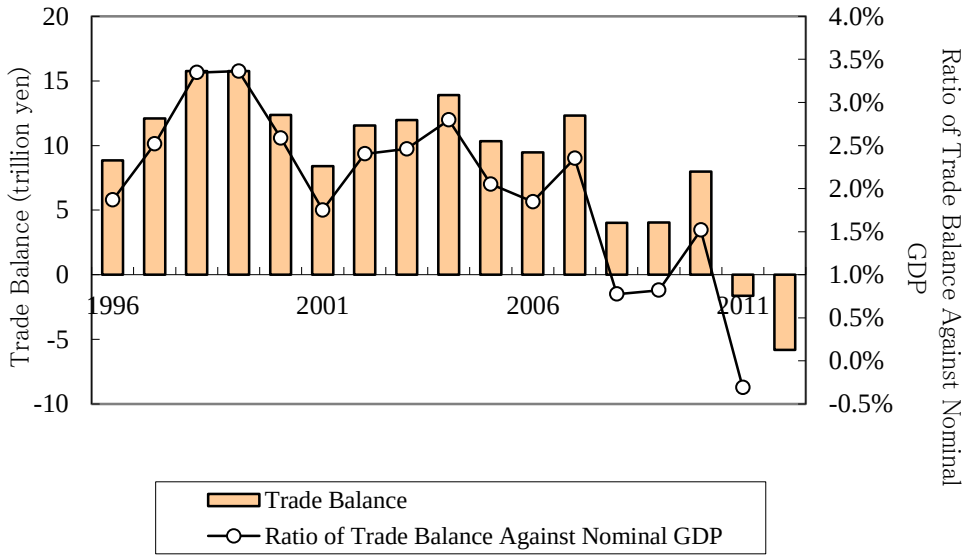


Figure 1.14 Changes in Trade Balance

Sources: Ministry of Finance, "Balance of Payments Monthly;" Economic and Social Research Institute, Cabinet Office, Government of Japan, "National Accounts of 2011"

In terms of the industrial sector, the yen continued to appreciate from the spring of 1990 through the spring of 1995, impacting the processing and assembly industries and spurring on a structural shift among Japanese firms towards greater overseas production. On the other hand, information, telecommunications, and other industries have been recording large growth. In agriculture, competition with foreign producers has intensified as the volume of imports has been increasing sharply. In response, Japanese farmers have been strengthening their operations by moving towards larger-scale production and pursuing other rationalization measures.

Looking at the trade balance, a surplus of between 10 and 15 trillion yen has been recorded each year since the 1980s but the ratio of the surplus to nominal GDP has been declining since its peak year of 1986.

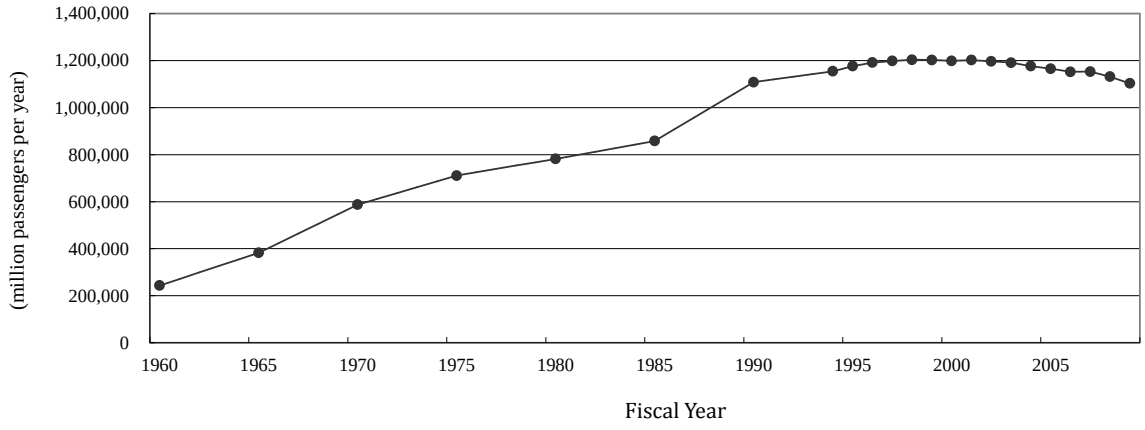
1.6 Transport

1.6.1 Passenger Transport

Domestic passenger traffic grew significantly throughout the period of rapid economic growth as a result of the popularization of automobiles, improvements to the transport system, and the reduction of travelling time accompanying network expansion. Private automobile ownership began to grow from around 1960 in line with the growth of income levels. As a result, rail traffic's share decreased significantly throughout the 1960s as road traffic's share increased significantly. Air traffic represented a small fraction of all traffic, but its transport volume grew significantly due to its timesaving features and the introduction of jet aircraft by domestic airlines, which resulted in an increase in the size and speed of air transport services.

Following the oil shock, the growth in domestic passenger traffic slowed as a whole, but the rise in the standard of living and the increase in leisure time pushed up passenger travel by automobile. The introduction of jumbo jet services, relatively low airfares, and a growing preference for faster modes of transportation caused an increase in the volume of air traffic and its share. On the other hand, the share of railways decreased, sinking to barely above 40% at the end of the 1970s, down from 75% in 1960.

The growth rate of passenger traffic during the early 1980s lowered, but suddenly increased in the latter 1980s along with the economic boom due to the bubble economy. From the 1990s, however, passenger traffic volume, along with the share of each transportation mode, has remained almost constant.



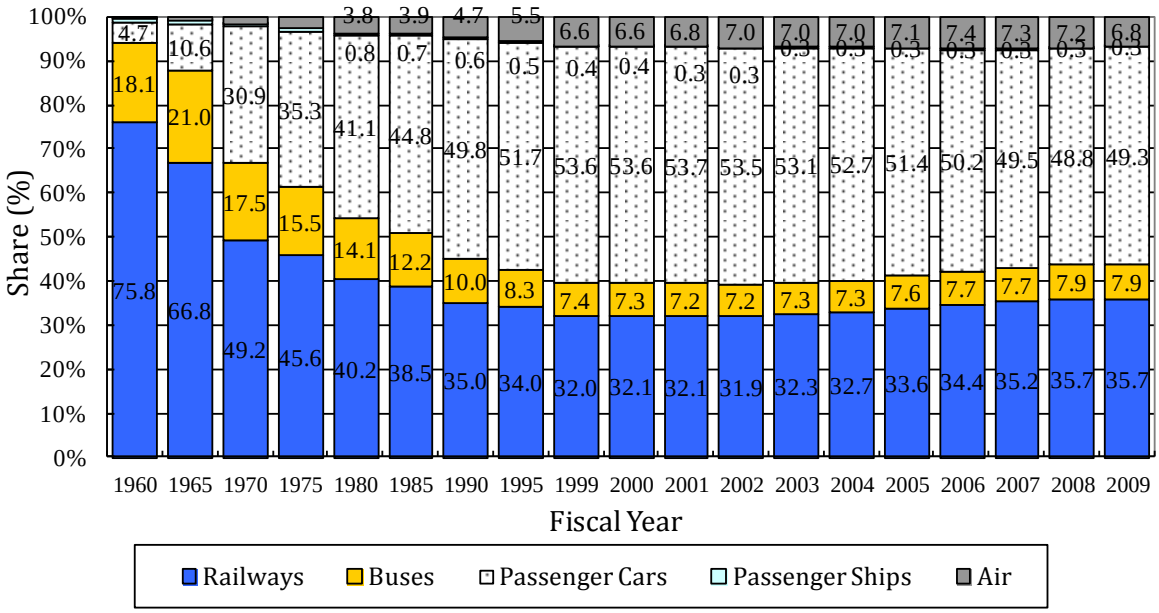


Figure 1.15 Volume of Domestic Passenger Traffic (above) and Modal Shares (below) in Passenger-Kilometers[6]

Source: Ministry of Land, Infrastructure and Transport, "Domestic Transportation Statistics Handbook"

1.6.2 Freight Transport

Domestic freight traffic followed the same upward path as the economy during the period of rapid economic growth. Freight road transport showed especially rapid growth, because of an increased demand for the transportation of relatively light processing components and shortened transport distances as industries moved their offices to coastal complexes near major cities. With the shift from coal to oil as an energy source and the development of heavy industry in coastal areas, domestic sea freight traffic grew, mainly carrying raw materials for the petrochemical, steel, cement, and other key heavy industries. In contrast, the growth of freight traffic by rail barely increased.

The first oil shock in 1973 sharply decreased domestic freight traffic in FY1974 and 1975. Freight traffic then gradually increased until FY1979 as the transport of civil engineering-related cargos grew due to robust public works expenditures resulting from policies to stimulate the economy. When the second oil shock struck in 1979, however, domestic demand and shipments of basic and material industries again stagnated and freight traffic shrank as oil consumption decreased with the conversion from oil to other forms of energy.

[6] Passenger cars do not include light motor vehicles or household freight vehicles. Numeric data on passenger cars for fiscal 1994 does not include figures for Hyogo prefecture between January and March 1995 due to the Great Hanshin-Awaji Earthquake.

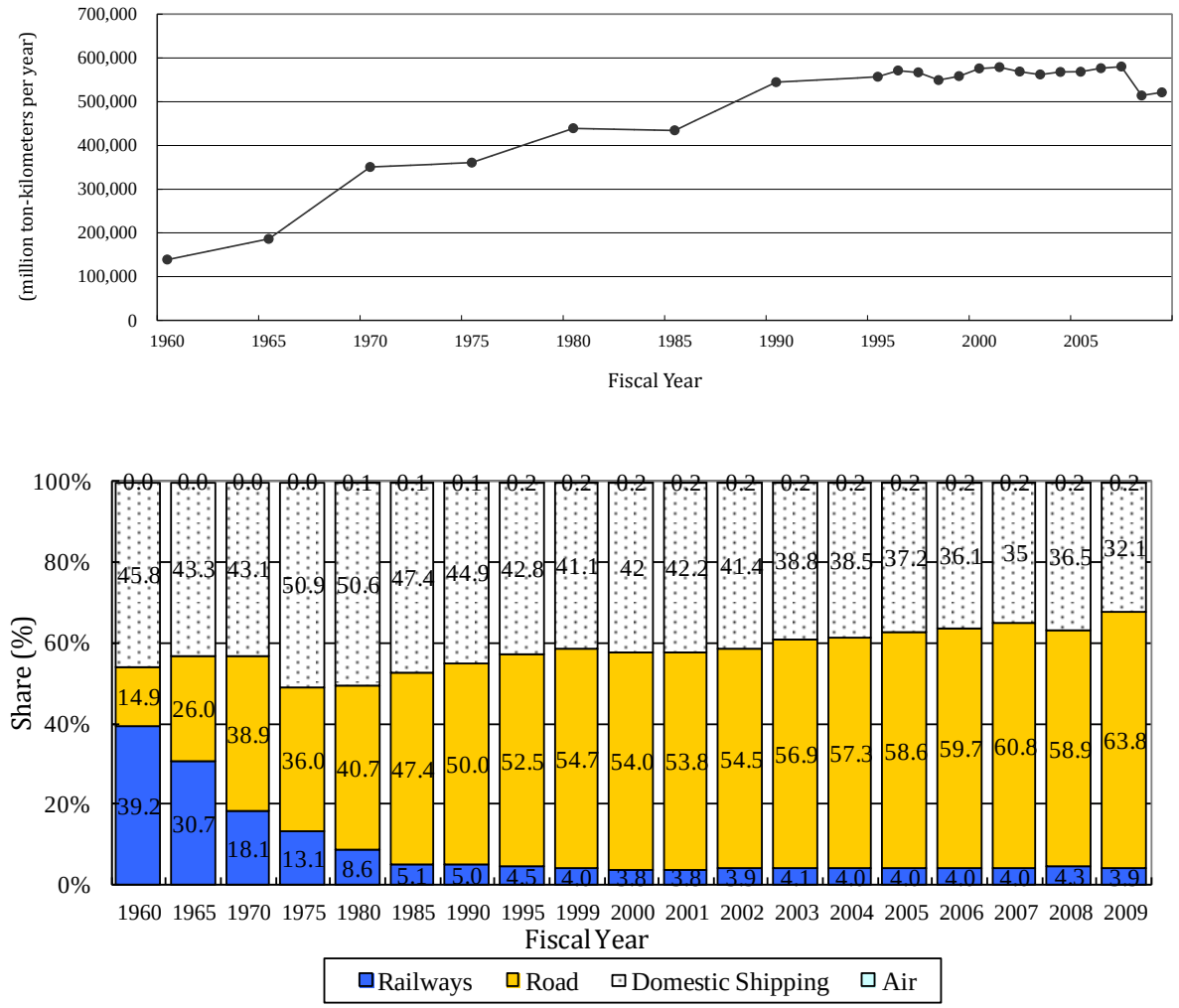


Figure 1.16 Domestic Freight Traffic (above) and Modal Shares (below) in Ton-Kilometers[7]

Source: Ministry of Land, Infrastructure and Transport, "Domestic Transportation Statistics Handbook"

From the 1980s, Japan experienced industrial restructuring, including a shift from basic materials to processing and assembly, the growth of knowledge-intensive industries, and the transformation of the industrial structure towards tertiary industries. Transport demand generated through industrial activities has been reduced in line with the shift to a service-oriented economy. As a result, freight traffic remained generally flat during this period, and decoupled from economic growth. In the latter half of the 1980s, freight traffic increased due to a major economic expansion led by domestic demand. The modal share of road freight traffic topped 50% in 1987, as the characteristics of truck transport met the need for high-frequency small-lot transportation brought on by the advance of the small-volume production of a wide variety of products, and as small packet delivery services were upgraded. As a result of the decline in the basic material industries, growth of domestic sea transportation remained rather slack overall, but it showed some growth with the economic expansion

[7] Passenger cars do not include light motor vehicles. Numeric data on passenger cars for fiscal 1994 does not include figures for Hyogo prefecture between January and March 1995 due to the Great Hanshin-Awaji Earthquake.

in the late 1980s. Domestic sea shipments exceeded their second oil shock freight traffic level in FY1990. Although the share of airfreight was small, it has been growing to meet the demand for shipping relatively small, light items including machine parts, fresh foods, and books. The share of rail freight transportation has steadily declined, but the advance of containerized transport in recent years has slowed this decline.

The total freight volume (ton-kilometers) has remained generally flat since FY1991 due to the impact of streamlined distribution and changes in the industrial sector following the collapse of the bubble economy at the beginning of the 1990s. However, on a ton basis, volumes have been slightly decreasing since their peak in FY1991.

1.6.3 Motor Vehicle Traffic

Road transport accounts for a large portion of both passenger traffic and freight traffic. In this section, trends in the number of motor vehicles owned and vehicle mileage are both explained. Changes in the number of motor vehicles owned show that total motor vehicle ownership has increased consistently since the 1960s, but has been flat in recent years.

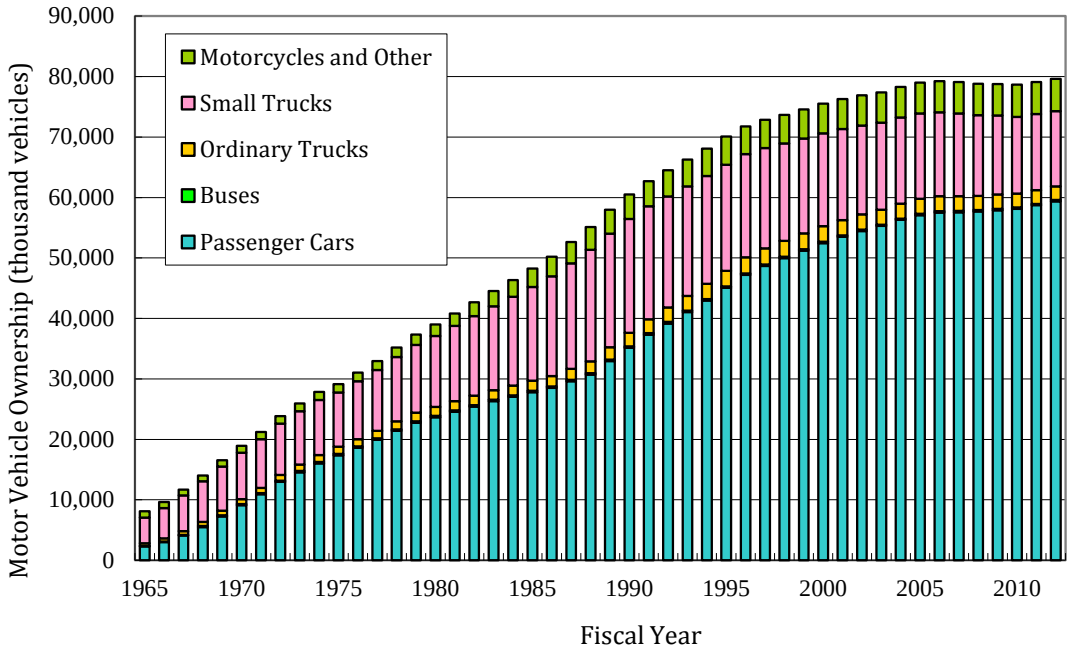


Figure 1.17 Motor Vehicle Ownership[8]

Source: Ministry of Land, Infrastructure and Transport, "Annual Statistical Report for Motor Vehicle Transport;" Automobile Inspection & Registration Information Association, "Statistical Data for Motor Vehicle Ownership"

Motor vehicle mileage was on an upward trend until 2003, and began to decline in 2004. This was due to a decrease in the number of freight vehicles and business-use passenger cars in addition to the

[8] "Passenger cars" includes lightweight cars. "Small trucks" includes lightweight trucks. Special categories of small-size vehicles, Type I motorcycles (up to 50 cc) and Type II motorcycles (up to 125 cc), are not included.

decline in the number of household-use passenger cars, which had been increasing until 2003. The decrease in mileage for household-use passenger cars can be attributed to a change in people's perception of cars, such as a decrease in the number of people who enjoy leisure-time driving.

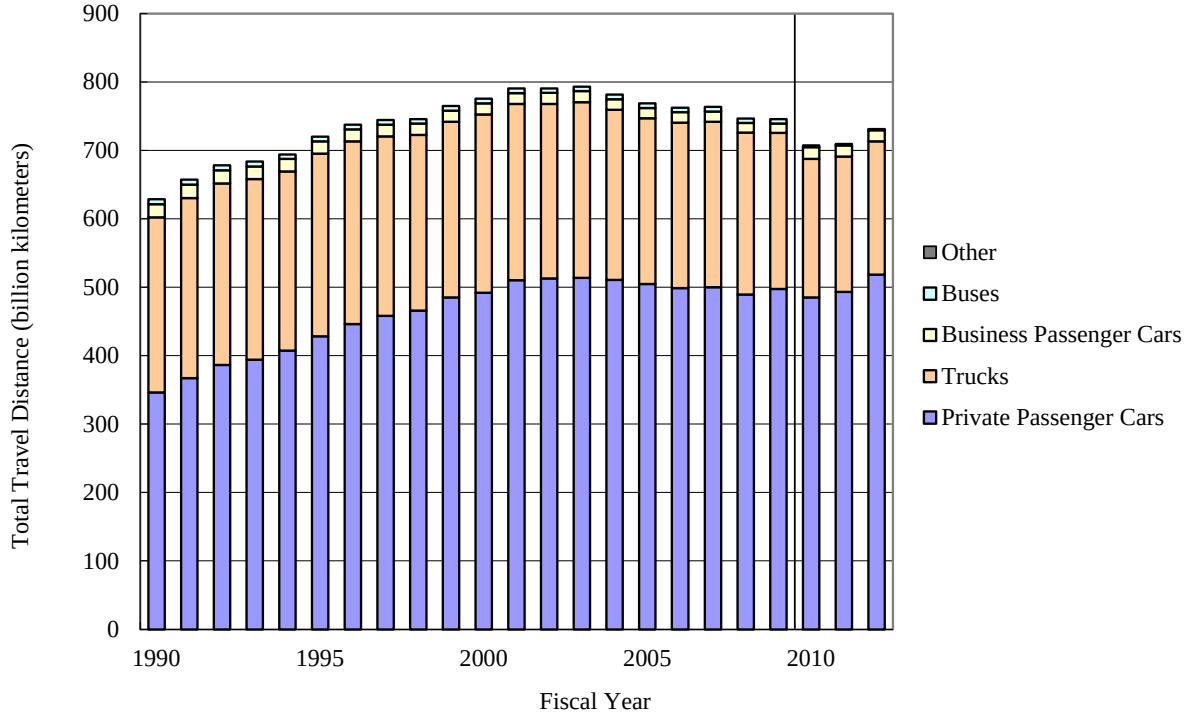


Figure 1.18 Change in Vehicle Total Travel Distance

Source: Ministry of Land, Infrastructure and Transportation, "Annual Statistical Report on Automobile Transport" and "Annual Report on Fuel Consumption of Automobiles"

※1: Since the survey and counting methods used in the "Annual Statistical Report on Automobile Transport" changed in October 2010, the data before FY2009 has a gap compared to the data after FY2010. Therefore, the data after FY2010 uses figures from the "Annual Report on Fuel Consumption of Automobiles." It must be noted that continuity of the data is not necessarily ensured.

※2: "Other" is the total of "other LPG automobiles" and "CNG automobiles" in the "Annual Report on Fuel Consumption of Automobiles."

With regard to passenger cars, which account for a large proportion of the total number of owned vehicles, preferences have shifted to luxury vehicles and RVs since 1980. The ratio of heavier vehicles has increased, due in part to safety measures. In particular, excluding light motor vehicles, there is a marked trend for ordinary passenger cars and compact passenger cars to increase in size, and the ratio of passenger cars 1,000 kilograms or lighter in FY2010 was approximately 37.2% fewer than in FY1980. Meanwhile, during the same period the number of passenger cars between 1,001 kilograms and 1,500 kilograms increased by nearly 2.9 times, while the number of passenger cars 1,501 kilograms or heavier increased 67.0 times.

However, the rise in ownership of ordinary and compact passenger cars recently peaked, and the share of lightweight cars is increasing overall. The average weight of lightweight cars has also been increasing following legislation to improve their safety implemented in 1994. Nevertheless, as they

are still relatively lighter than ordinary and compact passenger cars, the increase in average weight of all passenger cars has peaked.

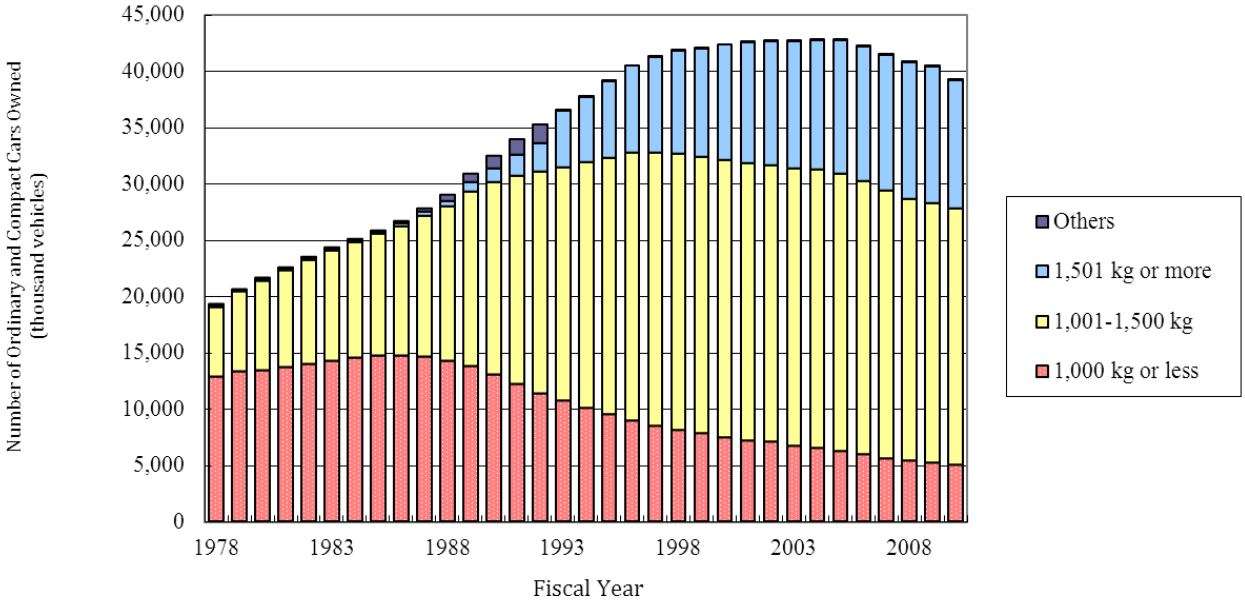


Figure 1.19 Increase in Size (Weight) of Ordinary and Compact Passenger Cars[9,10]

Source: Automobile Inspection and Registration Association, "Car ownership by category"

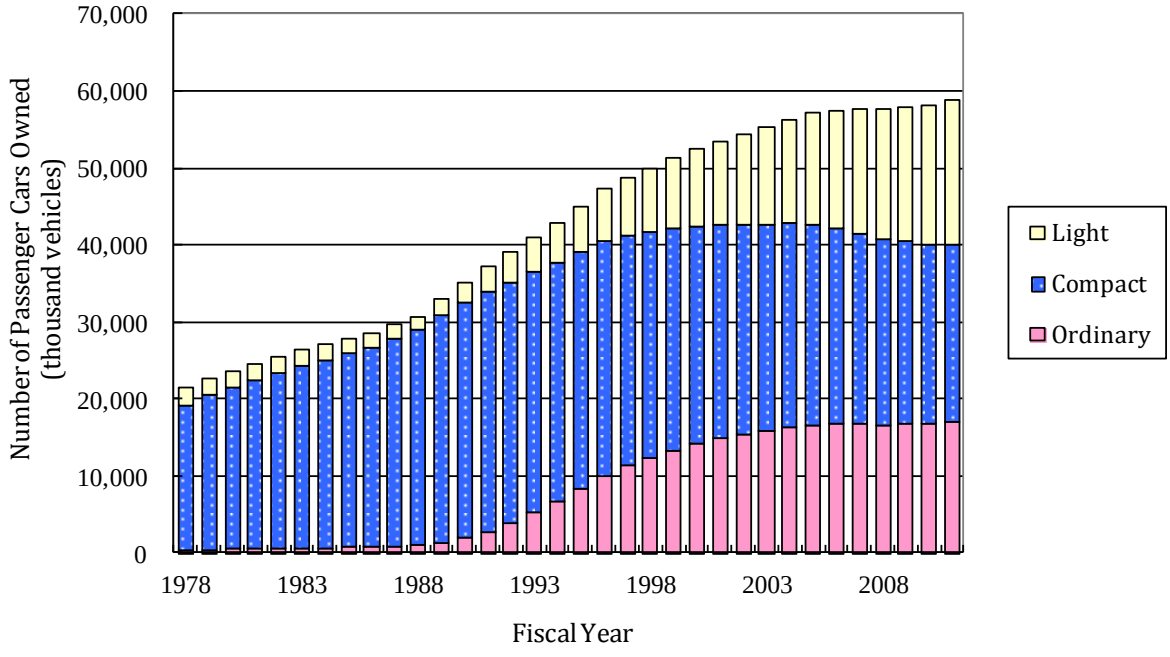


Figure 1.20 Ownership of Passenger Cars (Ordinary, Compact, and Lightweight)

Source: Automobile Inspection and Registration Association, "Car ownership by category," "Car Ownership"

[9] Lightweight cars are not included. Minivans, etc., that weigh 1,501 kg or more were included under "Other" until 1992, but they are categorized by weight from 1993 onwards.

[10] "Other" includes vehicles for which a category assignment is unclear.

1.7 Energy

1.7.1 Consumption

Final energy consumption continued to increase significantly with the Japanese economy's rapid growth until the 1970s (Phase I). It then leveled off following the two oil shocks of the 1970s, followed by a period represented by a downward trend (Phase II). A strong economy and relatively lower crude oil prices in the late 1980s, however, pushed consumption to increase again (Phase III), after which it has nearly leveled off since 2000 (Phase IV). Energy consumption in FY2011 was $14{,}527 \times 10^{15}$ J.

These trends can be summarized for different consumption sectors as follows. Until the first oil shock in 1973 (Phase I), energy consumption in the industrial, commercial and residential, and transport sectors grew rapidly. From FY1973 until FY1986 (Phase II), energy consumption in the commercial and residential sector and transport sector continued to grow, but industrial energy consumption began to decrease. From FY1986 until FY2000 (Phase III), the strong economy and drop in crude oil prices in the latter half of the 1980s boosted energy consumption in all four sectors. From 2001 onward (Phase IV), energy consumption in the industrial and transport sectors has decreased overall, but energy consumption in the commercial and residential sector has continued to increase. The share of final energy consumption for Japan in FY2011 was 43% for the industrial sector (including non-energy uses), 34% for the commercial and residential sector, and 23% for the transport sector.

Energy consumption trends differ according to the type of energy in question. Electricity and city gas consumption have grown without interruption; in FY2007, they were 2.5 times and 4.3 times their FY1973 levels, respectively. The commercial and residential demand for electricity, which includes the total consumption for electric lighting and commercial power, accounted for 70% of the overall demand, and the growth in demand was led by commercial and residential consumption. In the residential sector, this increase was spawned by the rapid spread of electrical equipment due to a higher standard of living, while in the business sector the increase was supported by a larger number of office buildings and the swift diffusion of office automation equipment in response to economic informatization and the advancement of the services industry. The electrification ratio[11] was 12.7% in FY1970 and reached 26.1% by FY2011. City gas consumption was once centered on the residential sector, but the share for residential consumption has fallen below 50% since the 1990s, while the shares for industrial and commercial gas consumption have increased and exceeded 50% in 2010. The reasons for this jump can be attributed to factors such as the implementation of a payment system that realizes large-scale and heavy-load industrial demand (with minimal fluctuation in usage amounts between seasons) for major general gas companies that have introduced LNG, the advancement of technological innovation related to city gas systems, and the demand for a response to global environmental problems. Coal consumption has gradually increased at a rather steady pace, while oil

[11] The electrification ratio is the ratio of consumed electricity within "Final Consumer Energy Consumption" as shown in the "General Energy Statistics."

consumption increased during Phase I and Phase II, but then gradually decreased during Phase III and Phase IV.

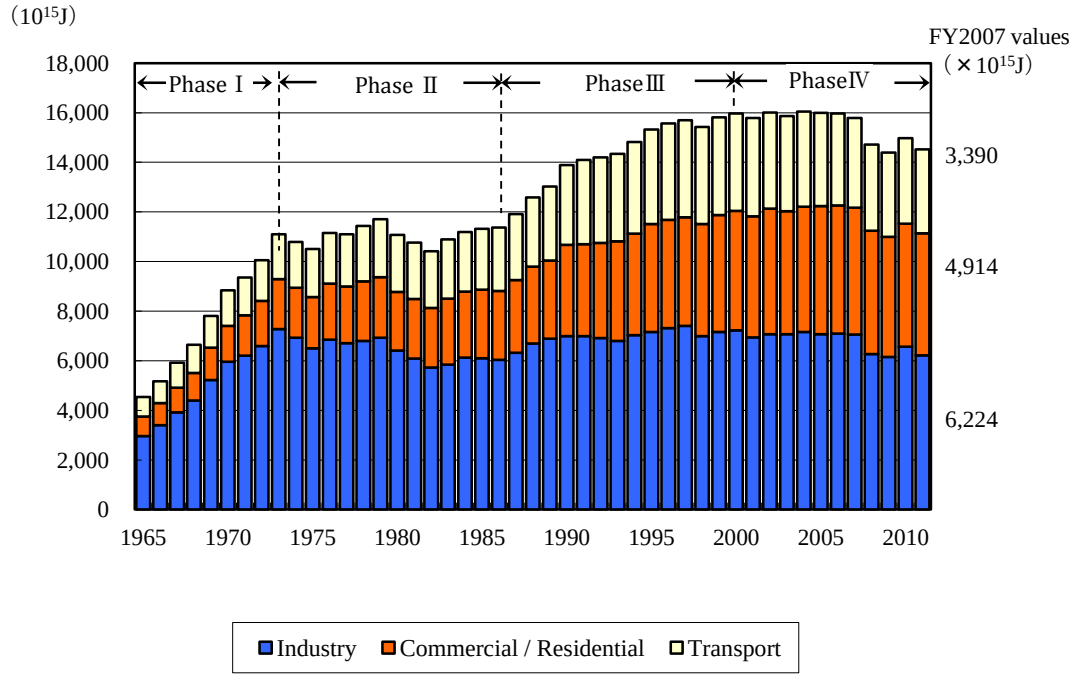


Figure 1.21 Final Consumer Energy Consumption[12]

Source: Based on the data from 'Agency of Natural Resources and Energy, "General Energy Statistics"'

1.7.2 Supplies

Japan has almost no domestic fossil fuel resources. The ratio of domestic production volumes for the total fossil fuel supply volume is 0.4% for crude oil and 3.1% for natural gas (all data as of FY2011). Japan's dependence on foreign energy sources peaked in FY1973 at 88.6% of its energy supply. Although this dependence has been reduced since then by efforts to find substitutes for oil, in recent years foreign dependence has remained at about 80%, putting the nation in a vulnerable energy supply situation.

Japan's total primary energy supplies reflect increases in final energy consumption; supplies continued to grow at a substantial rate until FY1973 but leveled off after the first oil shock. After FY1986 there was another surge of growth, but supply has leveled off again in recent years. In FY2011, Japan's total primary energy supply was $21,960 \times 10^{15}$ J.

[12] Figures for the industrial and transport sectors include non-energy use. Furthermore, the compilation methods of the "General Energy Statistics" for FY2001 and before and for FY2002 onwards are different, and it should also be noted that there are points where data for FY1989 and before differs from data for FY1990 and onwards.

Oil supplies grew continuously during Phase I, and shrank in Phase II due to the promotion of oil substitution policies and energy conservation policies implemented in response to the oil shock. In Phase III, oil supplies increased overall due to Japan's strong economy and a drop in crude oil prices. However, they have been decreasing since FY1995 for reasons such as the promotion of substitute energy sources, for example. Coal supplies have gradually increased, while natural gas and nuclear energy supplies have increased significantly.

Different energy sources have contributed different shares of the total primary energy supply: during Phase I, oil increased its share while coal and hydroelectric power decreased. As a result, oil's share of total primary energy (the "oil dependency" rate) rose to a peak at 77% in FY1973, and the oil dependency rate then began to decrease with the promotion of substitute energy sources including nuclear energy and natural gas, the introduction of coal, and the development of new energies. This resulted in a significant decrease in the share of oil supplies during Phase II, and its share was 46.1% in FY2011. At the same time, natural gas rapidly increased its share, reaching 21% (from 2% in FY1972) in FY2007. With regard to the nuclear energy generation, despite its increase during Phase II, it slowed down its increase in FY2011 and the share fell into 4% compared with 1% of FY1972 due to the impact of the Great East Japan Earthquake. The share of coal also increased to reach 21% (from 15% in FY1972) in FY2011.

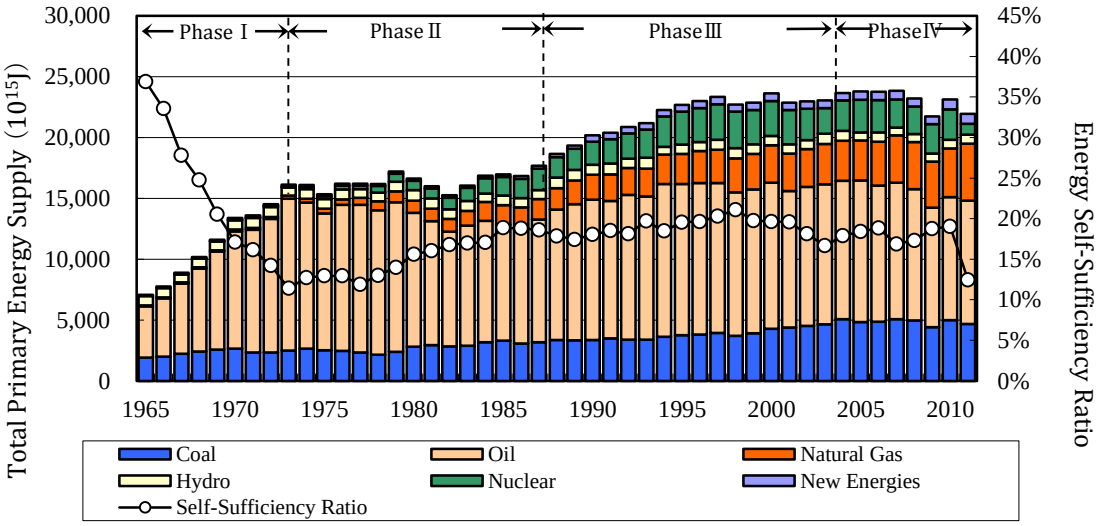


Figure 1.22 Total Primary Energy Supply and Self-Sufficiency Ratio[13]

Source: Based on the data from 'Agency of Natural Resources and Energy, "General Energy Statistics"'

Total electric power generation in FY2007 was 2.5 times greater than FY1973 levels. In FY2011, the sources of electrical power generation were nuclear power (10.7%), coal-fired thermal power (25.0%), LNG thermal power (39.5%), oil and other thermal power (14.4%), and hydroelectric power (9.0%).

[13] "New energies" includes geothermal heat.

The power generation from nuclear power in FY2011 amounted to 101.8 billion kWh which was substantially decreased from the figure in FY2010 (288.2 billion kWh) due to the impact of the Great East Japan Earthquake and consequent decline of the nuclear power generation. Coal power generation in FY2011 amounted to 239.2 billion kWh, which was approximately 14 times greater than the 1973 level. LNG power generation reached 377.2 billion kWh in FY2011, which was nearly 42 times the level in 1973. Oil power generation dropped dramatically, amounted to 137.3 billion kWh in FY2011, which was approximately 30% of the 1973 level. The drop in oil usage is due to a shift from base and middle load power resources to peak power optimization by such means as beginning new nuclear power operations and increasing operating efficiency. Since FY2007, oil-fired power generation levels have risen on a short-term basis in order to make up for a shortfall in power generation from nuclear generation. The development of hydroelectric power commenced before the Second World War. Development of large-scale hydroelectric power plants has been substantially completed and their power generation amounts generally continue to remain flat. The amount of hydroelectric power generation in FY2011 was 86.3 billion kWh, a level 1.3 times higher than in FY1973.

1.7.3 Per Capita Total Primary Energy Supply and Total Primary Energy Supply per Unit of GDP

Japan's total primary energy supply per capita as of 2011 is 172×10^9 J, and has been declining in recent years.

Japan's total primary energy supply per unit of GDP (total primary energy supply per gross domestic product) increased during Phase I, but has improved significantly since Phase II. This is a result of the introduction of world-leading energy-saving facilities and technologies brought about by the oil shock. Levels remained generally static during Phase III. This was due to the significant contribution of the industrial sector's extensive investments in energy-saving reductions, which had already shown a marked decrease in energy input per unit of output, as well as increased energy consumption in the commercial, residential, and transport sectors in line with the public's pursuit of a more comfortable and affluent standard of living. In Phase IV, amounts declined overall in response to changes in the industrial sector's structure and a shift to reductions in the transport sector.

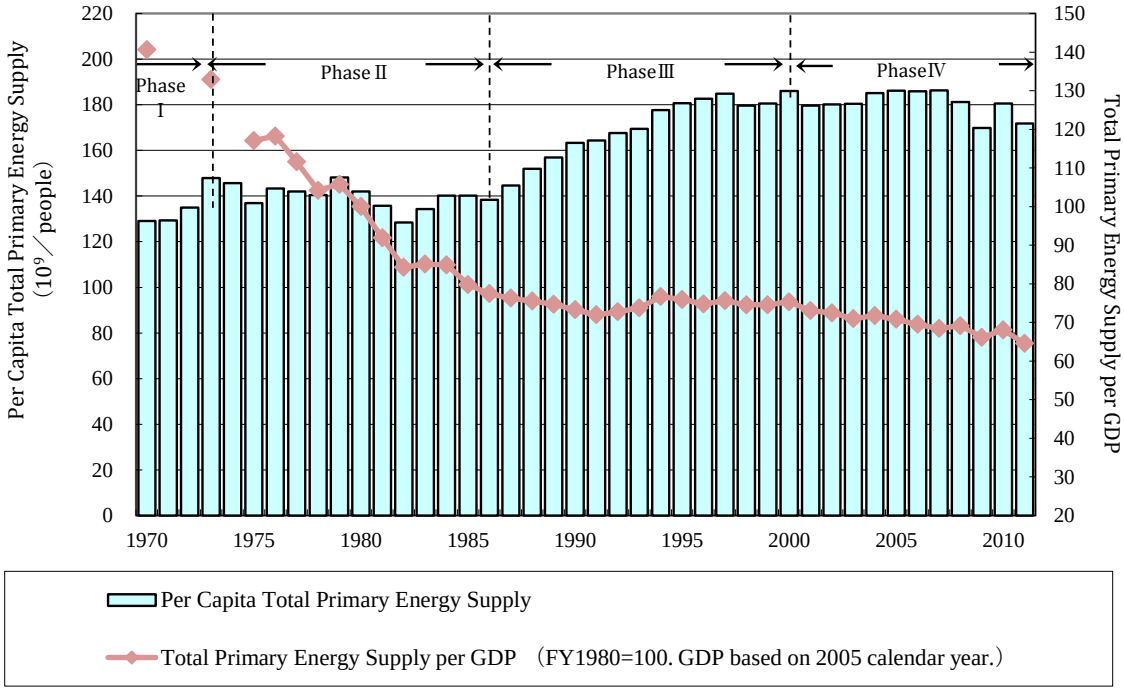


Figure 1.23 Per Capita Total Primary Energy Supply and Total Primary Energy Supply per GDP

Sources: Based on the data from 'Agency of Natural Resources and Energy, "General Energy Statistics;" Economic and Social Research Institute, Cabinet Office, Government of Japan, "Annual Report on National Accounts;" Ministry of Internal Affairs and Communications, "Population Census" and "The Annual Report on Current Population Estimates"'

1.7.4 Prices

Imported energy price was low and shifted stable during Phase I; prices skyrocketed as a result of the two oil shocks, peaking in FY1981 then beginning to fall, and have been steady since FY1986. Partially due to the substantial appreciation of the yen, the FY1990 yen-denominated real price of crude oil[14] was only slightly higher than it was prior to the oil shock.

Crude oil prices shot up temporarily at the outbreak of the 1990 Gulf War, but soon returned to the prior prevailing levels. In 1996, however, the price of crude oil topped US$20 a barrel, due to the strong growth of worldwide oil demand, the low inventory system for crude oil, oil products adopted by international oil companies in an effort to reduce costs, and the unstable political situation in the Persian Gulf region.

[14] Crude oil prices are adjusted using an indicator (deflator) to correct for price fluctuations after converting dollar-based crude oil prices to yen using an exchange rate from the period concerned.

As stated above, in the first half of the 1990s, the price per barrel changed to around US$20, but the crude oil price fell to US$10 per barrel when global oil stocks increased in line with a slowdown in the rate of demand, mainly in Asia. This was a result of the faltering Asian economy during the financial and currency crises from 1997 to 1998. Soon after, crude oil prices increased to the lower US$30s per barrel level as the OPEC countries repeatedly reduced production and Asian economies began to recover, among other factors. The September 11, 2001 terrorist attacks on the United States led to a slowdown in the world economy and, as a result, crude oil prices fell to low levels.

However, after the price of crude oil per barrel bottomed out at US$17 (OPEC basket) in January 2002, it began to rise dramatically. Even though the price briefly fell in December 2004, it once again began to rise, and in 2005 remained above US$40 per barrel.

Crude oil prices continued to skyrocket and surpassed the price levels of the second oil shock, even recording a CIF import price of US$136 per barrel in August 2008. Nevertheless, CIF prices began to drop, and the price after 2009 declined to US$40 per barrel. This was due not only to the fall in global crude oil prices from mid-July 2008, but also the appreciation of the yen (Figure 1.24). In the context of crude demand rising to recovery, the CIF price rose to US$52 per barrel in May 2009, and to around US$70 in July of the same year as economic stimulation measures were implemented by various nations. Since 2010, the price has fluctuated between US$74 per barrel and US$127, generally on an upward trend, and it was priced at more than US$100 as of April 2012.

There are various reasons for skyrocketing crude oil prices, including: (1) a marked growth in demand for oil in the Asia-Pacific region, particularly in China and India, due to their high levels of growth; (2) the reduction in oil production in non-OPEC oil-producing countries, and specifically the significant decline in the United States' oil production in response to Hurricane Katrina in August 2005; and (3) the influx of funds into the oil market from investments by speculators.

Crude oil prices dropped drastically following the financial crisis in September 2008, which can be ascribed to reasons such as: (1) a significant reduction in OECD demand, as well as a quick deceleration in the growth of non-OECD demand, due to the impact of a rapidly worsening real economy; and (2) the increase in the withdrawal of funds from the crude oil futures market in order to evade risk following the financial crisis-induced credit crunch, as well as the accelerating concern over the future of the United States and global economies.

In Japan, the ratio of fossil fuels to all imports is falling (at a rate of 10% to 20%) due to oil substitution and energy-saving policies, both implemented after the oil shock, as well as the effects of yen appreciation on crude oil transactions conducted in US dollars. In addition, due to the transformation of the industrial sector, the structure of the Japanese economy is changing into a form that is resilient to the impact of rising crude oil prices. Thus the impact on the Japanese economy of these skyrocketing crude oil prices is relatively low compared with the first and second oil shocks.

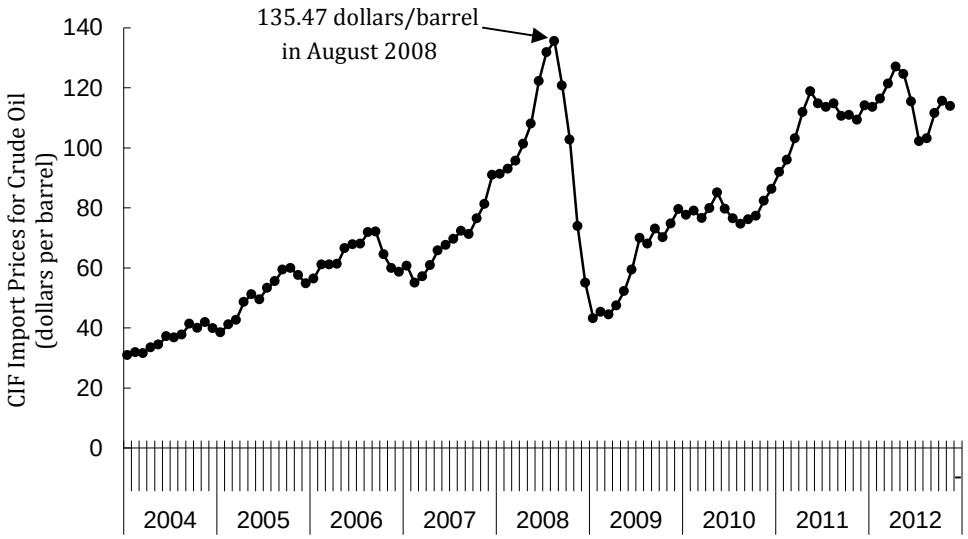


Figure 1.24 CIF Import Prices for Crude Oil (Dollars/Barrel)

Source: Ministry of Finance, "Trade of Japan"

1.7.5 National Energy Budget and Taxation System

Japan now finds it necessary to reform its energy supply and demand structure in order to increase national energy security and positively address global environmental problems.

On the demand side, the government is trying to promote efficient energy usage, beginning with energy conservation measures. In terms of supply, efforts are being made to promote the introduction of non-fossil energy, including new energy resources, and to strengthen measures to secure a stable supply of oil. In order to further advance these policies, the funds for energy-related measures in the national budget are secured via special accounts. Until FY2006 the Special Accounts for Petroleum and Sophisticated Structure of Energy of Supply and Demand and the Special Accounts for Electric Power Development Acceleration Measures were responsible for this role. However, from FY2007, the two were integrated to form the Special Accounts for Measures for Energy. The Special Accounts for Measures for Energy is composed of the Accounts for Supply and Demand of Energy (formerly the Special Accounts for Petroleum and Sophisticated Structure of Energy of Supply and Demand) and the Accounts for Promotion of Power Development (formerly the Special Accounts for Electric Power Development Acceleration Measures).

The Accounts for Supply and Demand of Energy focus on measures for both a stable fuel supply and for advancing the supply and demand structure for energy. Measures for a stable fuel supply include increasing stockpiles of oil and promoting the development of oil, combustible natural gas and coal resources, as well as measures for streamlining the production and distribution of these resources. Measures for advancing the supply and demand structure for energy include developing technology related to non-fossil energy (including energy conservation), and promoting the introduction of

facilities using alternative energy as well as high-capacity energy-saving facilities. The Accounts for Supply and Demand of Energy in FY2013 (budget plan) amounted to 328.8 billion yen as measures to upgrade the energy supply and demand structure.

Table 1.2 Accounts for the Supply and Demand of Energy and Accounts for the Promotion of Power Development

(Unit: hundred million yen)

Special Accounts for Measures for Energy	FY2013 (budget plan)
Accounts for Supply and Demand of Energy	
Measures for stable fuel supply	3,890
Measures for advancing te supply and demand structure for enery	3,288
Accounts for Promotion of Power Development	
Measures for electrical power plant location	1,412
Measures for electrical power generation diversification	285
Budget for safety regulatory measures for nuclear power plants	290

Japan has a system of energy-related taxes that include the Petroleum and Coal Tax, imposed on crude oil, imported oil products, coal, etc., and the Promotion of Power-Resources Development Tax, which is levied on the electricity sold by general electrical power suppliers. The Tax Reform adopted in FY2003 revised the former Petroleum Tax and reduced the Promotion of Power-Resources Development Tax in order to more fairly allocate the public costs of ensuring a stable supply of energy and stronger policies to combat global warming. Regarding the Petroleum Tax, the government increased the tax rate on LPG and LNG and at the same time created a new tax on coal, and renamed the tax the Petroleum and Coal Tax. Tax rates on LPG, LNG, and coal were raised in three stages: in FY2003, FY2005, and FY2007.

In addition, an investment-promoting taxation system that relates to Japanese energy infrastructure was implemented from FY1981. The Energy Demand Structure Reform investment promotion tax system was established in FY1992, which aimed to promote reforms to the supply and demand structure for energy. This overall system was established in order to promote the introduction of energy-saving facilities, new energy facilities, etc. It allows for such measures as special depreciation and corporate tax or income tax credits in the event that an entity acquires facilities that implement energy supply and demand reforms, as long as these reforms are applied to their operations within a one-year period (only certain small and medium-sized enterprises below a level of 100 million yen in capital can elect to use the tax credit).

1.8 Waste

Waste mainly falls into two categories: municipal solid waste and industrial waste. Industrial waste refers to waste generated through business activities and comprises 20 types specified by Cabinet Order. Municipal solid waste covers waste other than industrial waste, and mainly includes household waste disposed of by families and business waste disposed of from offices and restaurants, as well as sewerage.

Even though the total amount of municipal solid waste and waste disposal per capita per day had decreased since the second oil shock (1979), it rapidly increased again during the bubble economy period from around 1985. It continued to increase gradually between 1989 and 2000, but has been decreasing since 2001. The total amount of municipal solid waste disposed of in 2011 was 45.39 million tonnes, which equates to about 1.0 kilograms per capita per day. This is composed of 28.7% business waste and 71.3% household waste. In terms of disposal methods, most waste is directly incinerated (79.3%), some is recycled (19.3%), and the rest buried as direct landfill (1.4%).

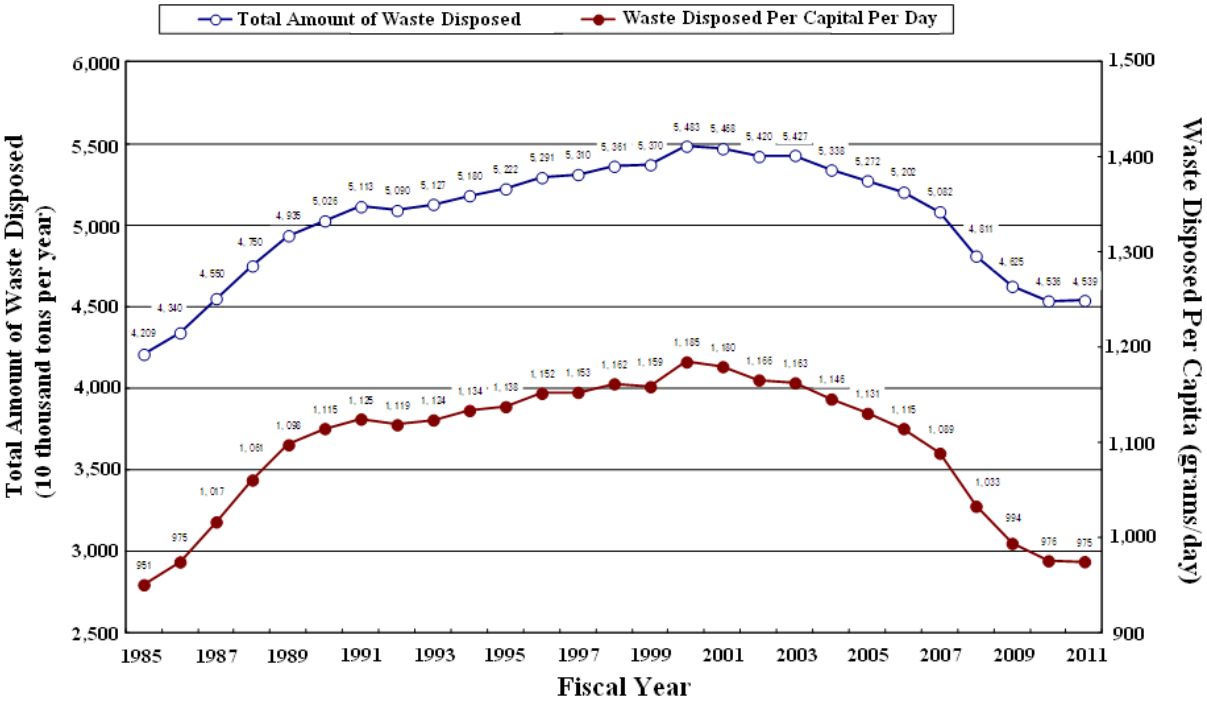


Figure 1.25 Changes in the Amount of Total Disposed Waste and Per Capita Disposed Waste

Source: Waste Disposal in Japan (FY2011)

*The "Total Amount of Waste Disposed" is using the data from results gathered in FY2005 so as to be the same as "Municipal Solid Waste Discharge Amounts (the amount of planned collection of waste + direct delivery + mass collection of recyclable waste)" under the "Basic Policy for Comprehensive and Planned Promotion of Measures for Proper Waste Management Focusing on Waste Reduction, Etc.", based on the Waste Disposal and Public Cleansing Law.

*The 'Per Capita Disposed Waste per Day' is a value obtained by dividing the amount of total disposed waste by 365 days or 366 days multiplied by the total population.

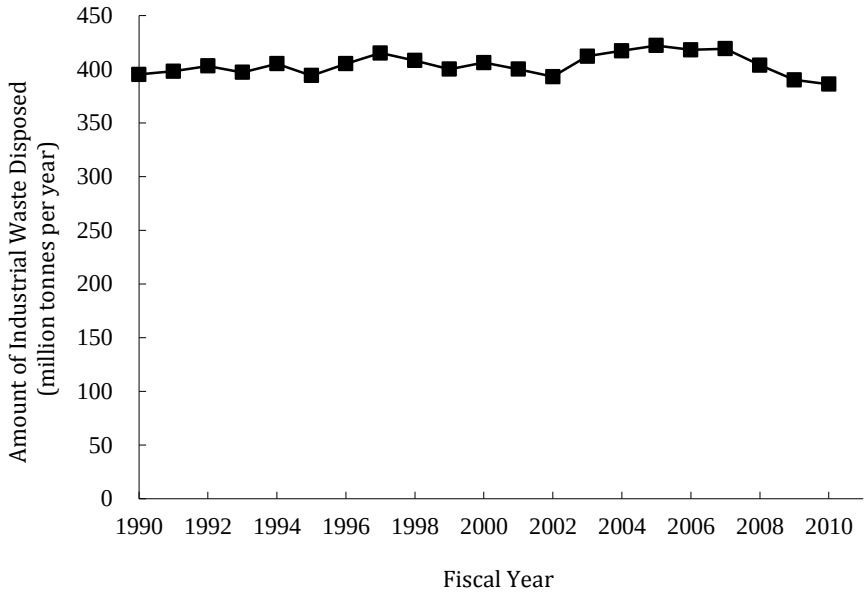


Figure 1.26 Changes in Amounts of Industrial Waste Disposed
Source: Ministry of the Environment, "Status of Industrial Waste Discharge and Disposal"

The amount of industrial waste disposed of has not changed significantly since 1990, but has remained fairly static. The total amount of industrial waste disposed of in 2010 was about 439 million tonnes. After such industrial waste is disposed of, about 205 million tonnes (53%) is recycled and about 14 million tonnes (4%) is finally disposed of.

1.9 Agriculture

In Japan, which falls within the Asian Monsoon region, rice cultivation in paddy fields has long formed part of the agricultural system suited to the humid and rainy summer conditions. In order to develop paddy field cultivation, measures to improve irrigation have been implemented, and, as a result, the ratio of irrigated paddy fields out of the total agricultural area in Japan (54.4%) is quite high compared to other countries.

However, as Japan is mountainous and does not have much flat land (mountainous areas account for 61% of the national land area), there is intense competition over land use. The ratio of the national land area used for agriculture is about 12% and the cultivated fields per household are small (approximately 1.8 hectares). Furthermore, the cultivated area has been decreasing each year, and in 2012, it had fallen about 24% from the 1965 level, to 4.55 million hectares. In terms of paddy fields, new development was restricted in 1969, and since then the total area has declined by a rate of 1% per year due to the conversion of paddy fields to fields for other crops and/or non-agricultural land use. Since the latter half of the 1980s, farmland development has been reduced and much farmland is being left uncultivated, mainly in hilly and mountainous regions. As a result the total area under cultivation has also reduced. This trend remains current.

Japan's food self-sufficiency ratio has also fallen significantly. During the period from FY1965 to FY2012, the food self-sufficiency ratio decreased from 73% to 39% on calorie supply basis[15], from 86% to 68% on production value basis[16], and from 62% to 27% of grains[17]. The main long-term cause for the decrease is the significant change in Japanese eating habits, including decreased consumption of rice and increased consumption of meat and fats, which rely on imported feed grains and oilseeds due to the restrictions of the national land area.

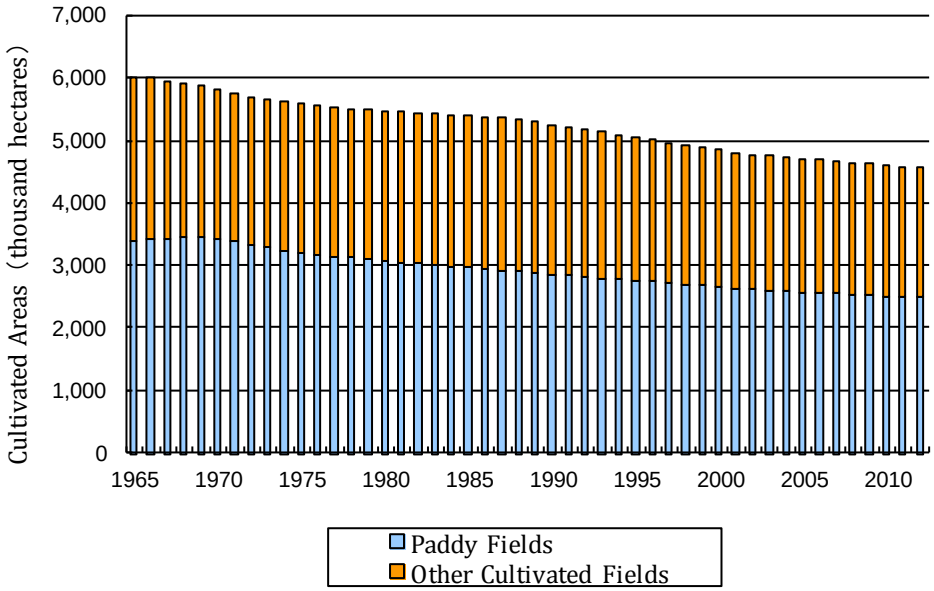


Figure 1.27 Changes in Cultivated Areas

Source: Ministry of Agriculture, Forestry and Fisheries of Japan, "Statistics on Cultivated Land and Planted Areas"

1.10 Forestry

Forestry plays an important role in Japan in maintaining and fulfilling functions of forests for the public benefit. This includes national land conservation through forestry activities, including thinning and tending, as well as providing products such as timber.

Forest currently covers about 25 million hectares, or about 70%, of Japan's national land area. It comprises national forests (approximately 30%) and non-national forests (approximately 70%). In Japan, trees were planted on over 300,000 hectares of land each year between the early 1950s and the early 1970s, and at the peak of these efforts, over 400,000 hectares were planted in a single year. This

[15] The food self-sufficiency ratio on calorie supply basis is the ratio of the calorific value of food produced domestically over the total calorific value of food supplied to the total population.

[16] The food self-sufficiency ration on production value basis is the ration of the value of food produced domestically over the total production value of food supplied to the total population,

[17] The food self-sufficiency ration of grains is the ratio of the weight of grains which were produced domestically over the total amount of grains (rice, wheat, barley, rye, maize, sorghum, and the other miscellaneous grains) supplied to the total population.

active effort reached to establishing over 10 million hectares of planted forests. As a result of the growth of these planted forests, the volume of Japan's 25 million hectares of forest has amounted to approximately 4.9 billion cubic meters, which is more than double compared to the level between 1965 and 1974.

Meanwhile, the demand for wood in Japan has recently declined to about 70 million cubic meters per year. However, the domestic wood supply is increasing slightly, and the ratio of domestically-produced wood supply to the total domestic demand in 2012 was approximately 28%.

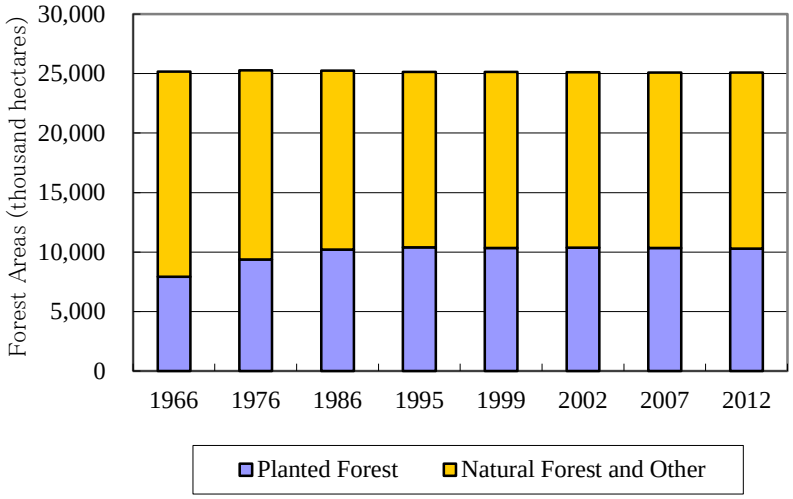


Figure 1.28 Changes in Forested Area

Source: Forestry Agency "Statistics on Forests and Forestry"

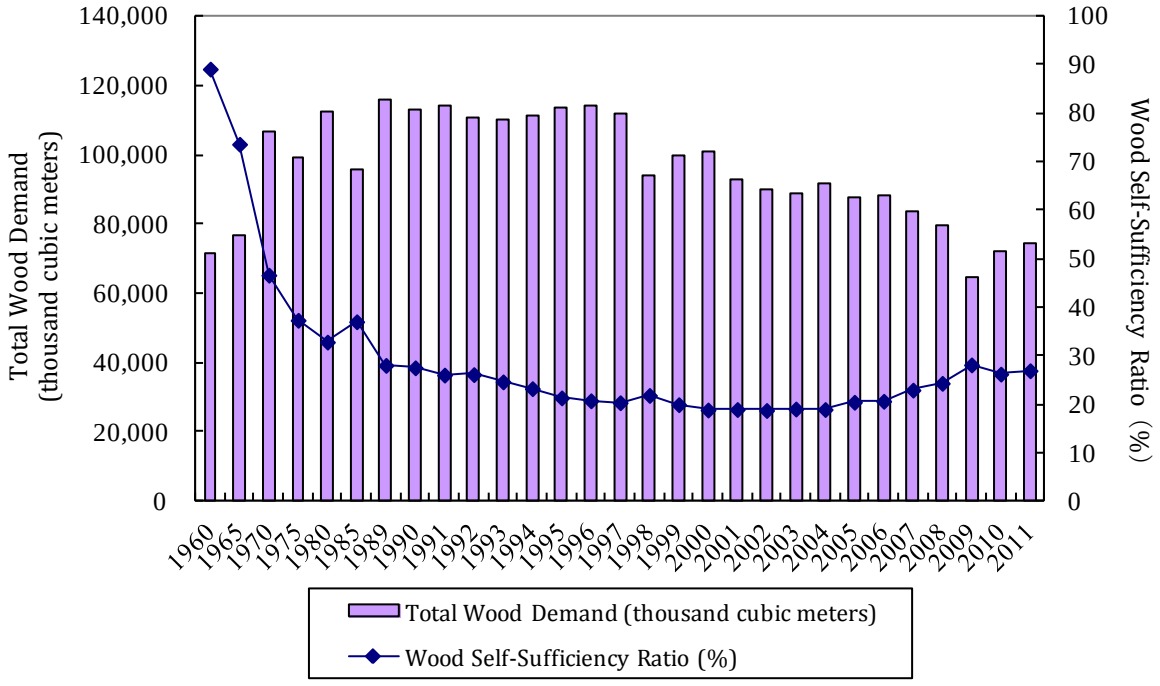


Figure 1.29 Change in Total Wood Demand and Wood Self-Sufficiency Ratio

Source: Forestry Agency, "Demand and Supply of Wood"

1.11 Information and Telecommunications

There were 96.52 million Internet users in Japan at the end of 2012, while the diffusion rate among the Japanese population was 79.5%, a figure which continues to increase, although the rate of increase has a tendency to decrease (Figure 1.30).

By the end of 2012, 47.3% of the entire population above the age of six were using broadband connections, while 88.4% of people who used the Internet from household personal computers and other devices[18] used broadband lines[19] to connect to the Internet from these devices. The number of broadband connection contracts at the end of 2012 was 6.1 million, of which 5.42 million were DSL contracts. While the number of DSL contracts is on the decline, the number of FTTH contracts (23.86 million) and the number of 3.9G (LTE) mobile phone contracts (20.36 million) are on the rise. In addition, FTTH contracts accounted for 39.1% of all broadband contracts, and 3.9G (LTE) mobile phones accounted for 33.4 % (Figure 1.31).

Regarding the purpose of Internet usage, more than 50% of each generation between the twenties and fifties accessed the Internet for purposes such as browsing websites and blogs, sending and receiving E-mails, and online shopping (Figure 1.32).

E-commerce websites targeting consumers using personal computers and mobile phones are also spreading. This can be attributed to factors such as the tremendously vast variety of products sold through Internet shopping and the ability to conveniently purchase products that would otherwise be unavailable without traveling to a faraway location. The size of the consumer-targeted e-commerce market in Japan had expanded to 8.5 trillion yen in 2011, and personal computers and mobile phones are currently becoming the second-most prominent purchasing method behind actual store visits (Figure 1.33).

[18] "Broadband lines" includes cable television lines, fixed wireless access (FWA), third-generation (3G) mobile phone lines, fiber optic lines (FTTH), and DSL lines.
[19] "Broadband lines" includes cable television lines, fixed wireless access (FWA), third-generation (3G) mobile phone lines, fiber optic lines (FTTH), and DSL lines.

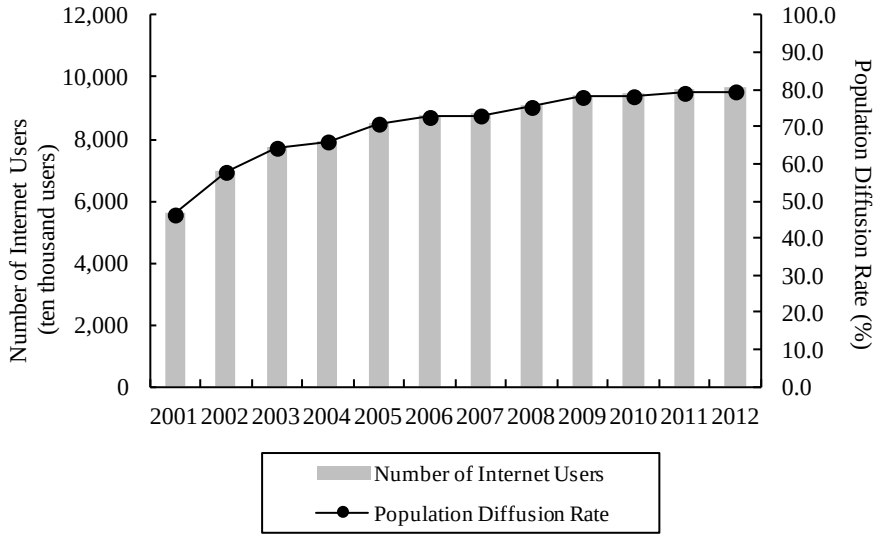


Figure 1.30 Number of Internet Users and the Internet Diffusion Rate

*The target age was all people over the age of six.
*The number of Internet users (estimate) is an estimated figure based on the results of a survey conducted over the past year on people over the age of six who use the Internet. Internet connection devices include personal computers, mobile phones and PHS, smartphones, tablet computers, gaming devices, and all other devices (subjects were not asked whether they possessed such devices). The purpose of Internet use also includes all purposes, such as personal use, business use, and academic use.
*The number of Internet users is calculated based on the estimated population over the age of six (estimated using the results of the census and life tables) multiplied by the Internet usage rate gained from this survey conducted on people over the age of six who use the Internet.
*Non-respondents are excluded.
Source: 2012 Survey Point of Usage Trend for Telecommunications

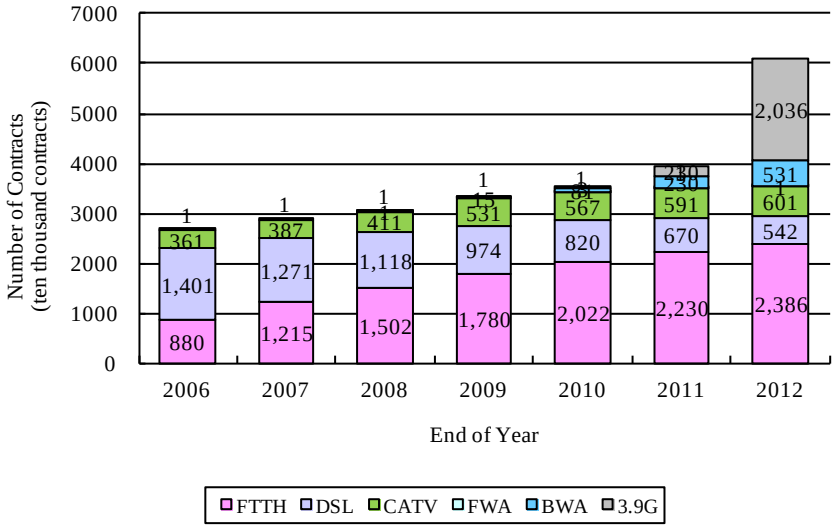


Figure 1.31 Changes in the Number of Broadband Contracts

Source: Information and Communications in Japan 2013

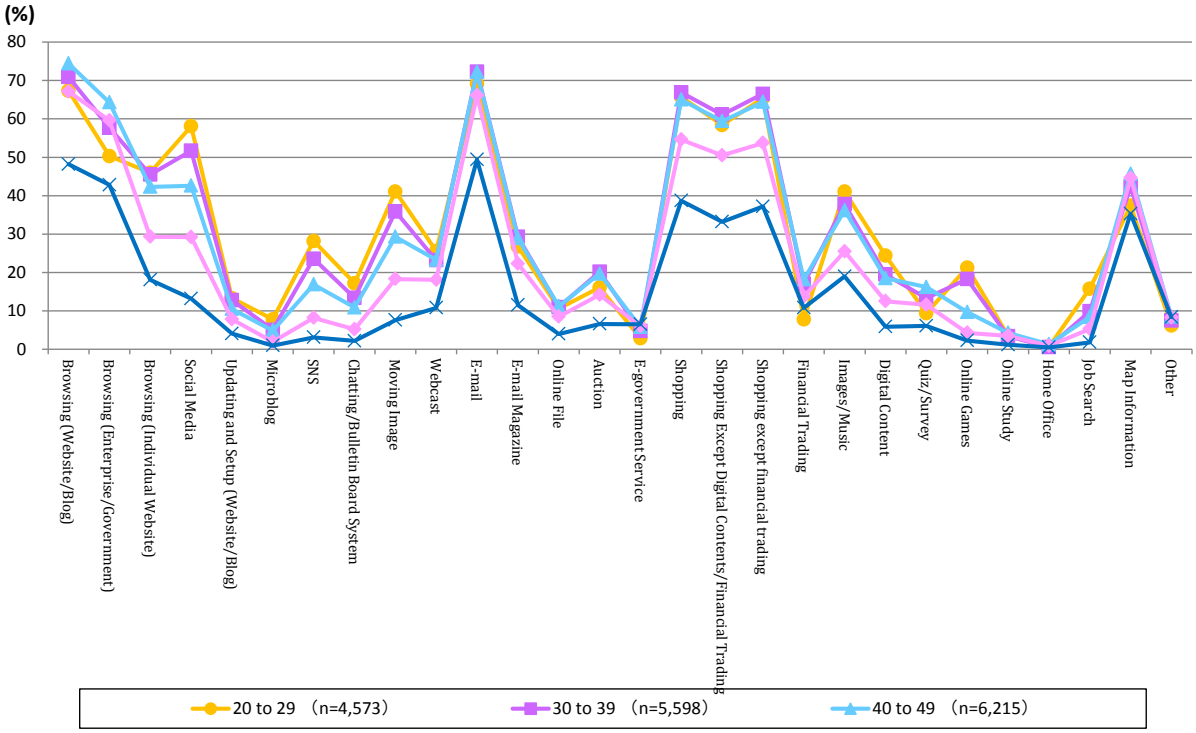


Figure 1.32 Functions and Services Used on Websites

Source: Information and Communications in Japan 2013

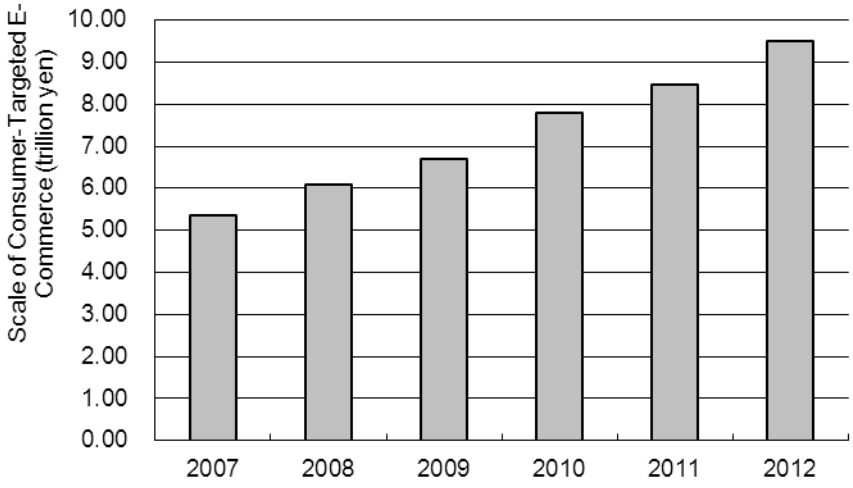


Figure 1.33 Scale of Consumer-Targeted E-commerce

Source: 2012 Infrastructure Development Report on the Information Economic Society in Japan (market research related to e-business)

1.12 Administration and Finances

1.12.1 Administration

Under the Japanese Constitution enacted in 1947, sovereign power resides with the people while the judicial, legislative, and executive powers of government are vested in the mutually independent courts, Diet, and Cabinet, respectively. The constitution establishes a parliamentary cabinet linking the Cabinet to the Diet; the Diet designates the Prime Minister; the Prime Minister and a majority of the Ministers of State must be Diet members; and the Cabinet is collectively responsible to the Diet.

Organs of national administration under Cabinet jurisdiction are established, namely, the Cabinet Office and eleven ministries: Internal Affairs and Communications; Justice; Foreign Affairs; Finance; Education, Culture, Sports, Science and Technology; Health, Labour and Welfare; Agriculture, Forestry, and Fisheries; Economy, Trade and Industry; Land, Infrastructure and Transport; Environment; and Defense. As the chief ministers of state, the Prime Minister and the individual ministers divide responsibility for national administrative duties. Councils are among the representative organs established by law with the object of ensuring that expert opinions and the views of the people are reflected in administrative actions. The main duty of the councils and other advisory bodies is to investigate and deliberate on the jurisdiction and stipulation of laws and to inform administrative organs of their views.

Concerning the global warming issue, government-level plans have been drawn up and countermeasures advanced. These include, for example, the Action Program to Arrest Global Warming of October 1990, the Guidelines for Measures to Prevent Global Warming of June 1998 (drawn up in response to the adoption of the Kyoto Protocol in December 1997), and the revision of the Outline for Promotion of Efforts to Prevent Global Warming in March 2002, in response to the adoption of the Marrakesh Accords (November 2001). Concerning structures for the promotion of global warming countermeasures, in December 1997 the Global Warming Prevention Headquarters was established with all of the government cabinet ministers as its members. The Headquarters annually checks the level of progress of the specified measures for ways to address global warming.

In October 1998, the Law Concerning the Promotion of the Measures to Cope with Global Warming (the Act on Promotion of Global Warming Countermeasures) was enacted and the basic framework for the promotion of measures to cope with global warming in Japan was constructed. The law was amended in June 2002, and the Kyoto Protocol Target Achievement Plan was formulated when the Kyoto Protocol came into force. After the development of this domestic framework, Japan ratified the Kyoto Protocol in June 2002.

The Outline for Promotion of Efforts to Prevent Global Warming, revised in 2002, divided the years from 2002 until the completion of the first commitment period into three periods of steps, adopting a step-by-step approach of evaluating the progress of measures and emissions in 2004 and 2007, as well

as adopting additional policies and measures as necessary. A complete evaluation and revision was conducted in 2004. Meanwhile, in February 2005 the Kyoto Protocol came into force and it became necessary to make a decision on the Kyoto Protocol Target Achievement Plan based on the Act on Promotion of Global Warming Countermeasures. In response to this need, in April 2005 the Cabinet approved the Kyoto Protocol Target Achievement Plan, which stipulated the countermeasures and policies necessary to reliably achieve Japan's 6% reduction commitment under the Kyoto Protocol. Afterwards, the whole plan is amended in March 2008, based on the review commissions.

In January 2010, Japan agreed to the Copenhagen Accord and reported a quantitative emissions reduction target considering the whole economy in 2020 to the UN as "Japan will reduce its emissions by 25% compared to the 1990 level with the precondition of an international agreement with the participation of the all member states on an equal and effective international framework and aspirational emissions reduction targets."

In March 2011, however, the Great East Japan Earthquake occurred and struck the Fukushima nuclear power plants, which caused severe damage in the northeast region and the surrounding areas. Since the disaster, there has been more use of thermal power generation as a consequence of the long-term halt of nuclear power plants, and thus GHG emissions from Japan have massively increased. Furthermore, it has become necessary to reexamine Japan's whole energy policy in response to the unprecedented situation caused by the accident at the nuclear power plants.

In these circumstances, the 4th Basic Environmental Plan was formulated in April 2012 by the Cabinet, which regulated the holistic and long-term principles on policies for protecting the environment based on the Basic Environment Law. In this plan, Japan announced a long-term target for tackling global warming as reducing GHG emissions by 80% by 2050.

In addition, in January 2013, the Prime Minister ordered a complete reconsideration of the current emissions reduction target of 25% before COP19.

Moreover, the first commitment period of the Kyoto Protocol was to be terminated at the end of 2012, and for Japan, as a member state without joining the second commitment period, that meant the action period of the Kyoto Protocol for pursuing the target achievement would also be terminated. In response to this situation, the Global Warming Prevention Headquarters decided on "The Principle of Global Warming Policies for the Time Being," and decided on action principles to fill the gap before the national global warming action plan is confirmed, to seamlessly implement global warming policies. The action principles include: the government requires local governments, business operators and nations to promote the activities to tackle global warming which were listed in the Kyoto Protocol Target Achievement Plan; and the government would implement global warming policies by supporting such activities by local governments, business operators, and the nation. In May 2013, the Act on Promotion of Global Warming Countermeasures was approved, and it will

regulate the principles of national global warming policies instead of the Kyoto Protocol Target Achievement Plan.

Just before COP19, at the meeting of the Global Warming Prevention Headquarters in November 2013, Japan's GHG emissions reduction and absorption target to 2020 was announced as being that Japan will reduce its emissions by 3.8% compared to the 2005 level based on the order from the Prime Minister. Additionally, Japan also announced a target of reducing GHG emissions from the whole world by 50% and from industrialized countries by 80% by 2050, and reported the "Proactive Diplomatic Strategy for Countering Global Warming," which aims to make a global contribution with Japan's advanced technology, with the three pillars of innovation, application, and partnership.

On November 29, the Government of Japan submitted the target, replacing the 25% reduction target, which had been submitted to the UNFCCC, in accordance with the Copenhagen Accord. This target is a target at this point, which has not yet taken into account the emission reduction effect resulting from nuclear power, given that the energy policy and energy mix, including the utilization of nuclear power, are still under consideration.

A firm target will eventually be set, based on further review of the energy policy and energy mix.

As of January 2013, local public organizations in Japan included 47 prefectures and 1,719 municipalities (cities, towns, and villages) with local assemblies serving as their legislatures; their executive branches are headed by a governor in the case of prefectures and by a mayor in the case of municipalities. The sizes of the prefectures and municipalities vary.

It is becoming increasingly more important for these local public organizations to make active efforts in response to global warming.

The Act on Promotion of Global Warming Countermeasures, revised in June 2008, requires that local public organizations in prefectures, designated cities, core cities, and specially designated cities expand their action plans to include measures in response to area-wide natural conditions commensurate to traditional regional promotion plans. Moreover, the Act on Promotion of Global Warming Countermeasures requested that efforts be made to collaborate between related policies, including new local public organization action plans (such as area-based measures), city plans, and development plans for agricultural promotion areas.

As of October 2012, local public organization action plans (clerical affairs) had been drafted by all 47 prefectures and by 1,362 municipalities (cities, towns, and villages). In addition, 54 more municipalities were planning to establish plans within FY2012. Moreover, as of October 2012 regional promotion plans—the area-based local public organization action plans—had been drafted for 37 prefectures as well as for 200 municipalities, while 91 more municipalities planned to draft them within FY2012.

Furthermore, 6,914 volunteers to promote activities to mitigate global warming have been commissioned by 46 prefectures and six cities (there were 3,677 as of April 2005). Prefectural centers for the promotion of activities to stop global warming have been designated in all prefectures, and 461 global warming countermeasure regional councils have been established in 47 prefectures (there were 128 as of April 2005).

In addition, as a part of the structure for promoting the Kyoto Protocol Target Achievement Plan, the government will establish Regional Committees on Energy Supply and Demand and Prevention of Global Warming in nine regional blocks from Hokkaido to Okinawa. This will allow for the relevant ministries and agencies to cooperate to back up efforts in the regions for global warming countermeasures, in collaboration with local governments, etc.

Among local public organizations, Tokyo is implementing particularly advanced undertakings. In December 2006, Tokyo set a goal of reducing its greenhouse gas emissions by 25% in comparison to 2000 by 2020. In June 2007, the Tokyo Climate Change Strategy was drafted, which defined the basic policy for climate change countermeasures in Tokyo over the ensuing ten years. Based on this strategy, the Tokyo Metropolitan Ordinance on Environmental Preservation was revised in June 2008. In April 2010 it required large business establishments to cut total greenhouse gas emissions and introduced an emissions trading system. It also implemented a global warming countermeasures reporting system for small- to medium-sized enterprises, amongst other revisions. In addition, in January 2009 environment-related tax breaks (a tax system promoting energy conservation for small- to medium-sized enterprises, a tax system promoting the introduction of next-generation automobiles, etc.), which are unique to Tokyo, were implemented. Continuing these efforts, Tokyo created the Action Program 2013 for Tokyo in 2020 in January 2013, which established action plans emphasizing disaster prevention, energy, water and greenery, and the transportation system, targeting 3 years between 2013 and 2015.

Regarding the creation of a low-carbon society, the Action Plan for Achieving a Low-Carbon Society sets high targets for significantly cutting greenhouse gas emissions. The plan selects Eco-Model cities nationwide to challenge themselves with pioneering efforts in creating an Eco-Model city. Twenty cities had been selected as of April 2013. Support and results follow-ups will be conducted with regard to these efforts by fiscal year and by city in order to promote distinguished cases nationwide. In addition, partnerships will be formed with overseas cities that are aggressively addressing environmental measures so that Japan can transmit its leading efforts to the rest of the world. The Promotion Council for the Low Carbon Cities (PCLCC), which consists of local public organizations and other entities eager to create a low-carbon society, was established in December 2008 as a venue for nationally promoting the aforementioned distinguished cases and for forming partnerships with overseas cities, among other activities. The Council is currently promoting activities aimed at constructing a low-carbon society (membership of 231 organizations as of April 1, 2013). The PCLCC selected eleven cities as Eco-Model Cities (EMCs) in December 2011, with the basic concept that the

city is for creating new human-centered value in order to respond to the environment and a super-aging society.

In this way, the efforts of Japan's local governments are steadily growing, and it is expected that they will develop even more in future.

1.12.2 Finances

Japan's national finances are administered as follows. Every fiscal year (April 1 to March 31 of the following year) the government prepares a budget, which must be approved by the Diet before it is implemented by the administrative organs. The national budget consists of three parts: the general account, special accounts, and government-related operating accounts.

The general account is the record of the national government's ordinary revenues and outlays. It is sourced from taxes and, when necessary, national bonds. This account covers the most fundamental national expenses, such as social welfare, education, and defense. In FY2013, ordinary expenditures totaled 53.9774 trillion yen, 4.0% more than the initial budget for the previous year. The general account totaled 92.6115 trillion yen, an increase of 2.5%.

Special accounts are specially established under the Finance Law independent of the general account in cases where the national government runs certain enterprises, invests certain funds, or allots certain revenues to particular expenditures. As of February 2013 there was a total of 18 accounts, including transitional ones. Government-related organizations are wholly state-owned financial institutions established via special legislation. Currently, the Okinawa Development Finance Corporation, Japan Finance Corporation, and Japan International Cooperation Agency are, respectively, two banks and one organization set up in this way in the loan assistance sector.

Table 1.3 FY2013 General Expenditure Budget

(Hundred million yen)

	FY2012 budget			FY2013 estimates		
		2011-2012 change	Growth rate (%)		2012-2013 change	Growth rate (%)
Social Security	263,901	-23,177	-8.1	291,224	27,323	10.4
Education and Science	54,057	-1,043	-1.9	53,687	-370	-0.7
Science and Technology Promotion	12,943	-409	-3.1	13,007	65	0.5
Government Employee Pensions and Other	5,712	-722	-11.2	5,045	-668	-11.7
National Defence	47,138	-614	-1.3	47,538	400	0.8
Public Works	45,734	-4,009	-8.1	52,853	7,119	15.6
Economic Assistance	5,216	-82	-1.6	5,150	-66	-1.3
(Reference)ODA	5,612	-115	-2.0	5,573	-39	-0.7
Small- and Medium-sized Businesses	1,802	-167	-8.5	1,811	9	0.5
Energy Measures	8,202	-357	-4.2	8,496	294	3.6
Major Foodstuff Measures	11,041	-545	-4.7	10,539	-502	-4.5
Miscellaneous	62,554	6,894	12.4	59,931	-2,623	-4.2
Economic Emergency Response Preparation and Regional Development Preparation	9,100	1,000	12.3	-	-	-
Contingencies	3,500	0	0.0	3,500	0	0.0
General Expenditure Total	517,957	-22,823	-4.2	539,774	21,817	4.2

Source: Ministry of Finance, Foreign Ministry

Beginning in FY2003, funds related to global warming countermeasures in the draft budgets of the relevant ministries and agencies have been classified under the Outline for Promotion of Efforts to Prevent Global Warming. In response to Cabinet approval on April 28, 2005 of the Kyoto Protocol Target Achievement Plan, the budget from FY2006 was classified according to the countermeasures category of the budget related to the Kyoto Protocol Target Achievement Plan. The budget related to the Kyoto Protocol Target Achievement Plan in FY2012 was 379.4 billion yen for “items directly affecting the six percent emission cut commitment of the Kyoto Protocol,” 299.8 billion yen for “items affecting greenhouse gas cuts in the medium to long term,” 206.9 billion yen for “other items that result in contributing to greenhouse gas cuts,” and 93.8 billion yen for “basic measures, etc.” The FY2013 budget plan related to the global warming countermeasures was announced on March 22, 2013. The budget was 330.9 billion yen for “items affecting greenhouse gas cuts until 2020,” 153.4 billion yen for “items affecting greenhouse gas cuts after 2021,” 267 billion yen for “other items that result in contributing to greenhouse gas cuts,” and 76.3 billion yen for “basic measures, etc.” The following table is a breakdown of the budget.

Table 1.4 Budget Related to Global Warming Countermeasures (by Ministry and Office)

(Unit: 100 million yen)

	A	B	C	D
	Items affecting greenhouse gas cuts until 2020	Items affecting greenhouse gas cuts after 2021	Other items that result in contributing to greenhouse gas cuts	Basic measures, etc.
Education, Culture, Sports, Science and Technology		294		253
Agriculture, Forestry and Fisheries	1,189	106	611	28
Economy, Trade and Industry	1,244	988	1,002	264
Land, Infrastructure and Transport	91	14	303	89
Environment	604	124	488	37
Other	181	9	266	92
All ministries and offices	3,309	1,534	2,670	763

Note 1: Totals may not be consistent due to the processing of fractions (rounding).

Chapter 2

Trends in GHG Emissions and Removals

2.1 Description and Interpretation of Emission and Removal Trends for Aggregate Greenhouse Gases (GHGs)

2.1.1 Overview of GHG Inventory

2.1.1.1 Background Information on Japan's Greenhouse Gas Inventory

Japan reports greenhouse gas (GHG) inventories that contain information on emissions and removals of GHGs, including indirect GHGs and SO_2 in Japan, on the basis of Articles 4 and 12 of the United Nations Framework Convention on Climate Change (UNFCCC) and of Article 7 of the Kyoto Protocol. Japan's estimation methodologies for GHG inventories are in line with the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (hereafter, Revised 1996 IPCC Guidelines) which were developed by the Intergovernmental Panel on Climate Change (IPCC). In addition, Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (2000) (hereafter, GPG (2000)) and Good Practice Guidance for Land Use, Land-Use Change and Forestry (hereafter, GPG-LULUCF) are applied to improve transparency, consistency, comparability, completeness, and accuracy of the inventories. Annual inventories are reported in accordance with the UNFCCC Reporting Guidelines on Annual Inventories (FCCC/SBSTA/2006/9) adopted by the Conference of the Parties. Supplementary information under Article 7, Paragraph 1 of the Kyoto Protocol is reported in accordance with Annotated outline of the National Inventory Report including reporting elements under the Kyoto Protocol prepared by the UNFCCC secretariat.

Greenhouse gases reported in the GHG inventories are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), and precursors such as nitrogen oxides (NO_X), carbon monoxide (CO), non-methane volatile organic compounds (NMVOC), and sulfur dioxide (SO_2) are also reported.

2.1.1.2 Brief General Description of Methodologies

The methodology used in the estimation of GHG emissions or removals is basically in accordance with the Revised 1996 IPCC Guidelines, the GPG (2000), and the GPG-LULUCF. Country-specific methodologies are also used for some categories in order to reflect the actual emission status in Japan.

Results of the actual measurements or estimates based on research conducted in Japan are used to determine the emissions factors (country-specific emissions factors). The default values given in the

Revised 1996 IPCC Guidelines, the GPG (2000), and the GPG-LULUCF are used for the estimation of emissions that are assumed to be quite low, and where the possibility of emission from a given source is uncertain.

2.1.1.3 Sectors

Japan's national GHG inventory is composed of 6 sectors: Energy Sector; Industrial Processes; Sectors that use solvents and other products; Agriculture; Land Use, Land-Use Change and Forestry; and Waste.

2.1.1.3.a Energy Sector

Emissions from the energy sector consist of two main categories: fuel combustion and fugitive emissions from fuels. Fuel combustion includes emissions released into the atmosphere when fossil fuels (e.g., coal, oil products, and natural gas) are combusted. Fugitive emissions are intentional or unintentional releases of gases from fossil fuels by anthropogenic activities. In Japan, fossil fuels are used to produce energy for a wide variety of purposes (e.g., production, transportation, shipment, and consumption of energy products), and not only CO_2 but also CH_4, N_2O and indict greenhouse gases such as NO_X (Nitrogen Oxide), CO (Carbon Monoxide) and NMVOC (Non-Methane Volatile Organic Compounds) are emitted in the process.

2.1.1.3.b Industrial Processes

The Industrial Processes sector deals with GHG emissions resulting from chemical and physical transformations in industrial processes. Specially, CO_2, CH_4 and N_2O emissions from mineral products (e.g., cement production), the chemical industry (e.g., ammonia production), metal production (e.g., iron and steel production), and HFC, PFC and SF_6 emissions at the stage of production, use and discharge are estimated.

2.1.1.3.c Solvents and Other Products Use

The Solvents and other products use sector deals with N_2O emissions resulting from the use of anesthetics (e.g., laughing gas). In addition, NMVOC emission from solvent production and uses such as paint, metal cleansing, and dry cleaning are estimated.

2.1.1.3.d Agriculture

The Agriculture sector deals with GHG emissions resulting from agricultural activities. In particular, Specially, CH_4 as the result of enteric fermentation, CH_4 and N_2O generated in the treatment of manure excreted by cattle etc, CH_4 emitted from paddy fields cultivated for rice production, N_2O emitted from agricultural soil, and CH_4 and N_2O from field burning of agricultural waste, etc., are estimated.

2.1.1.3.e Land Use, Land-Use Change and Forestry

The Land use, land-use change and forestry (LULUCF) sector deals with GHG emissions and removals resulting from land use such as forestry activities and land-use change. Japan classifies its national land into six categories—forest land, cropland, grassland, wetlands, settlements, and other land—and subdivides each of these into two subcategories by distinguishing them on the basis of whether or not land conversion has occurred, in accordance with the GPG-LULUCF. GHG emissions and removals in this sector cover carbon stock changes in five carbon pools (aboveground biomass, belowground biomass, dead wood, litter, and soil), direct N_2O emissions from N fertilization, N_2O emissions from drainage of soils, N_2O emissions from disturbance associated with land-use conversion to cropland, CO_2 emissions from agricultural lime application, and non-CO_2 emissions from biomass burning.

2.1.1.3.f Waste

In the waste sector, GHG emissions from the treatment and disposal of waste are estimated for solid waste disposal on land, wastewater handling, waste incineration, and other processes, in accordance with each treatment process. The waste to be covered in this sector is waste as defined in the Revised 1996 IPCC Guidelines. In the case of Japan, waste not only includes municipal waste and industrial waste as defined by the Waste Disposal and Pubic Cleansing Law, but also recyclables and valuables that are re-used within a company.

2.1.2 Trends in GHG Emissions and Removals

Total GHG emissions in FY2011[20,21] (excluding LULUCF[22]) amounted to 1,308 million tonnes (in CO_2 eq.). They increased by 8.5% compared to the emissions in FY1990[23] (excluding LULUCF). Compared to the emissions in the base year under the Kyoto Protocol[24], they increased by 3.7%.

[20] "FY" (fiscal year), from April of the reporting year through March of the next year, is used because CO_2 is the primary GHG emission and it is estimated on a fiscal year basis. "CY" stands for calendar year.

[21] The sum of CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6 emissions converted to CO_2 equivalents, multiplied by their respective global warming potential (GWP). The GWP is a coefficient by means of which greenhouse gas effects of a given gas are made relative to those of an equivalent amount of CO_2. The coefficients are subjected to the *Second Assessment Report* (1995) issued by the Intergovernmental Panel on Climate Change (IPCC).

[22] Abbreviation of "Land Use, Land-Use Change, and Forestry"

[23] The sum of CO_2, CH_4, and N_2O emissions converted to CO_2 equivalents multiplied by their respective GWP.

[24] Japan's base year under the Kyoto Protocol for CO_2, CH_4, and N_2O emissions is FY1990, while CY1995 is the base year for emissions of HFCs, PFCs, and SF_6.

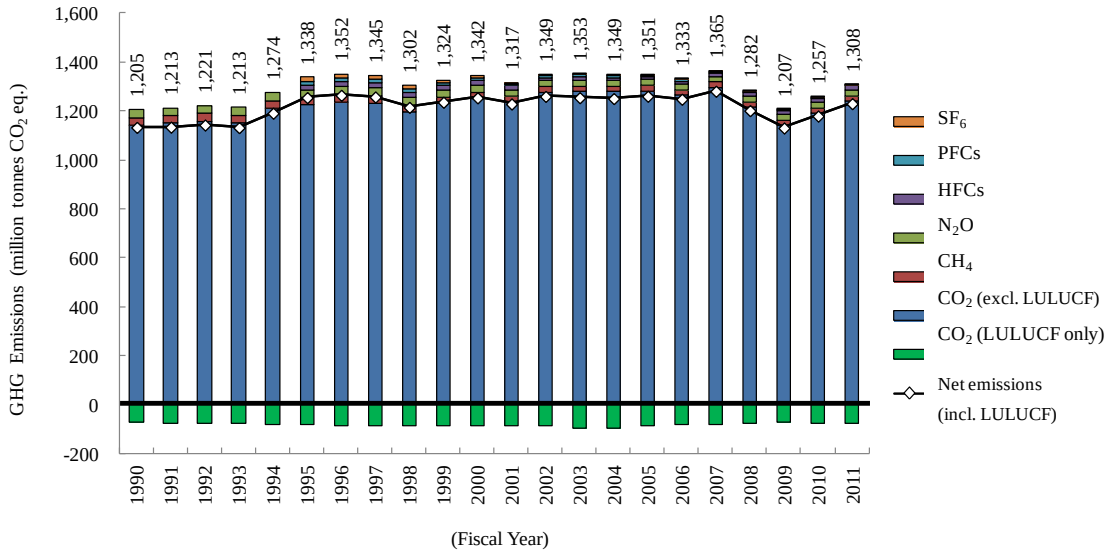


Figure 2.1 Trends in GHG Emissions and Removals in Japan [25]

Carbon dioxide emissions in FY2011 amounted to 1,241 million tonnes (excluding LULUCF), accounting for 94.9% of total GHG emissions. They increased by 8.7% from FY1990 and by 4.2% compared to the previous year. Carbon dioxide removals[26] in FY2011 amounted to 75.4 million tonnes, which were equivalent to 5.8% of total GHG emissions. They increased by 8.4% from FY1990 and decreased by 0.4% compared to the previous year. Methane emissions in FY2011 (excluding LULUCF) amounted to 20.3 million tonnes (in CO_2 eq.), accounting for 1.6% of total GHG emissions. They decreased by 36.8% from FY1990 and by 2.1% compared to the previous year. Nitrous oxide emissions in FY2011 (excluding LULUCF) amounted to 21.6 million tonnes (in CO_2 eq.), accounting for 1.7% of total GHG emissions. They decreased by 31.5% from FY1990 and by 1.7% compared to the previous year. Emissions of hydrofluorocarbons in CY2011 amounted to 20.5 million tonnes (in CO_2 eq.), accounting for 1.6% of total GHG emissions. They increased by 1.0% from CY1995 and by 11.8% compared to the previous year. Emissions of perfluorocarbons in CY2011 amounted to 3.0 million tonnes (in CO_2 eq.), accounting for 0.2% of total GHG emissions. They decreased by 78.9% from CY1995 and by 11.5% compared to the previous year. Sulfur hexafluoride emissions in CY2011 amounted to 1.6 million tonnes (in CO_2 eq.), accounting for 0.1% of total GHG emissions. They decreased by 90.3% from CY1995 and by 12.1% compared to the previous year.

[25] Actual emissions of HFCs, PFCs, and SF_6 in the period from CY1990 to 1994 are not estimated (NE). Potential emissions are reported in common reporting format (CRF) for CY1990 to 1994.

[26] Since the inventory to be submitted under the UNFCCC reports all GHG emissions and removals from the LULUCF sector, these values do not correspond to emissions and removals which can be accounted for compliance under the Kyoto Protocol (for ”forest management”, 13 million carbon tonnes is given as the upper limit for Japan in the appendix to the annex to decision 16/CMP.1).

Table 2.1 Trends in GHG Emissions and Removals in Japan

[Million tonnes CO_2 eq.]	GWP	KPBY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO_2 (excl. LULUCF)	1	1,144.1	1,141.1	1,150.1	1,158.5	1,150.9	1,210.7	1,223.7	1,236.6	1,231.5	1,195.9	1,230.8
CO_2 (incl. LULUCF)	1	NA	1,071.5	1,073.3	1,082.1	1,072.0	1,130.3	1,143.0	1,151.4	1,146.0	1,110.6	1,145.4
CO_2 (LULUCF only)	1	NA	-69.6	-76.8	-76.5	-78.9	-80.3	-80.7	-85.2	-85.5	-85.3	-85.4
CH_4 (excl. LULUCF)	21	33.4	32.1	31.9	31.6	31.4	30.7	29.9	29.1	28.1	27.3	26.7
CH_4 (incl. LULUCF)	21	NA	32.1	31.9	31.6	31.4	30.7	29.9	29.2	28.1	27.3	26.7
N_2O (excl. LULUCF)	310	32.6	31.6	31.1	31.2	31.0	32.2	32.6	33.6	34.3	32.8	26.4
N_2O (incl. LULUCF)	310	NA	31.6	31.1	31.3	31.0	32.2	32.7	33.7	34.3	32.8	26.4
HFCs	HFC-134a: 1,300 etc.	20.2	NE	NE	NE	NE	NE	20.3	19.9	19.9	19.4	19.9
PFCs	PFC-14: 6,500 etc.	14.0	NE	NE	NE	NE	NE	14.3	14.8	16.2	13.4	10.4
SF_6	23,900	16.9	NE	NE	NE	NE	NE	17.0	17.5	15.0	13.6	9.3
Gross total (excl. LULUCF)		1,261.3	1,204.8	1,213.0	1,221.4	1,213.2	1,273.6	1,337.7	1,351.6	1,345.0	1,302.4	1,323.5
Net total (incl. LULUCF)		NA	1,135.3	1,136.3	1,145.0	1,134.4	1,193.3	1,257.1	1,266.4	1,259.5	1,217.2	1,238.2

[Million tonnes CO_2 eq.]	GWP		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CO_2 (excl. LULUCF)	1		1,251.5	1,236.3	1,273.4	1,278.5	1,277.9	1,282.1	1,262.9	1,296.2	1,213.8	1,141.5
CO_2 (incl. LULUCF)	1		1,165.4	1,150.2	1,186.2	1,182.2	1,182.1	1,193.3	1,179.8	1,213.8	1,135.7	1,067.4
CO_2 (LULUCF only)	1		-86.0	-86.1	-87.2	-96.3	-95.8	-88.9	-83.1	-82.3	-78.2	-74.1
CH_4 (excl. LULUCF)	21		26.1	25.2	24.3	23.8	23.4	23.0	22.7	22.3	21.8	21.2
CH_4 (incl. LULUCF)	21		26.1	25.2	24.3	23.8	23.4	23.0	22.7	22.3	21.8	21.2
N_2O (excl. LULUCF)	310		28.9	25.5	24.8	24.4	24.4	23.9	23.9	22.7	22.7	22.5
N_2O (incl. LULUCF)	310		29.0	25.5	24.8	24.4	24.5	24.0	23.9	22.7	22.7	22.5
HFCs	HFC-134a: 1,300 etc.		18.8	16.2	13.7	13.8	10.6	10.5	11.7	13.3	15.3	16.6
PFCs	PFC-14: 6,500 etc.		9.6	8.0	7.4	7.2	7.5	7.0	7.3	6.4	4.6	3.3
SF_6	23,900		7.2	6.0	5.6	5.3	5.1	4.8	4.9	4.4	3.8	1.9
Gross total (excl. LULUCF)			1,342.1	1,317.1	1,349.2	1,352.9	1,348.8	1,351.4	1,333.5	1,365.2	1,282.0	1,206.8
Net total (incl. LULUCF)			1,256.1	1,231.0	1,262.0	1,256.6	1,253.0	1,262.6	1,250.4	1,282.9	1,203.8	1,132.8

[Million tonnes CO_2 eq.]	GWP		2010	2011	Changes in emissions/removals (2011)			
					KPBY	1990	1995	Previous year
CO_2 (excl. LULUCF)	1		1,191.1	1,240.7	8.4%	8.7%	-	4.2%
CO_2 (incl. LULUCF)	1		1,115.3	1,165.2	-	8.7%	-	4.5%
CO_2 (LULUCF only)	1		-75.8	-75.4	-	8.4%	-	-0.4%
CH_4 (excl. LULUCF)	21		20.7	20.3	-39.2%	-36.8%	-	-2.1%
CH_4 (incl. LULUCF)	21		20.7	20.3	-	-36.8%	-	-2.1%
N_2O (excl. LULUCF)	310		22.0	21.6	-33.7%	-31.5%	-	-1.7%
N_2O (incl. LULUCF)	310		22.0	21.6	-	-31.6%	-	-1.7%
HFCs	HFC-134a: 1,300 etc.		18.3	20.5	1.3%	-	1.0%	11.8%
PFCs	PFC-14: 6,500 etc.		3.4	3.0	-78.5%	-	-78.9%	-11.5%
SF_6	23,900		1.9	1.6	-90.3%	-	-90.3%	-12.1%
Gross total (excl. LULUCF)			1,257.4	1,307.7	3.7%	8.5%	-2.2%	4.0%
Net total (incl. LULUCF)			1,181.6	1,232.3	-	8.5%	-	4.3%

* KPBY : Base year of Kyoto Protocol
* NA : Not applicable
* NE : Not estimated
* LULUCF: Land Use, Land-Use Change and Forestry
* CH_4 and N_2O emissions in Table 1 include emissions from LULUCF based on the estimation method decided by the UNFCCC. On the other hand, since emissions from LULUCF are regarded as RMUs (removal units) according to Article 3.3 of the Kyoto Protocol, they are not included in GHGs emissions based on the Kyoto Protocol (refer annex 8 table 1).

Japan's total emissions showed a tendency towards slightly increasing from being constant from the mid-1990s to FY2007, and reached the highest emission level on record. From the mid-1990s to

FY2007, CO_2 emission demonstrates the increasing trend due to the increase of electricity consumption etc., whereas other GHGs except CO_2 decreased. However, with the impact of the global economic crisis that occurred in 2008, the recession led to reduced energy consumption, and Japan's total emissions were greatly reduced for the two consecutive years (FY2008, FY 2009). With the recovery from the recession, energy consumption increased with production activities in the manufacturing sector, and total emissions began to increase in FY2010. Total emissions continued to increase in FY2011, and the main driving factor was the increase in fossil fuel consumption in response to the expansion of thermal power generation due to the suspension of nuclear power plants, although the amount of manufacturing production decreased due to the influence of the Great East Japan Earthquake, which occurred in March 2011.

2.1.3 Description of Emission and Removal Trends by Gas

2.1.3.1 CO_2

2.1.3.1.a Trends in CO_2 Emissions

Carbon dioxide emissions in FY2011 amounted to 1,241 million tonnes (excluding LULUCF), accounting for 94.9% of total GHG emissions. They increased by 8.7% from FY1990 and by 4.2% compared to the previous year.

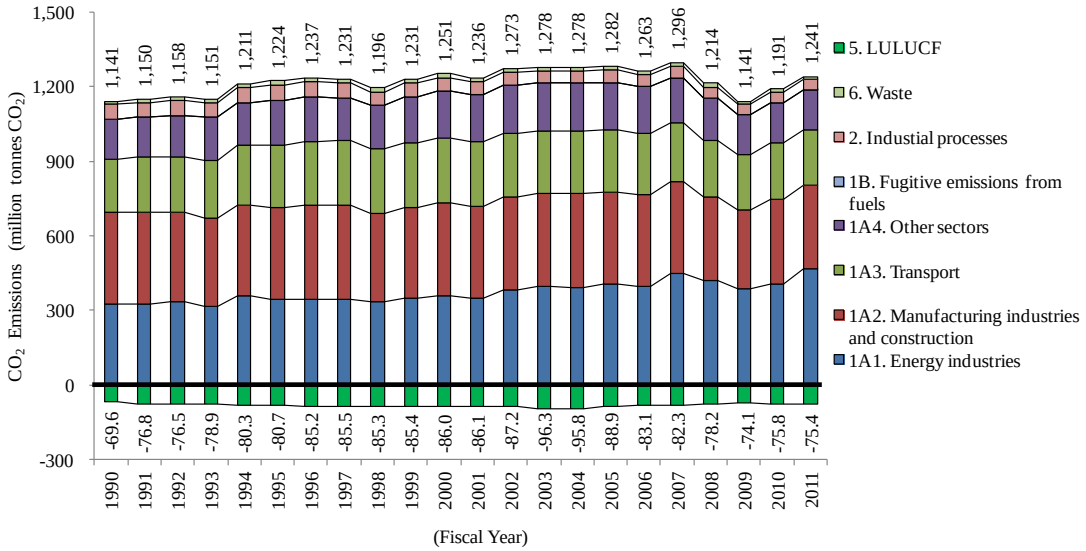


Figure 2.2 Trends in CO_2 Emissions

CO_2 emissions showed a tendency to increase from FY1990 to FY2007. Emissions until the early 2000s increased due to factors such as the enlargement of cars, increasing traffic volume, and increasing energy demand in the commercial and residential sectors. The main factors driving the increase in CO_2 emissions since the 2000s have been continuous electricity consumption and the expansion of thermal power generation in response to the low operating rate of nuclear plants. After a peak in FY2007, CO_2 emissions decreased for two years in FY2008 and FY2009 due to the impact of the global economic crisis that occurred in FY2008. In the recovery from the recession, because of an

increase in energy consumption occurred due to the recovery of production activities in the manufacturing sector, total CO_2 emissions began to increase in FY2010.

The breakdown of CO_2 emissions in FY2011 shows that fuel combustion accounts for 95.6%, followed by industrial processes (3.3%) and the waste sector (1.0%). Regarding the breakdown of CO_2 emissions within the fuel combustion category, energy industries account for 37.6%, followed by manufacturing industries and construction at 27.0%, transport at 17.9%, and other sectors[27] at 13.1%. The main factor driving the increase in CO_2 emissions compared to the previous year was the increased consumption of fossil fuel in response to the expansion of thermal power generation, although the amount of manufacturing production decreased due to the influence of the Great East Japan Earthquake, and other factors.

Looking at the changes in FY2011 emissions compared to FY1990 and the previous year by sector, emissions from fuel combustion in the energy industries increased by 43.9% from FY1990 and by 15.1% compared to the previous year. The main factors driving the increase in CO_2 emissions from FY1990 are the increase in electricity consumption and the expansion of thermal power generation in response to the suspension of nuclear plants. CO_2 emissions from fuel combustion in the manufacturing industries and construction decreased by 9.7% (compared to FY1990) and by 2.2% (compared to the previous year). Emissions had leveled off, but greatly reduced due to the impact of the global economic crisis in 2008. Emissions from the fuel combustion in the transport sector increased by 5.2% (compared to FY1990) and decreased by 1.5% (compared to the previous year). The main factor driving the increase in CO_2 emissions until the early 2000s was the increase in demand for passenger transportation, compensating for a decrease in the volume of freight transportation. However, these emissions have been on the decline since the early 2000s due to the increased volume of cars with good fuel efficiency. Emissions from the fuel combustion in other sectors (commercial and other, and residential) increased by 0.6% from FY1990 and decreased by 0.5% compared to the previous year. Emissions have tended to decrease in recent years, but the main factor for this is a shift to electricity in energy usage.

[27] This covers emissions from commercial/institutional, residential and agriculture/forestry/fisheries.

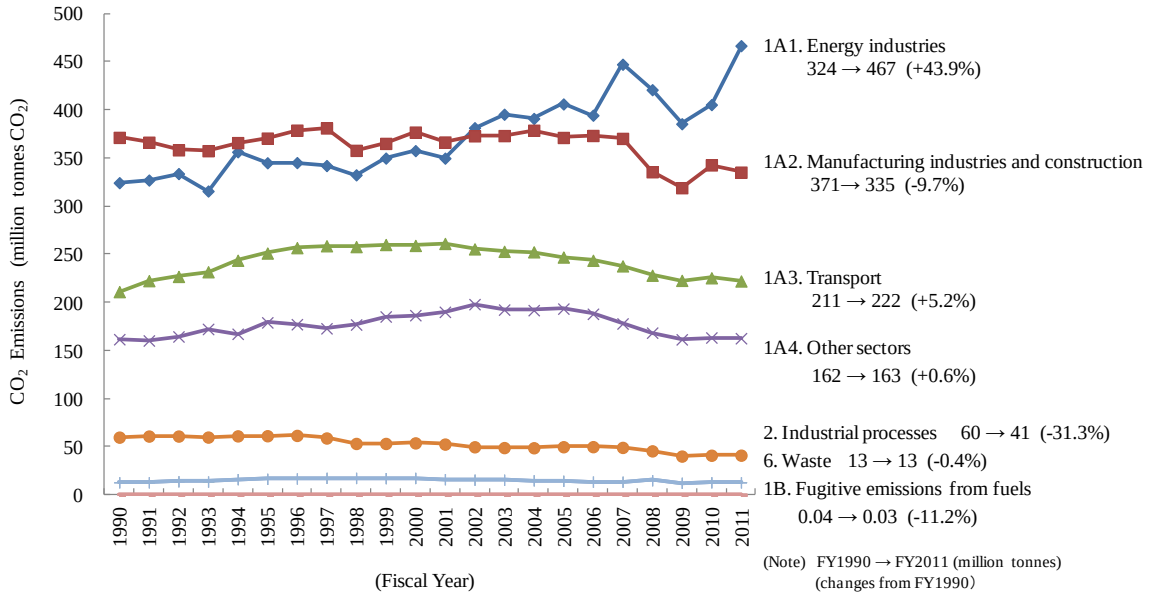


Figure 2.3 Trends in CO_2 Emissions in Each Sector

(Figures in brackets indicate increases or decreases relative to FY1990 values)

Table 2.2 Trends in CO_2 Emissions and Removals in Each Sector

[Thousand tonnes CO_2]

Category	1990	1995	2000	2005	2008	2009	2010	2011
1A. Fuel combustion	1,068,260	1,145,769	1,180,044	1,217,697	1,153,043	1,088,805	1,136,982	1,186,604
1A1. Energy industries	324,253	344,948	357,574	406,039	420,887	385,493	405,372	466,617
Public electricity and heat production	297,074	315,399	330,863	378,921	395,339	356,702	379,341	439,529
Petroleum refining	15,893	16,956	17,285	16,441	14,324	14,564	15,038	14,223
Manufacture of solid fuels and other energy industries	11,286	12,592	9,426	10,677	11,225	14,227	10,994	12,866
1A2. Manufacturing industries and construction	371,311	370,539	376,778	371,229	335,621	319,043	342,744	335,186
Iron and steel	149,600	141,862	150,776	152,741	143,269	134,610	151,892	147,164
Non-ferrous metals	6,092	4,770	3,042	2,634	2,333	2,120	2,075	1,979
Chemicals	64,736	74,806	67,216	58,650	53,325	52,549	53,588	52,585
Pulp, paper and print	25,825	29,449	29,035	26,553	22,845	21,242	20,329	20,816
Food processing, beverages and tobacco	13,129	14,407	13,161	11,326	8,862	8,761	9,128	9,230
Other	111,929	105,245	113,547	119,326	104,987	99,761	105,733	103,412
1A3. Transport	211,054	251,167	259,076	247,010	228,099	222,768	225,460	222,133
Civil aviation	7,162	10,278	10,677	10,799	10,277	9,781	9,193	9,001
Road transportation	189,228	225,381	232,827	222,652	205,933	202,018	204,981	201,975
Railways	932	819	707	644	600	586	570	568
Navigation	13,731	14,687	14,865	12,915	11,288	10,383	10,716	10,588
1A4. Other sectors	161,641	179,115	186,615	193,419	168,436	161,500	163,405	162,668
Commercial/institutional	83,593	93,269	101,450	110,678	98,756	93,283	91,894	93,497
Residential	56,668	66,320	68,958	67,583	59,023	57,792	61,074	58,995
Agriculture/forestry/fisheries	21,380	19,526	16,207	15,158	10,657	10,425	10,438	10,176
1B. Fugitive emissions from fuels	37	51	36	38	38	35	33	33
2. Industrial processes	59,876	61,333	53,887	49,903	45,613	40,189	41,074	41,135
Mineral products	55,311	56,756	49,746	46,774	42,883	37,589	38,177	38,344
Chemical industry	4,209	4,220	3,893	2,887	2,574	2,488	2,737	2,629
Metal production	356	357	248	242	156	112	160	162
5. LULUCF	-69,612	-80,652	-86,015	-88,851	-78,158	-74,105	-75,782	-75,445
6. Waste	12,966	16,534	17,494	14,491	15,135	12,436	12,979	12,913
Total (including LULUCF)	1,071,526	1,143,035	1,165,445	1,193,277	1,135,671	1,067,360	1,115,287	1,165,240
Total (excluding LULUCF)	1,141,138	1,223,687	1,251,461	1,282,128	1,213,830	1,141,465	1,191,068	1,240,684

* LULUCF: Land Use, Land-Use Change and Forestry

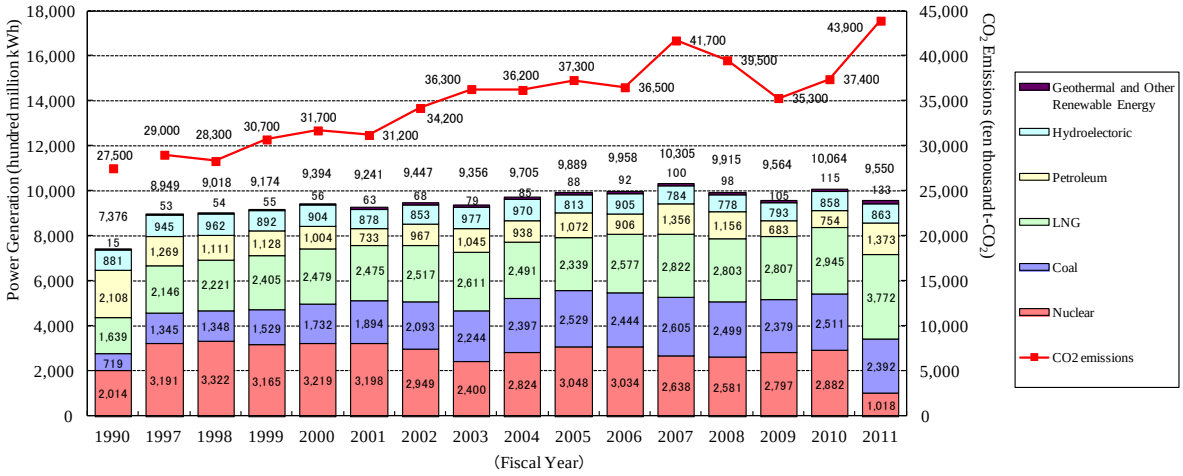


Figure 2.4 The Power Generation by Type and CO_2 Emissions (10 General Electricity Utilities, Including Receiving Power from Other Companies)

Source of Power Generation by Type

FY1990–FY2009: calculated using the *Summary of electric power development*(Agency for Natural Resources and Energy)

FY2010–FY2011: calculated using *The composition ratio of electric power generation by power generation type in FY2011* (The Federation of Electronic Power Companies of Japan, June 13, 2012）

Sources of CO_2 emissions

FY1990–FY2010: *Efforts for preventing global warming* (The Federation of Electronic Power Companies of Japan), documents by the of Resource and Energy Working Group of the Global Environmental Subcommittee under the Environment Division of the Industrial Structure Council (FY2011）

FY2011: *Environmental Action Plan* (The Federation of Electronic Power Companies of Japan, September 2012）

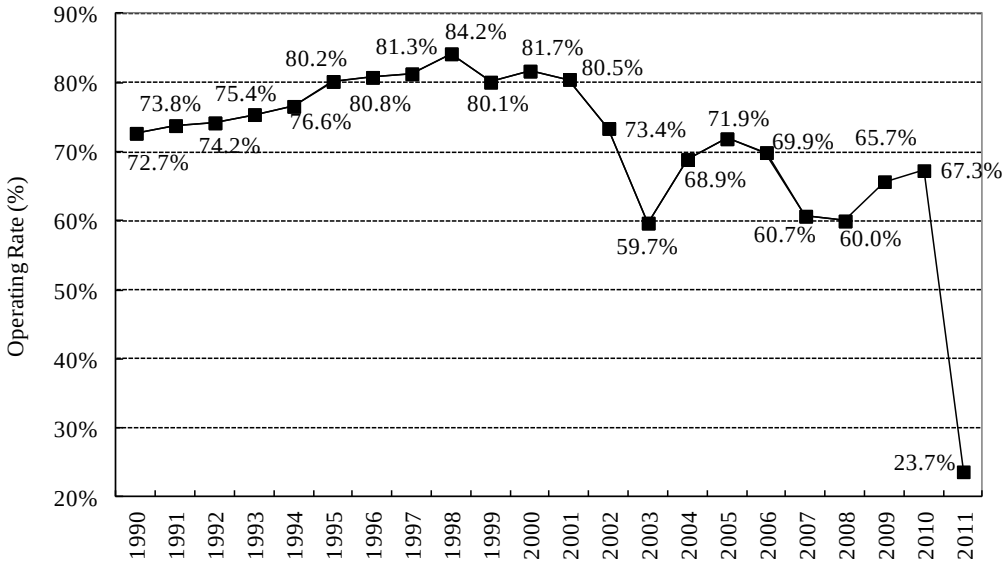


Figure 2.5 Trends in the Rate of Utilization of Nuclear Plants

Source: *The composition ratio of electric power generation by power generation type in FY 2011* (The Federation of Electronic Power Companies of Japan, June 13, 2012), *Electricity Generated and Purchased (Bulletin)* (The Federation of Electronic Power Companies of Japan)

Carbon dioxide removals in FY2011 amounted to 75.4 million tonnes, which was equivalent to 5.8% of total GHG emissions. They increased by 8.4% from FY1990 and decreased by 0.4% compared to the previous year.

2.1.3.1.b CO_2 Emissions per Capita, CO_2 Emissions per Unit of GDP

Carbon dioxide emissions per capita in FY2011 amounted to 9.71 tonnes, which was an increase of 5.2% from FY1990, and an increase of 4.4% compared to the previous year.

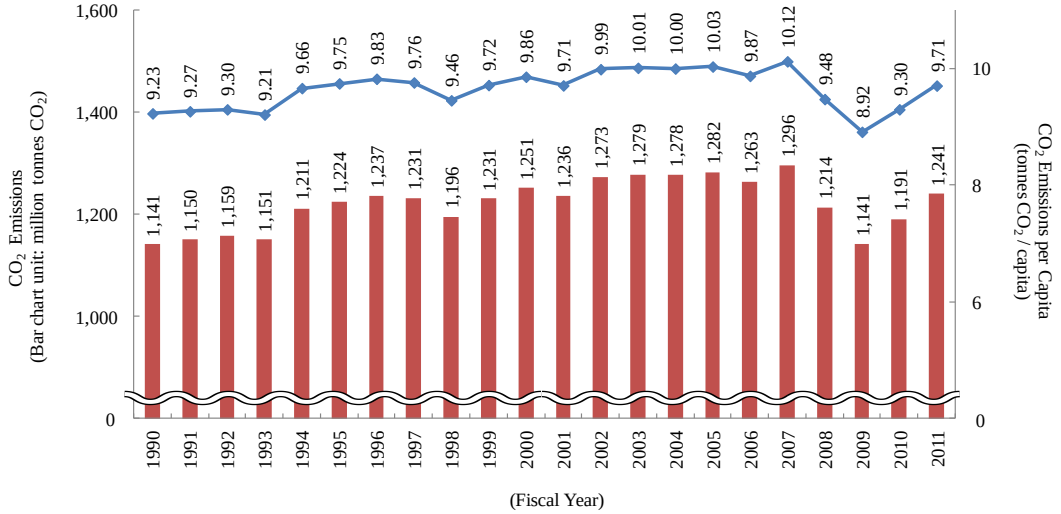


Figure 2.6 Trends in Total CO_2 Emissions and CO_2 Emissions per Capita
Source of population data: Statistics Bureau, Ministry of Internal Affairs and Communications, *Population Census* and *Population Estimates*

Carbon dioxide emissions per unit of GDP (million yen) in FY2011 amounted to 2.41 tonnes, which was a decrease of 4.0% from FY1990 and an increase of 3.9% compared to the previous year.

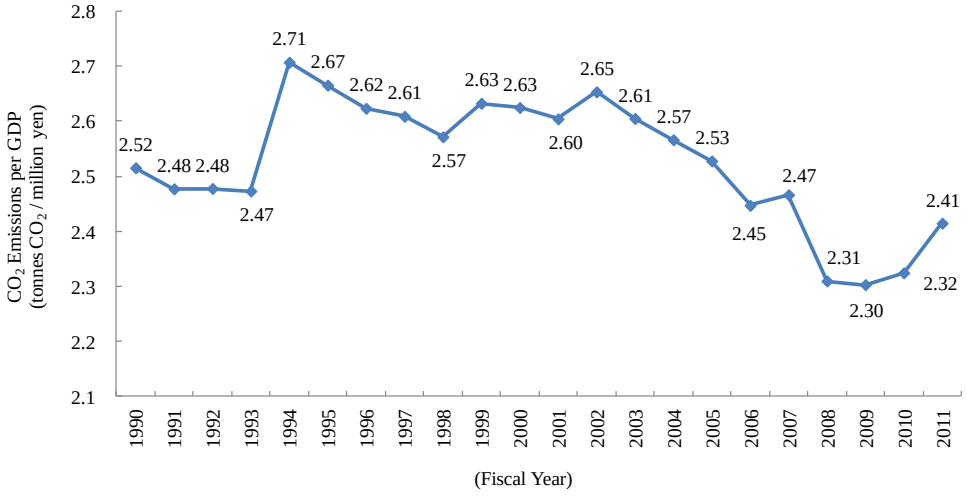


Figure 2.7 Trends in CO_2 Emissions per Unit of GDP
Source of GDP data: Cabinet Office, Government of Japan, *Annual Report on National Accounts*

Figure 2.8 shows trends of population, GDP, CO_2 emissions per capita, and CO_2 emissions per unit of GDP. CO_2 emissions per capita continuously exceeded the FY1990 level between FY1990 and FY2008, but it fell under the FY1990 level in FY2009, due to a significant decrease in CO_2 emissions. GDP and CO_2 emissions per unit of GDP show the opposite trend, and CO_2 emissions per unit of GDP has continued to be below FY1990 the level since the early 2000s.

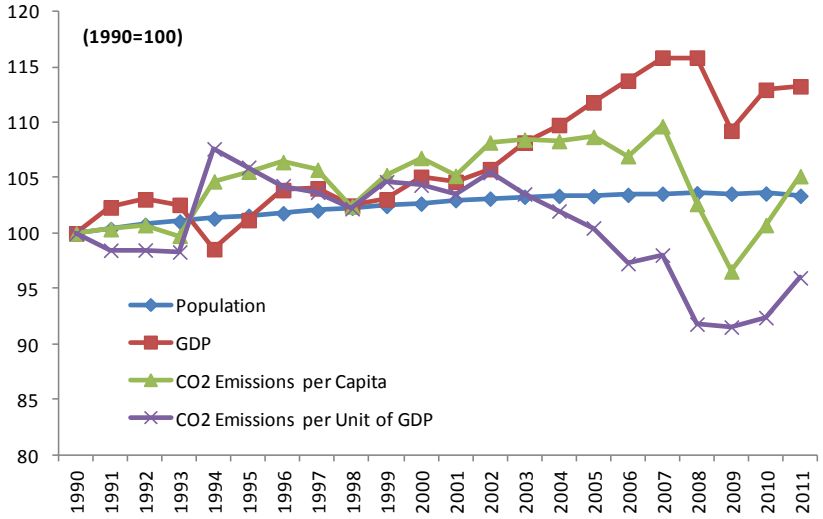


Figure 2.8 Trends in Population, GDP, CO_2 Emissions per Capita, CO_2 Emissions per Unit of GDP (FY1990 = 100)

Source of population data: Statistics Bureau, Ministry of Internal Affairs and Communications, *Population Census* and *Population Estimates*; Source of GDP data: Cabinet Office, Government of Japan, *Annual Report on National Account*

2.1.3.2 CH_4

Methane emissions in FY2011 amounted to 20.3 million tonnes (in CO_2 eq., including LULUCF), accounting for 1.6% of total GHG emissions. They decreased by 36.8% from FY1990 and by 2.1% compared to the previous year. Their decrease since FY1990 was mainly a result of a decrease in emissions from the waste sector (53.2% reduction compared to FY1990) due to a decrease in waste disposal on land, etc.

The breakdown of the FY2011 emissions shows that the largest source was enteric fermentation accounting for 32%. This was followed by rice cultivation (27%) and solid waste disposal on land (15%). Their decrease since the previous year was a result of a decrease in emissions from the waste sector (4.8% reduction compared to the previous year) due to a decrease in waste disposal on land, etc., and from the agricultural sector (1.0% reduction compared to the previous year) due to a decrease in emission from enteric fermentation.

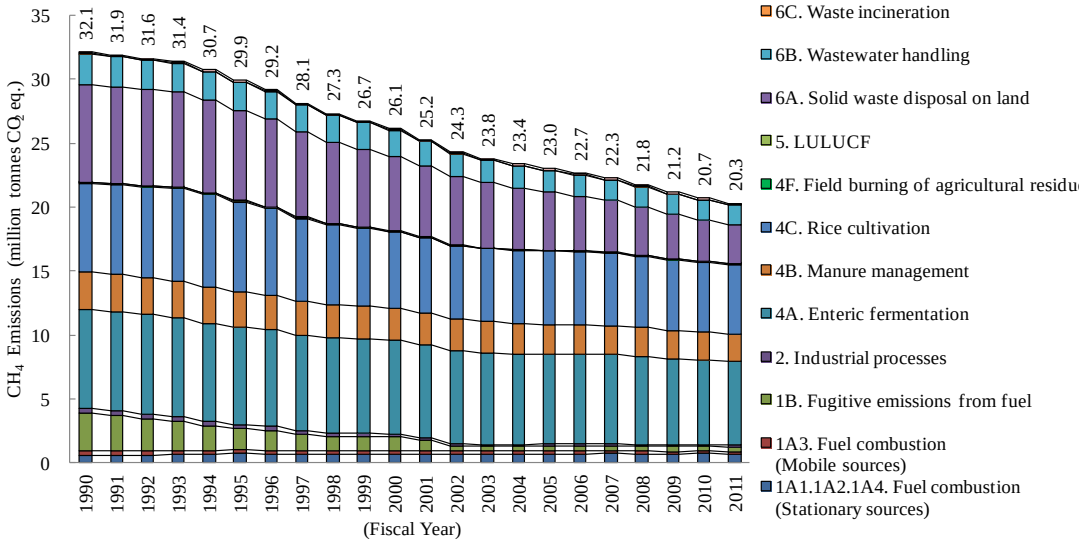


Figure 2.9 Trends in CH_4 Emissions

Table 2.3 Trends in CH_4 Emissions

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2005	2008	2009	2010	2011
1A. Fuel combustion	890	1,038	959	914	891	865	908	859
1A1. Energy industries	30	34	43	31	31	30	33	37
1A2. Manufacturing industries and construction	355	438	355	387	438	436	473	463
1A3. Transport	298	309	298	238	192	180	170	162
1A4. Other sectors	207	257	263	258	230	219	233	198
1B. Fugitive emissions from fuels	3,037	1,610	1,043	396	408	394	376	374
1B1. Solid fuels	2,806	1,345	769	74	46	46	44	45
1B2. Oil & Natural gas	231	265	274	322	362	348	331	330
2. Industrial processes	358	322	196	134	121	110	119	120
4. Agriculture	17,681	17,531	15,907	15,180	14,811	14,561	14,334	14,185
4A. Enteric fermentation	7,677	7,606	7,370	7,002	6,913	6,773	6,658	6,568
4B. Manure management	2,944	2,747	2,540	2,373	2,238	2,185	2,144	2,127
4C. Rice cultivation	6,960	7,083	5,920	5,739	5,599	5,545	5,477	5,434
4F. Field burning of agricultural residue	101	94	77	65	62	58	56	56
5. LULUCF	9	9	8	9	22	9	4	5
6. Waste	10,165	9,399	8,028	6,392	5,519	5,245	5,003	4,761
6A. Solid waste disposal on land	7,637	7,070	5,876	4,568	3,758	3,517	3,286	3,093
6B. Wastewater handling	2,402	2,207	2,043	1,684	1,592	1,545	1,518	1,518
6C. Waste incineration	13	15	13	14	12	10	10	10
6D. Other (Waste)	112	106	96	126	157	172	190	141
Total (including LULUCF)	32,140	29,908	26,142	23,024	21,772	21,183	20,745	20,304
Total (excluding LULUCF)	32,131	29,899	26,134	23,015	21,750	21,175	20,741	20,299

* LULUCF: Land Use, Land-Use Change and Forestry

2.1.3.3 N_2O

Nitrous oxide emissions in FY2011 amounted to 21.6 million tonnes (in CO_2 eq., including LULUCF), accounting for 1.7% of total GHG emissions.

Their decrease from FY1990 was mainly a result of a decrease in emissions from industrial processes (87.7% reduction compared to FY1990) due to the operation of N_2O abatement equipment in adipic acid production plants, and from the agricultural sector (19.8% reduction compared to FY1990) due to a decrease in the livestock population and the use of nitrogen fertilizers applied to cropland.

There was a sharp decline in emissions from industrial processes from FY1998 to 1999, as N_2O abatement equipment came on stream in adipic acid production plants in March 1999. However, N_2O

emissions increased in FY2000 because of a decrease in the efficiency of the equipment; emissions decreased again in FY2001 with the resumption of normal operation.

The breakdown of the FY2011 emissions shows that the largest source was agricultural soils, which accounted for 27%, followed by manure management (25%) and fuel combustion (stationary sources) (19%). Their decrease from the previous year was mainly a result of a decrease in emissions from industrial processes (-26.9% compared to the previous year) due to a decrease in emissions from adipic acid production.

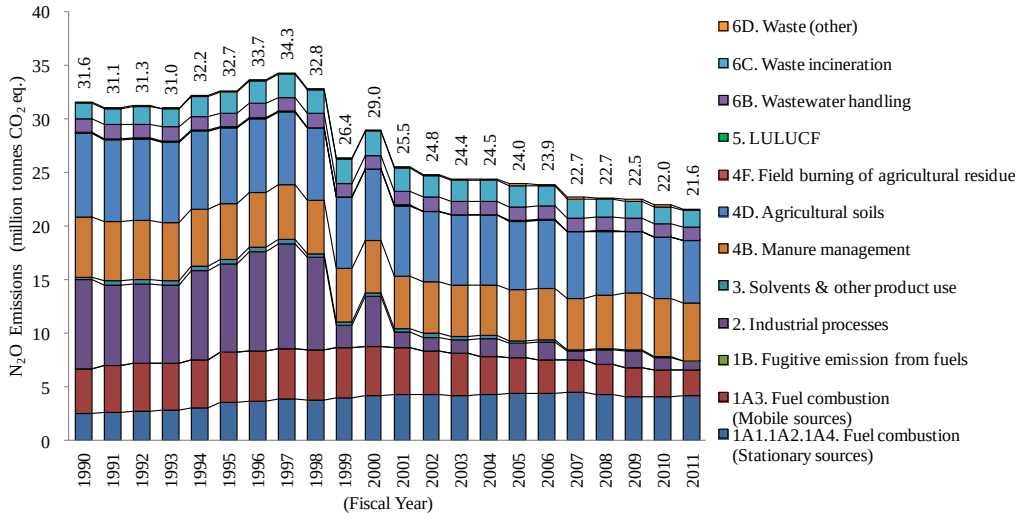


Figure 2.10 Trends in N_2O Emissions

Table 2.4 Trends in N_2O Emissions

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2005	2008	2009	2010	2011
1A. Fuel combustion	6,752	8,284	8,762	7,777	7,184	6,846	6,663	6,609
1A1. Energy industries	922	1,413	1,700	2,068	2,022	1,934	1,903	1,990
1A2. Manufacturing industries and construction	1,350	1,871	2,116	2,036	1,988	1,917	1,902	1,884
1A3. Transport	4,206	4,652	4,589	3,321	2,851	2,682	2,533	2,412
1A4. Other sectors	273	348	356	352	322	313	325	323
1B. Fugitive emissions from fuels	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
2. Industrial processes	8,267	8,213	4,690	1,300	1,262	1,559	1,078	788
3. Solvent & Other product use	287	438	341	266	129	120	99	97
4. Agriculture	13,409	12,330	11,558	11,186	11,004	10,990	11,183	11,218
4B. Manure management	5,556	5,174	4,905	4,768	5,043	5,252	5,450	5,410
4D. Agricultural soils	7,826	7,130	6,631	6,400	5,943	5,721	5,717	5,792
4F. Field burning of agricultural residue	27	26	22	18	17	16	15	15
5. LULUCF	71	50	30	14	11	8	6	5
6. Waste	2,848	3,382	3,570	3,417	3,085	3,022	2,970	2,912
6B. Wastewater handling	1,256	1,307	1,244	1,263	1,253	1,236	1,222	1,222
6C. Waste incineration	1,493	1,981	2,242	2,042	1,694	1,633	1,580	1,566
6D. Waste (other)	99	94	85	112	139	153	168	124
Total (including LULUCF)	31,634	32,697	28,951	23,960	22,675	22,545	21,999	21,629
Total (excluding LULUCF)	31,562	32,647	28,921	23,946	22,664	22,537	21,993	21,624

* LULUCF: Land Use, Land-Use Change and Forestry

2.1.3.4 HFCs

Emissions of hydrofluorocarbons in CY2011[28] amounted to 20.5 million tonnes (in CO_2 eq.), accounting for 1.6% of total GHG emissions. They increased by 1.0% from CY1995, and by 11.8% compared to the previous year. Their increase from CY1995 was mainly a result of an increase in

[28] Emissions of HFCs, PFCs and SF_6 are estimated on a calendar year (CY) basis.

emissions from refrigerants (+2,203%) due to the substitution of HCFC, an ozone depleting substance, with HFCs. This occurred despite regardless of a decrease in emissions of HFC-23 (-99.9%), a by-product of HCFC-22 production, due to regulation under the Act on the Protection of the Ozone Layer through the Control of Specified Substances and Other Measures.

The breakdown of the CY2011 emissions shows that the largest source was refrigerants for refrigeration and air conditioning equipment accounting for 95%. This was followed by aerosols and metered dose inhalers (MDIs) (3%). Their increase from the previous year was mainly a result of a 12.9% increase in emissions from refrigerants due to the substitution of HCFC with HFCs.

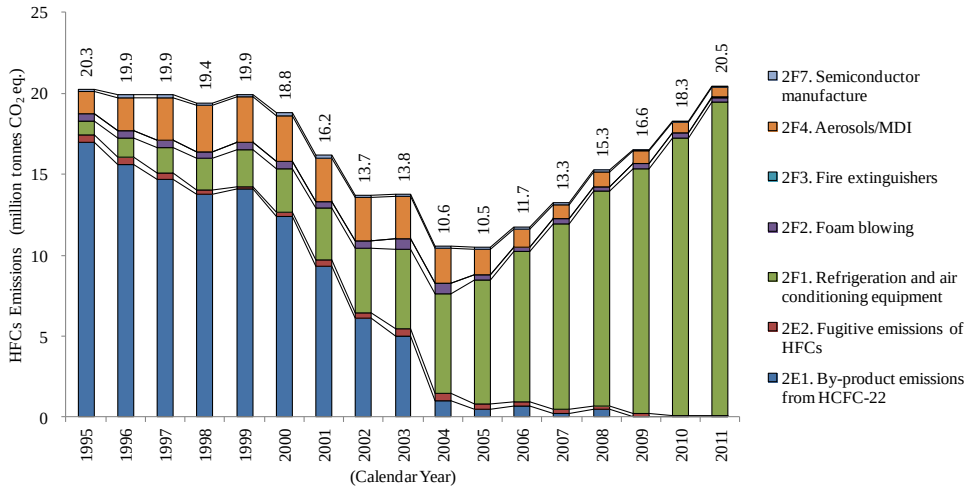


Figure 2.11 Trends in HFCs Emissions

Table 2.5 Trends in HFCs Emissions

[Thousand tonnes CO_2 eq.]

Category	1995	2000	2005	2008	2009	2010	2011
2E. Production of F-gas	17,445	12,660	816	701	222	128	112
2E1. By-product emissions from production of HCFC-22	16,965	12,402	463	469	40	42	13
2E2. Fugitive emissions of HFCs	480	258	353	232	182	86	100
2F. Consumption of F-gases	2,815	6,141	9,702	14,597	16,332	18,179	20,355
2F1. Refrigeration and air conditioning equipment	840	2,689	7,667	13,269	15,134	17,139	19,355
2F2. Foam blowing	452	440	316	286	290	291	295
2F3. Fire extinguishers	NO	3.7	5.9	6.3	7	7	7
2F4. Aerosols/MDI	1,365	2,834	1,572	890	809	640	609
2F7. Semiconductor manufacture	158	174	141	146	92	102	89
Total	20,260	18,800	10,518	15,298	16,554	18,307	20,467

2.1.3.5 PFCs

Emissions of perfluorocarbons emissions in CY2011 amounted to 3.0 million tonnes (in CO_2 eq.), accounting for 0.2% of total GHG emissions. They decreased by 78.9% from CY1995, and by 11.5% compared to the previous year. Their decrease from the CY1995 level (-87.5%) was mainly a result of a decrease in emissions from solvents by using substitute materials as solvents. The breakdown of the CY2011 emissions shows that the largest source was semiconductors for manufacturing accounting for 51%. This was followed by solvents such as those used for washing metals (43%) and fugitive emissions of PFCs (6%). The decrease from the previous year was mainly a result of a decrease in emissions from the production of semiconductors (-15.0%).

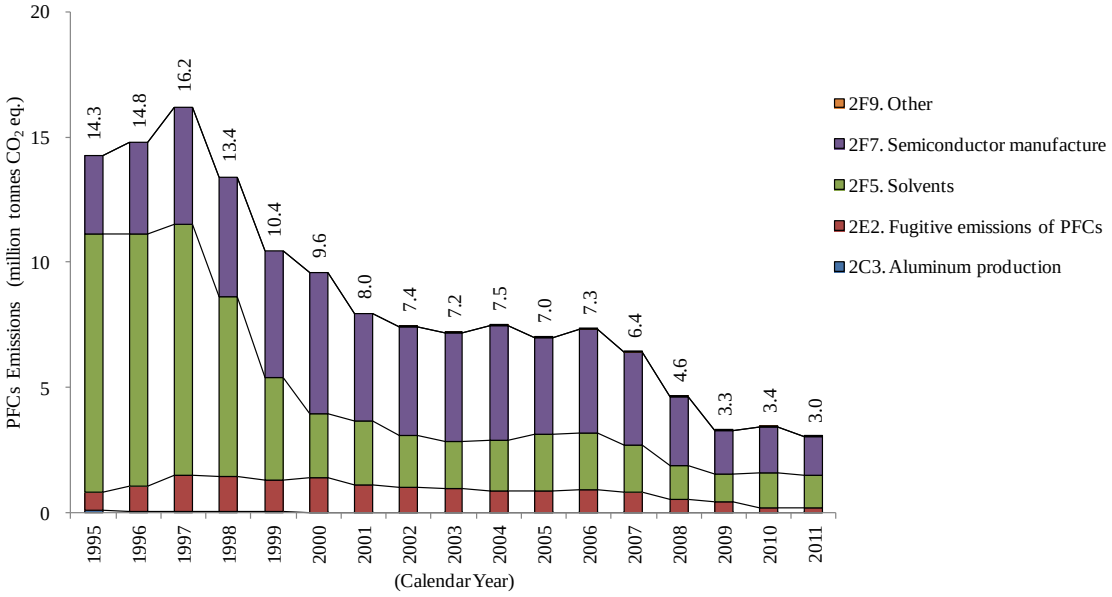


Figure 2.12 Trends in PFCs Emissions

Table 2.6 Trends in PFCs Emissions

[Thousand tonnes CO_2 eq.]

Category	1995	2000	2005	2008	2009	2010	2011
2C3. Aluminum production	70	18	15	15	11	10	10
2E2. Fugitive emissions of PFCs	763	1,359	837	524	399	200	172
2F. Consumption of F-gases	13,439	8,207	6,138	4,077	2,855	3,198	2,834
2F5. Solvents	10,294	2,569	2,278	1,318	1,137	1,376	1,284
2F7. Semiconductor manufacture	3,144	5,637	3,861	2,756	1,715	1,819	1,545
2F9. Other	NE,NO	NE,NO	0.2	1.8	2.5	3.5	4.7
Total	14,271	9,583	6,991	4,615	3,265	3,409	3,016

2.1.3.6 SF_6

Sulfur hexafluoride emissions in CY2011 amounted to 1.6 million tonnes (in CO_2 eq.), accounting for 0.1% of total GHG emissions. They decreased by 90.3% from CY1995, and by 12.1% compared to the previous year. Their decrease from the CY1995 level (-93%) was mainly a result of a decrease in emissions from electrical equipment, due to the strengthening of the management of gases, largely in electric power companies.

The breakdown of the CY2011 emissions shows that the largest source was electrical equipment accounting for 45%. This was followed by semiconductor manufacture (35%) and aluminum and magnesium foundries (12%). The decrease from the previous year was mainly a result of a decrease in emissions from the production of semiconductors (-19.4%).

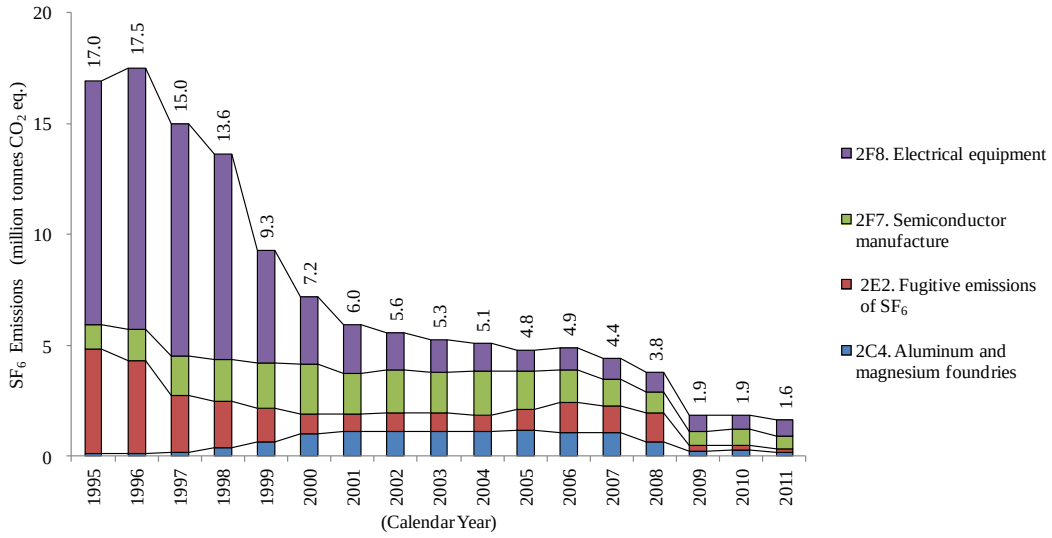


Figure 2.13 Trends in SF_6 Emissions

Table 2.7 Trends in SF_6 Emissions

[Thousand tonnes CO_2 eq.]

Category	1995	2000	2005	2008	2009	2010	2011
2C4. SF_6 used in aluminum and magnesium foundries	120	1,028	1,157	652	239	308	191
2E2. Fugitive emissions of SF_6	4,708	860	975	1,288	261	198	139
2F. Consumption of F-gases	12,134	5,300	2,676	1,855	1,352	1,356	1,308
2F7. Semiconductor manufacture	1,129	2,250	1,733	952	606	704	567
2F8. Electrical equipment	11,005	3,050	943	902	745	652	741
Total	16,961	7,188	4,808	3,795	1,851	1,862	1,638

2.1.4 Description of Emission and Removal Trends by Sector

The breakdown of GHG emissions and removals in FY2011 by sector[29] shows the energy sector accounted for 91.3% of total GHG emissions. This was followed by industrial processes (5.1%), agriculture (1.9%), waste (1.6%), and solvents and other product use (0.01%).
Removals by LULUCF in FY2011 were equivalent to 5.8% of total GHG emissions.

[29] This implies "Category" as indicated in the *Revised 1996 IPCC Guidelines* and CRF.

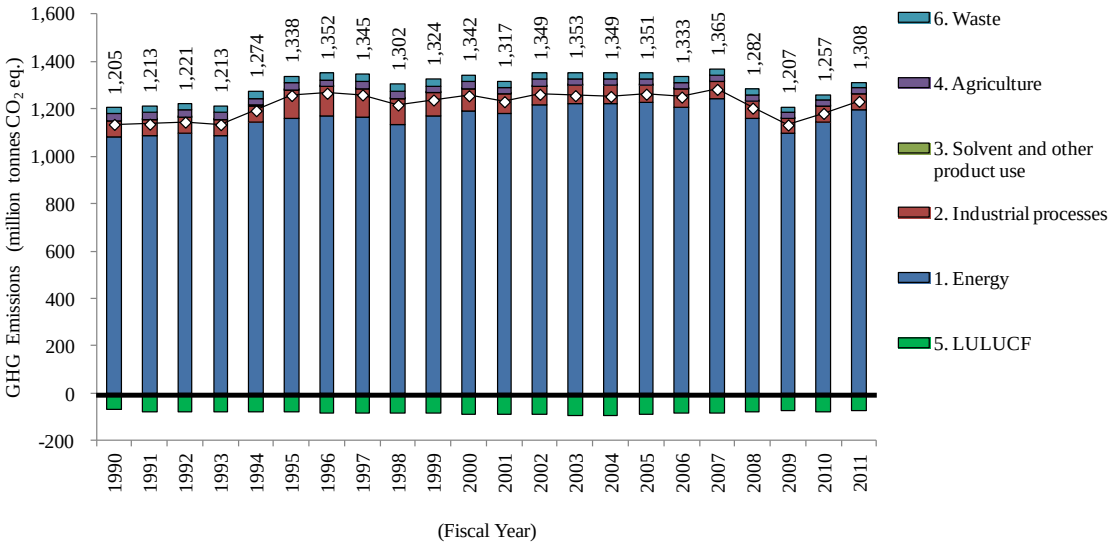


Figure 2.14 Trends in GHG Emissions and Removals in Each Sector

Table 2.8 Trends in GHG Emissions and Removals in Each Sector

[Million tonnes CO_2 eq.]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1. Energy	1,079.0	1,086.8	1,094.2	1,087.7	1,143.7	1,156.8	1,168.9	1,165.8	1,135.6	1,171.0
2. Industrial processes	68.5	68.9	68.8	67.6	69.8	121.4	123.4	120.1	108.6	95.2
3. Solvent and other product use	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
4. Agriculture	31.1	31.0	31.0	30.9	30.5	29.9	29.2	28.6	28.1	27.7
5. LULUCF	-69.5	-76.7	-76.4	-78.8	-80.3	-80.6	-85.1	-85.4	-85.2	-85.4
6. Waste	26.0	25.9	27.0	26.6	29.1	29.3	29.6	30.0	29.7	29.3
Net emissions/removals (incl. LULUCF)	1,135.3	1,136.3	1,145.0	1,134.4	1,193.3	1,257.1	1,266.4	1,259.5	1,217.2	1,238.2
Emissions (excl. LULUCF)	1,204.8	1,213.0	1,221.4	1,213.2	1,273.6	1,337.7	1,351.6	1,345.0	1,302.4	1,323.5

[Million tonnes CO_2 eq.]	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1. Energy	1,190.8	1,177.9	1,217.7	1,223.3	1,223.1	1,226.8	1,208.2	1,242.2	1,161.6	1,096.9
2. Industrial processes	94.3	84.3	77.9	76.6	73.8	73.7	75.7	74.3	70.7	63.5
3. Solvent and other product use	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1
4. Agriculture	27.5	27.2	27.0	26.7	26.5	26.4	26.3	26.0	25.8	25.6
5. LULUCF	-86.0	-86.1	-87.2	-96.3	-95.8	-88.8	-83.1	-82.3	-78.1	-74.1
6. Waste	29.1	27.3	26.3	25.9	25.1	24.3	23.1	22.5	23.7	20.7
Net emissions/removals (incl. LULUCF)	1,256.1	1,231.0	1,262.0	1,256.6	1,253.0	1,262.6	1,250.4	1,282.9	1,203.8	1,132.8
Emissions (excl. LULUCF)	1,342.1	1,317.1	1,349.2	1,352.9	1,348.8	1,351.4	1,333.5	1,365.2	1,282.0	1,206.8

[Million tonnes CO_2 eq.]	2010	2011
1. Energy	1,145.0	1,194.5
2. Industrial processes	65.8	67.2
3. Solvent and other product use	0.1	0.1
4. Agriculture	25.5	25.4
5. LULUCF	-75.8	-75.4
6. Waste	21.0	20.6
Net emissions/removals (incl. LULUCF)	1,181.6	1,232.3
Emissions (excl. LULUCF)	1,257.4	1,307.7

* LULUCF: Land Use, Land-Use Change and Forestry

2.1.4.1 Energy

Emissions from the energy sector in FY2011 amounted to 1,194 million tonnes (in CO_2 equivalents). They increased by 10.7% from FY1990 and by 4.3% compared to the previous year.

The breakdown of the FY2011 emissions shows that CO_2 from fuel combustion accounted for 99.3%. The largest source within fuel combustion was liquid fuel CO_2, which accounted for 43%, followed by solid fuel CO_2 (35%) and gaseous fuel CO_2 (21%).

For the trend of emissions, please refer to the description of trends in CO_2 emissions of fuel combustion, which accounted for most of the emissions (See 2.1.3.1. CO_2).

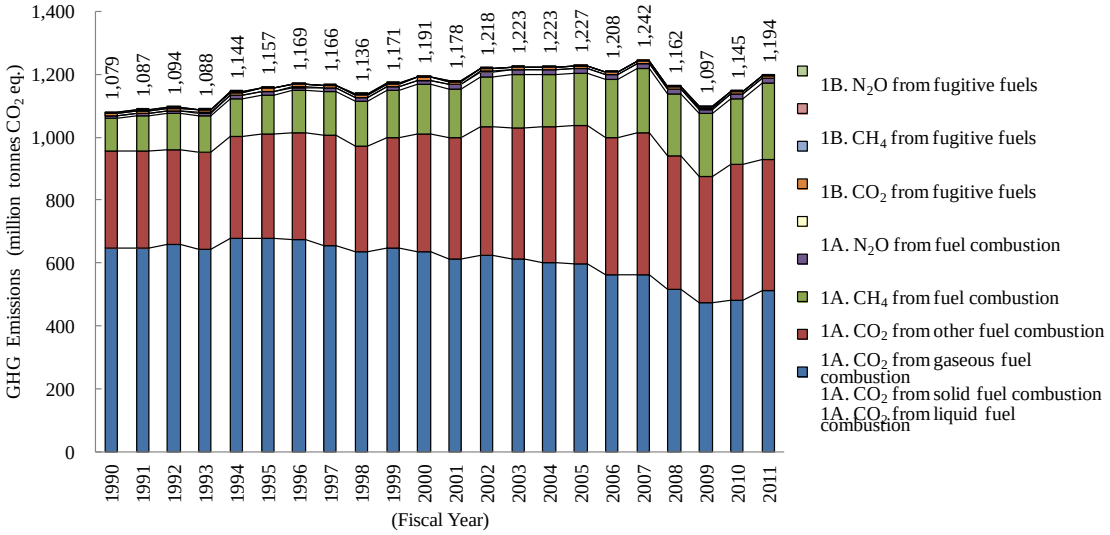


Figure 2.15 Trends in GHG Emissions from the Energy Sector

Table 2.9 Trends in GHG Emissions from the Energy Sector

[Thousand tonnes CO_2 eq.]

Source category	1990	1995	2000	2005	2008	2009	2010	2011
1A. Fuel combustion	1,075,901	1,155,091	1,189,765	1,226,388	1,161,118	1,096,515	1,144,553	1,194,073
Liquid fuel CO_2	646,223	677,349	635,121	597,813	518,395	474,999	481,310	514,568
Solid fuel CO_2	308,620	331,720	376,521	437,937	420,521	401,560	431,474	413,488
Gaseous fuel CO_2	104,301	126,198	155,261	166,823	199,525	198,684	210,686	245,018
Other fuels CO_2 (Waste)	9,116	10,503	13,142	15,124	14,602	13,561	13,512	13,530
CH_4	890	1,038	959	914	891	865	908	859
N_2O	6,752	8,284	8,762	7,777	7,184	6,846	6,663	6,609
1B. Fugitive emissions from fuel	3,074	1,661	1,079	433	446	430	409	407
CO_2	37	51	36	38	38	35	33	33
CH_4	3,037	1,610	1,043	396	408	394	376	374
N_2O	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Total	1,078,975	1,156,752	1,190,844	1,226,821	1,161,565	1,096,945	1,144,962	1,194,480

2.1.4.2 Industrial Processes

Emissions from the industrial processes sector[30] in FY2011 amounted to 67.2 million tonnes (in CO_2 eq.). They decreased by 2.0% from FY1990, and increased by 2.0% compared to the previous year.

The breakdown of GHG emissions from this sector in FY2011 shows that the largest source was mineral products such as CO_2 emissions from limestone in cement production, accounting for 57%. This was followed by the consumption of HFCs (30%) and the consumption of PFCs (4%). The increase from the previous year was a result of an increase in emissions from refrigerants due to the substitution of HCFC for HFCs.

The main driving factors for decreases in CO_2, CH_4 and N_2O emissions from FY1990 were the decrease in CO_2 emissions from cement production as clinker production declined, and the decrease in N_2O emissions from adipic acid production as N_2O abatement equipment came on stream. The

[30] Actual emissions of HFCs, PFCs, and SF_6 are not estimated (NE) for CY1990 to 1994.

main driving factors for decreases in emissions of PFCs and SF_6 emissions from CY1995 were the promotion of substitute materials use and of the capture and destruction of these gases.

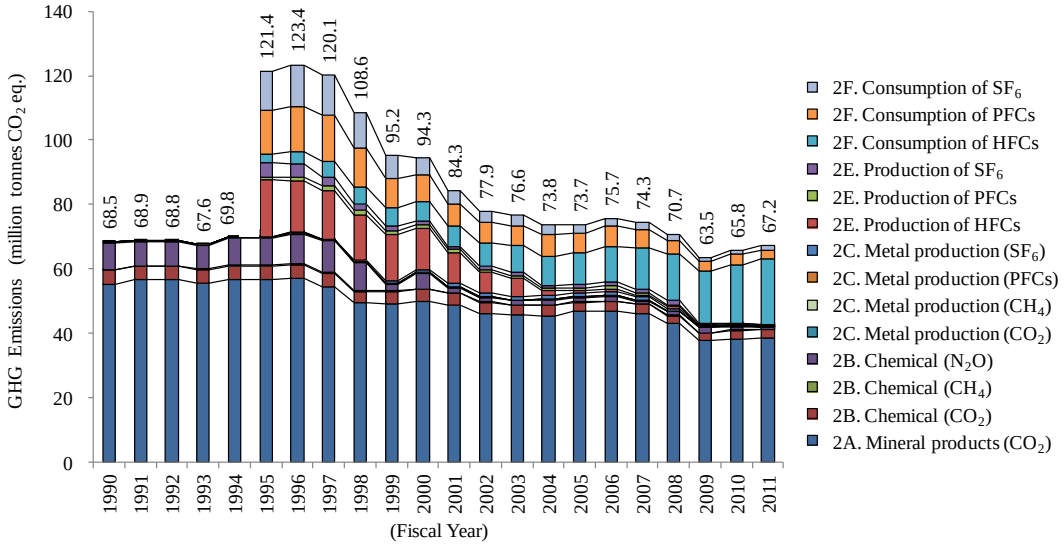


Figure 2.16 Trends in GHG Emissions from the Industrial Processes Sector

Table 2.10 Trends in GHG Emissions from the Industrial Processes Sector

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2005	2008	2009	2010	2011
2A. Mineral products (CO_2)	55,311	56,756	49,746	46,774	42,883	37,589	38,177	38,344
2B. Chemical industry	12,814	12,737	8,762	4,304	3,943	4,144	3,919	3,522
CO_2	4,209	4,220	3,893	2,887	2,574	2,488	2,737	2,629
CH_4	338	304	179	117	106	97	104	105
N_2O	8,267	8,213	4,690	1,300	1,262	1,559	1,078	788
2C. Metal production	375	564	1,311	1,431	838	375	493	378
CO_2	356	357	248	242	156	112	160	162
CH_4	19	18	17	17	15	13	15	15
PFCs	NE	70	18	15	15	11	10	10
SF_6	NE	120	1,028	1,157	652	239	308	191
2E. Production of F-gas	NE	22,916	14,879	2,629	2,513	882	527	423
HFCs	NE	17,445	12,660	816	701	222	128	112
PFCs	NE	763	1,359	837	524	399	200	172
SF_6	NE	4,708	860	975	1,288	261	198	139
2F. Consumption of F-gas	NE	28,387	19,648	18,516	20,528	20,539	22,733	24,497
HFCs	NE	2,815	6,141	9,702	14,597	16,332	18,179	20,355
PFCs	NE	13,439	8,207	6,138	4,077	2,855	3,198	2,834
SF_6	NE	12,134	5,300	2,676	1,855	1,352	1,356	1,308
Total	68,500	121,361	94,345	73,653	70,705	63,529	65,849	67,164

2.1.4.3 Solvent and Other Product Use

Emissions from the solvents and other product use sector in FY2011 amounted to 100,000 tonnes (in CO_2 eq.). They decreased by 66.2% from FY1990, and by 1.8% compared to the previous year. The only substance subject to estimation in this sector is laughing gas (N_2O) used as a general anesthetic in hospitals. Their trend since FY1990 and the previous year was a result of a decrease in emissions from laughing gas (N_2O) due to the substitution of anesthetics.

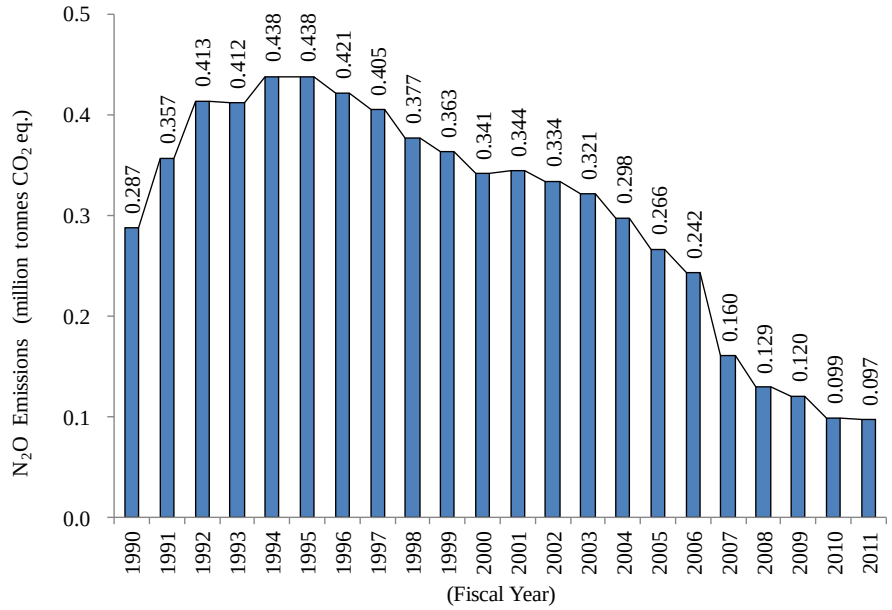


Figure 2.17 Trends in GHG Emissions from the Solvent and Other Product Use Sector

2.1.4.4 Agriculture

Emissions from the agriculture sector in FY2011 amounted to 25.4 million tonnes (in CO_2 eq.). They decreased by 18.3% from FY1990 and by 0.5% compared to the previous year.

The breakdown of the FY2011 emissions from this sector shows that the largest source was the enteric fermentation, accounting for 26%. This was followed by agricultural soils (23%) as a result of the application of nitrogen-based fertilizer, and rice cultivation (21%). The decrease from the previous year was mainly the result of a decrease in CH_4 emissions from enteric fermentation and CH_4 or N_2O emissions from manure management, due to a decline in the livestock population. The main driving factor for the decrease in emissions from FY1990 was the decrease in CH_4 emissions from rice cultivation as a result of crop a decline in acreage, and the decrease in N_2O emissions from agricultural soils, because the amount of nitrogen fertilizers applied to cropland had decreased.

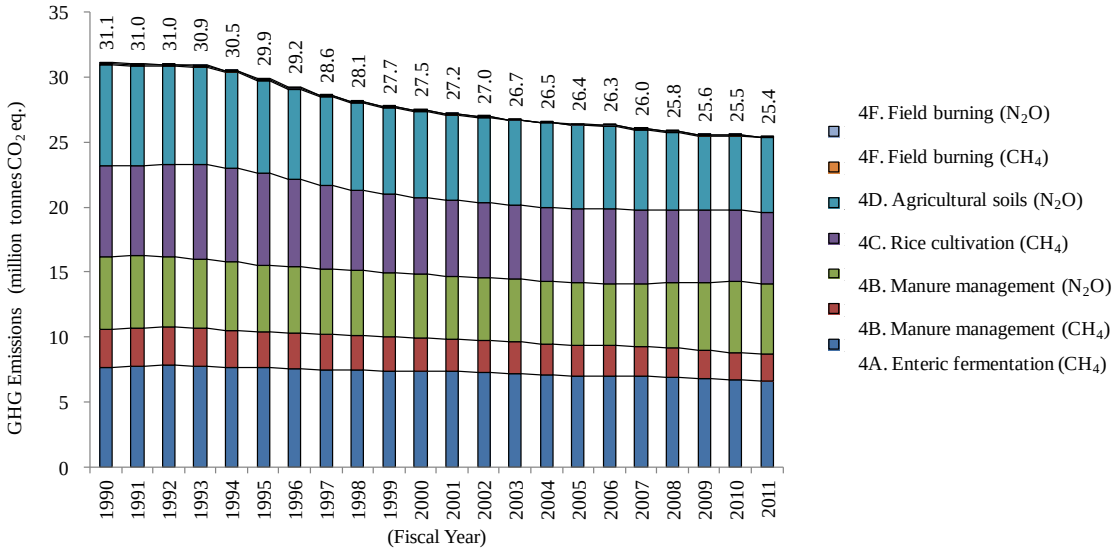


Figure 2.18 Trends in GHG Emissions from the Agriculture Sector

Table 2.11 Trends in GHG Emissions from the Agriculture Sector

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2005	2008	2009	2010	2011
4A. Enteric fermentation(CH_4)	7,677	7,606	7,370	7,002	6,913	6,773	6,658	6,568
4B. Manure management	8,500	7,921	7,446	7,142	7,282	7,437	7,594	7,537
CH_4	2,944	2,747	2,540	2,373	2,238	2,185	2,144	2,127
N_2O	5,556	5,174	4,905	4,768	5,043	5,252	5,450	5,410
4C. Rice cultivation (CH_4)	6,960	7,083	5,920	5,739	5,599	5,545	5,477	5,434
4D. Agricultural soils (N_2O)	7,826	7,130	6,631	6,400	5,943	5,721	5,717	5,792
4F. Field burning of agricultural residues	128	120	99	84	79	75	71	71
CH_4	101	94	77	65	62	58	56	56
N_2O	27	26	22	18	17	16	15	15
Total	31,090	29,861	27,465	26,366	25,815	25,550	25,517	25,402

2.1.4.5 Land Use, Land Use Change, and Forestry (LULUCF)

Net removals (including CO_2, CH_4 and N_2O emissions) from the LULUCF sector in FY2011 amounted to 75.4 million tonnes (in CO_2 eq.). They increased by 8.5% from FY1990 and decreased by 0.4% compared to the previous year. The declining trend in removals in recent years has largely been due to the maturity of Japanese forests. Emissions from cropland and settlements have decreased from FY1990 because land-use conversions to those land-use categories became lower due to factors such as economic depression and the decline of agriculture.

The breakdown of the FY2011 emissions and removals from this sector shows that the largest sink was the forest land, and its removals amounted to 78.1 million tonnes accounting for 104% of this sector's net total emissions/removals.

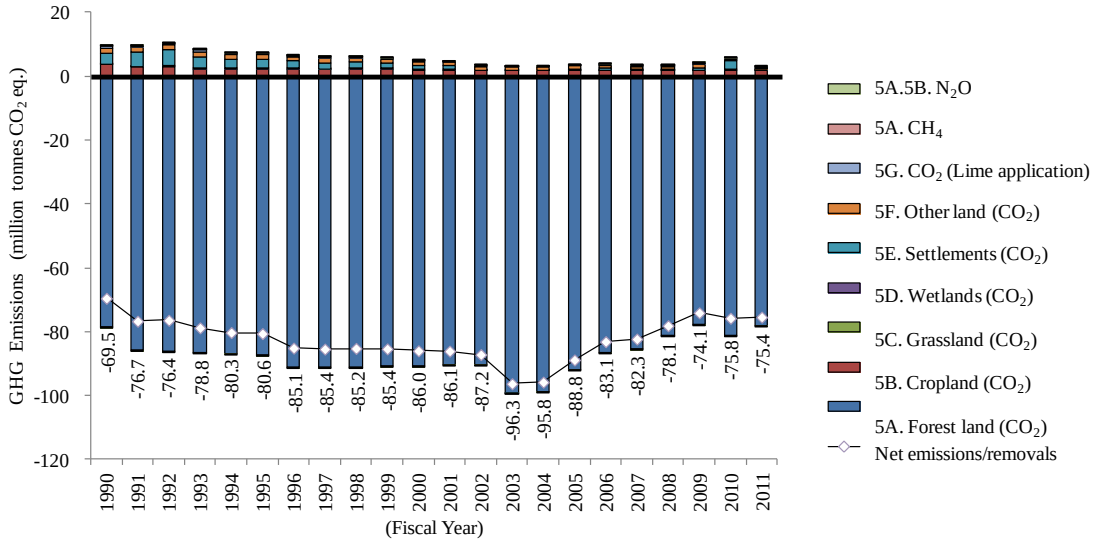


Figure 2.19 Trends in GHG Emissions and Removals from the LULUCF Sector

Table 2.12 Trends in GHG Emissions and Removals from the LULUCF Sector

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2005	2008	2009	2010	2011
5A. Forest land	-78,581	-87,331	-90,664	-92,040	-81,343	-77,885	-81,309	-78,085
CO_2	-78,590	-87,340	-90,673	-92,050	-81,367	-77,895	-81,314	-78,091
CH_4	9	9	8	9	22	9	4	5
N_2O	0.9	0.9	0.8	0.9	2.2	0.9	0.4	0.5
5B. Cropland	3,733	2,312	1,897	1,786	1,734	1,757	1,956	1,786
CO_2	3,663	2,263	1,868	1,773	1,725	1,750	1,951	1,781
CH_4	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
N_2O	70	49	29	13	9	7	6	5
5C. Grassland	-266	-309	-243	-160	-139	-118	-57	-90
CO_2	-266	-309	-243	-160	-139	-118	-57	-90
CH_4	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
N_2O	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
5D. Wetlands	68	307	409	16	16	24	87	60
CO_2	68	307	409	16	16	24	87	60
CH_4	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
N_2O	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
5E. Settlements	3,532	2,666	1,121	365	410	755	2,888	411
CO_2	3,532	2,666	1,121	365	410	755	2,888	411
CH_4	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
N_2O	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
5F. Other land	1,431	1,459	1,170	975	891	1,109	421	238
CO_2	1,431	1,459	1,170	975	891	1,109	421	238
CH_4	NO	NO	NO	NO	NO	NO	NO	NO
N_2O	NO	NO	NO	NO	NO	NO	NO	NO
5G. Other	550	304	333	231	306	270	243	247
CO_2	550	304	333	231	306	270	243	247
Total	-69,532	-80,594	-85,978	-88,828	-78,125	-74,089	-75,772	-75,434

2.1.4.6 Waste

Emissions from the waste sector in FY2011 amounted to 20.6 million tonnes (in CO_2 eq.). They decreased by 20.8% from FY1990 and by 1.8% compared to the previous year.

The breakdown of the FY2011 emissions from this sector shows that the largest source was waste incineration (CO_2), associated with waste derived from fossil fuels such as waste plastic and waste oil, accounting for 60%. This was followed by solid waste disposal on land (CH_4) (15%) and waste incineration (N_2O) (8%), which are associated with waste substances including those that do not have a fossil fuel origin.

The main driving factor for the decrease in emissions from FY1990 was the decrease in CH_4 emissions from solid waste disposal on land. This was a result of decrease in the amount of disposal of biodegradable waste due to improvement of the volume reduction ratio by intermediate treatment under the Waste Management and Public Cleansing Act and other acts. The decrease from the previous fiscal year was also for the same reason.

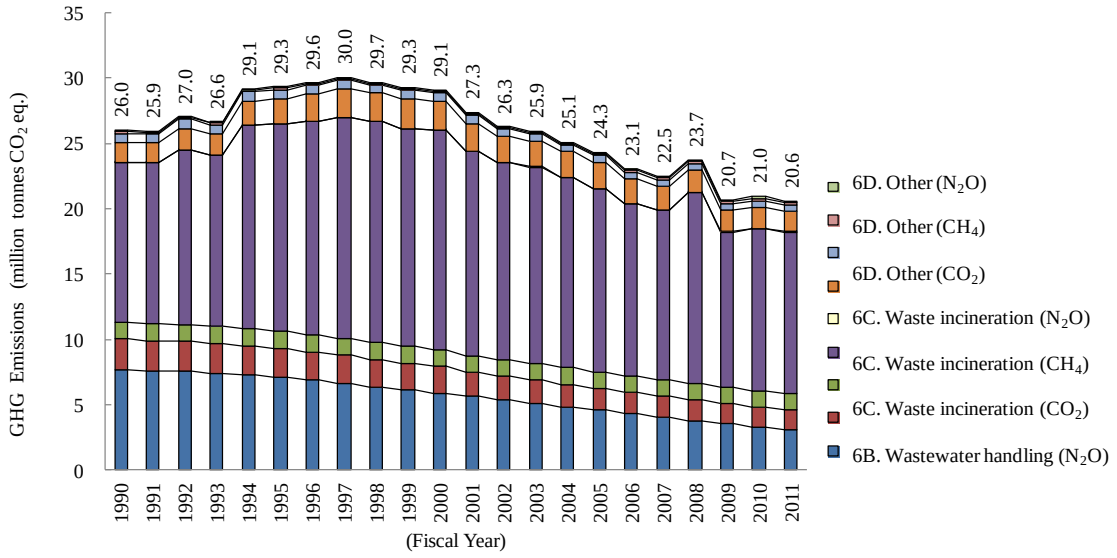


Figure 2.20 Trends in GHG Emissions from the Waste Sector

Table 2.13 Trends in GHG Emissions from the Waste Sector

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2005	2008	2009	2010	2011
6A. Solid waste disposal on land (CH_4)	7,637	7,070	5,876	4,568	3,758	3,517	3,286	3,093
6B. Wastewater handling	3,658	3,514	3,286	2,947	2,844	2,781	2,739	2,739
CH_4	2,402	2,207	2,043	1,684	1,592	1,545	1,518	1,518
N_2O	1,256	1,307	1,244	1,263	1,253	1,236	1,222	1,222
6C. Waste incineration	13,769	17,863	19,093	16,041	16,310	13,566	14,042	13,966
CO_2	12,263	15,867	16,838	13,984	14,605	11,922	12,452	12,391
CH_4	13	15	13	14	12	10	10	10
N_2O	1,493	1,981	2,242	2,042	1,694	1,633	1,580	1,566
6D. Other	914	868	837	744	826	838	885	787
CO_2	703	668	656	507	530	514	527	522
CH_4	112	106	96	126	157	172	190	141
N_2O	99	94	85	112	139	153	168	124
Total	25,978	29,315	29,092	24,300	23,739	20,703	20,953	20,585

2.1.5 Description of Emission Trends for Indirect GHGs and SO_2

Under the UNFCCC, emissions reporting is required not only for the 6 types of GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) that are controlled by the Kyoto Protocol, but also for emissions of indirect GHGs (NO_X, CO, and NMVOC) as well as SO_2. Their emission trends are indicated below.

Nitrogen oxide (NO_X) emissions in FY2011 amounted to 1,679,000 tonnes. They decreased by 17.8% from FY1990 and by 3.4% compared to the previous year.

Carbon monoxide (CO) emissions in FY2011 amounted to 2,409,000 tonnes. They decreased by 46.3% from FY1990 and by 5.6% compared to the previous year.

Non-methane volatile organic compounds (NMVOC) emissions in FY2011 amounted to 1,574,000 tonnes. They decreased by 19.0% from FY1990 and increased by 0.2% compared to the previous year.

Sulfur dioxide (SO_2) emissions in FY2011 amounted to 941,000 tonnes. They decreased by 25.0% from FY1990 and by 1.2% compared to the previous year.

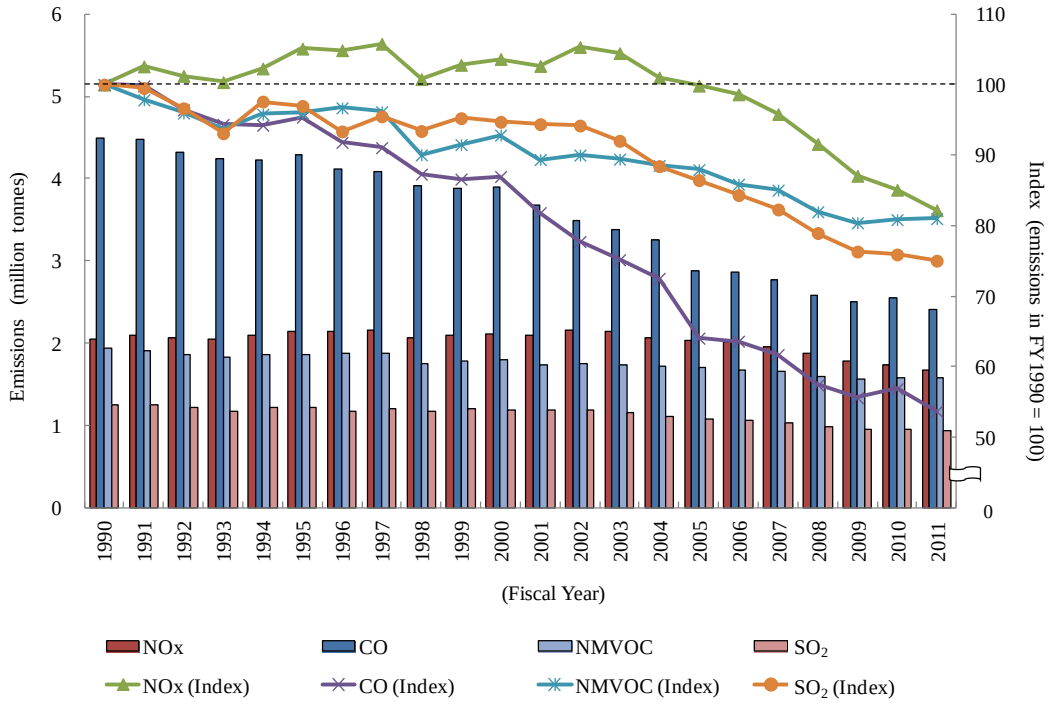


Figure 2.21 Trends in Emissions of Indirect GHGs and SO_2

2.1.6 Emissions and Removals from KP-LULUCF Activities

The net removals from KP-LULUCF activities in FY2011 amounted to 52.2 million tonnes (in CO_2 eq.). The breakdown of emissions and removals from each activity in the first commitment period of the Kyoto Protocol is shown in Table 2.14.

Table 2.14 Accounting Summary for Activities under Articles 3.3 and 3.4 of the Kyoto Protocol (CRF information table)

Greenhouse gas source and sink activities	Base year	Net emissions/removals					Accounting parameters	Accounting quantity
		2008	2009	2010	2011	Total		
	(Gg CO_2 equivalent)							
A. Article 3.3 activities								
A.1. Afforestation and Reforestation								-1786.15
A.1.1. Units of land not harvested since the beginning of the commitment period		-426.83	-441.27	-456.02	-462.04	-1,786.15		-1786.15
A.1.2. Units of land harvested since the beginning of the commitment period								
A.2. Deforestation		2,644.68	3,277.13	5,067.44	2,021.92	13,011.18		13011.18
B. Article 3.4 activities								
B.1. Forest management (if elected)		-46,917.90	-48,732.58	-53,286.10	-52,606.06	-201,542.65		-201542.65
3.3 offset							11,225.03	-11225.03
FM cap							238,333.33	-190317.62
B.2. Cropland management (if elected)	NA	NA	NA	NA	NA	NA	NA	NA
B.3. Grazing land management (if elected)	NA	NA	NA	NA	NA	NA	NA	NA
B.4. Revegetation (if elected)	-77.87	-1080.00	-1110.44	-1128.23	-1141.54	-4460.21	-311.49	-4148.72

*The net removals by FM after application of the Article 3.3 offset are lower than the upper limit (13 Mt-C × 5 [238,333 Gg CO_2]) given in the Annex to Decision 16/CMP.1.

*Since the total of anthropogenic GHG emissions from sources and removals by sinks in managed forests since 1990 is larger than the net source of emissions incurred under Article 3.3, the offset rule according to Paragraph 10 of the Annex to Decision 16/CMP.1 is applied to Japan.

*Methodologies for estimation and accounting of Article 3.3 and 3.4 activities are continuously reviewed. The values in Table 2.14 are estimated using current methodologies, and are only reported but not accounted for in the 2013 submission, since Japan elected accounting for the entire commitment period. The issuance of removal units from LULUCF activities under the Kyoto Protocol is to be performed at the end of the first commitment period.

*The total values and results of summing up each figure are not always the same because of the difference in display digits.

Table 2.15 Emission trends: summary (CTF Table 1)

Emission trends: summary [1]
(Sheet 1 of 2)

GREENHOUSE GAS EMISSIONS	Base year[a]	1991	1992	1993	1994	1995	1996	1997	1998	*1999*	2000
	kt CO_2 eq	*kt CO_2 eq*	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	*kt CO_2 eq*	*kt CO_2 eq*
CO_2 emissions including net CO_2 from LULUCF	1,071,525.74	1,073,291.88	1,082,060.74	1,072,004.41	1,130,319.24	1,143,035.00	1,151,379.02	1,145,963.02	1,110,596.47	1,145,385.00	1,165,445.29
CO_2 emissions excluding net CO_2 from LULUCF	1,141,137.74	1,150,071.46	1,158,544.41	1,150,877.15	1,210,660.44	1,223,687.33	1,236,581.84	1,231,477.53	1,195,870.15	1,230,797.27	1,251,460.72
CH_4 emissions including CH_4 from LULUCF	32,139.58	31,873.45	31,629.10	31,389.83	30,741.12	29,908.16	29,171.22	28,127.40	27,307.89	26,716.35	26,141.51
CH_4 emissions excluding CH_4 from LULUCF	32,131.07	31,867.09	31,624.71	31,365.60	30,723.24	29,899.43	29,142.54	28,092.88	27,297.16	26,711.10	26,133.73
N_2O emissions including N_2O from LULUCF	31,633.60	31,118.22	31,278.39	31,038.70	32,233.96	32,696.73	33,663.02	34,336.67	32,817.57	26,392.80	28,950.52
N_2O emissions excluding N_2O from LULUCF	31,562.46	31,051.76	31,215.67	30,978.09	32,178.04	32,646.83	33,616.36	34,294.89	32,781.36	26,360.03	28,920.82
HFCs	17,930.00	18,070.00	19,750.00	21,310.00	28,840.00	20,260.17	19,906.20	19,905.11	19,415.96	19,934.46	18,800.43
PFCs	5,670.00	6,370.00	6,370.00	8,860.00	12,274.00	14,271.14	14,772.09	16,187.61	13,401.73	10,428.82	9,583.35
SF_6	38,240.00	43,498.00	47,800.00	45,410.00	45,410.00	16,961.45	17,535.35	14,998.12	13,624.11	9,309.93	7,188.49
Total (including LULUCF)	1,197,138.92	1,204,221.55	1,218,888.23	1,210,012.93	1,279,818.32	1,257,132.65	1,266,426.90	1,259,517.92	1,217,163.73	1,238,167.35	1,256,109.60
Total (excluding LULUCF)	1,266,671.26	1,280,928.32	1,295,304.79	1,288,800.84	1,360,085.73	1,337,726.35	1,351,554.38	1,344,956.14	1,302,390.48	1,323,541.60	1,342,087.55

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[a]	1991	1992	1993	1994	1995	1996	1997	1998	*1999*	2000
	kt CO_2 eq	*kt CO_2 eq*	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	*kt CO_2 eq*	*kt CO_2 eq*
1. Energy	1,078,975.30	1,086,826.95	1,094,192.47	1,087,709.28	1,143,689.18	1,156,752.34	1,168,898.87	1,165,820.11	1,135,605.22	1,170,956.27	1,190,844.26
2. Industrial Processes	130,340.22	136,807.27	142,687.83	143,142.22	156,324.21	121,360.75	123,417.80	120,125.86	108,580.26	95,230.36	94,345.18
3. Solvent and Other Product Use	287.07	356.85	413.01	411.66	438.02	437.58	420.94	404.60	377.05	362.53	340.99
4. Agriculture	31,090.31	31,020.10	30,980.11	30,903.98	30,490.56	29,860.50	29,207.68	28,573.00	28,136.89	27,728.48	27,464.89
5. Land Use, Land-Use Change and Forestry[b]	-69,532.34	-76,706.77	-76,416.56	-78,787.90	-80,267.41	-80,593.70	-85,127.48	-85,438.22	-85,226.74	-85,374.25	-85,977.95
6. Waste	25,978.36	25,917.15	27,031.37	26,633.69	29,143.76	29,315.17	29,609.08	30,032.57	29,691.05	29,263.95	29,092.22
7. Other	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
Total (including LULUCF)	1,197,138.92	1,204,221.55	1,218,888.23	1,210,012.93	1,279,818.32	1,257,132.65	1,266,426.90	1,259,517.92	1,217,163.73	1,238,167.35	1,256,109.60

Emission trends: summary [(1)]
(Sheet 2 of 2)

GREENHOUSE GAS EMISSIONS	2001	2002	2003	2004	2005	2006	2007	2008	*2009*	2010	2011	Change from base to latest reported year
	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	*kt CO_2 eq*	*kt CO_2 eq*	kt CO_2 eq	(%)
CO_2 emissions including net CO_2 from LULUCF	1,150,203.28	1,186,188.07	1,182,204.95	1,182,074.65	1,193,277.39	1,179,817.09	1,213,843.66	1,135,671.49	1,067,360.25	1,115,286.51	1,165,239.66	8.75
CO_2 emissions excluding net CO_2 from LULUCF	1,236,320.52	1,273,396.60	1,278,505.00	1,277,883.64	1,282,128.45	1,262,945.19	1,296,152.73	1,213,829.51	1,141,465.31	1,191,068.27	1,240,684.47	8.72
CH_4 emissions including CH_4 from LULUCF	25,228.20	24,297.72	23,785.76	23,370.18	23,024.28	22,664.47	22,287.55	21,771.94	21,183.37	20,744.71	20,304.37	-36.82
CH_4 emissions excluding CH_4 from LULUCF	25,215.78	24,277.13	23,781.83	23,358.05	23,015.10	22,662.03	22,285.51	21,750.21	21,174.75	20,740.57	20,299.01	-36.82
N_2O emissions including N_2O from LULUCF	25,531.30	24,795.27	24,442.48	24,455.04	23,960.37	23,939.81	22,712.09	22,675.35	22,545.06	21,999.45	21,629.00	-31.63
N_2O emissions excluding N_2O from LULUCF	25,504.14	24,771.03	24,422.80	24,437.94	23,946.25	23,928.06	22,701.78	22,664.34	22,537.13	21,993.44	21,623.64	-31.49
HFCs	16,168.06	13,693.03	13,761.68	10,552.49	10,518.22	11,742.22	13,279.24	15,298.30	16,554.17	18,307.23	20,467.03	14.15
PFCs	7,953.56	7,433.60	7,178.70	7,478.43	6,990.73	7,311.27	6,400.59	4,615.07	3,265.25	3,408.71	3,016.35	-46.80
SF_6	5,962.42	5,579.50	5,253.91	5,095.89	4,807.94	4,910.86	4,407.45	3,795.22	1,851.27	1,862.42	1,637.85	-95.72
Total (including LULUCF)	1,231,046.82	1,261,987.19	1,256,627.49	1,253,026.67	1,262,578.93	1,250,385.72	1,282,930.60	1,203,827.35	1,132,759.38	1,181,609.03	1,232,294.25	2.94
Total (excluding LULUCF)	1,317,124.47	1,349,150.89	1,352,903.93	1,348,806.44	1,351,406.69	1,333,499.62	1,365,227.30	1,281,952.63	1,206,847.89	1,257,380.64	1,307,728.35	3.24

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2001	2002	2003	2004	2005	2006	2007	2008	*2009*	2010	2011	Change from base to latest reported year
	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	kt CO_2 eq	*kt CO_2 eq*	*kt CO_2 eq*	kt CO_2 eq	(%)
1. Energy	1,177,931.02	1,217,675.74	1,223,343.11	1,223,134.90	1,226,821.16	1,208,187.18	1,242,243.25	1,161,564.51	1,096,944.90	1,144,962.32	1,194,479.89	10.71
2. Industrial Processes	84,303.51	77,927.50	76,598.04	73,765.51	73,653.35	75,697.33	74,294.39	70,705.36	63,529.14	65,849.29	67,163.67	-48.47
3. Solvent and Other Product Use	343.60	334.05	320.83	297.54	266.41	242.34	159.95	129.10	120.50	98.95	97.15	-66.16
4. Agriculture	27,197.75	26,956.20	26,728.44	26,542.15	26,366.07	26,316.30	26,006.16	25,814.79	25,550.42	25,517.48	25,402.27	-18.30
5. Land Use, Land-Use Change and Forestry [b]	-86,077.66	-87,163.70	-96,276.44	-95,779.77	-88,827.76	-83,113.90	-82,296.70	-78,125.28	-74,088.51	-75,771.61	-75,434.10	8.49
6. Waste	27,348.58	26,257.39	25,913.51	25,066.34	24,299.70	23,056.46	22,523.55	23,738.87	20,702.93	20,952.60	20,585.38	-20.76
7. Other	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	0.00
Total (including LULUCF)	1,231,046.82	1,261,987.19	1,256,627.49	1,253,026.67	1,262,578.93	1,250,385.72	1,282,930.60	1,203,827.35	1,132,759.38	1,181,609.03	1,232,294.25	2.94

Table2.16 Emission trends (CO_2) (CTF Table 1(a))

Emission trends (CO_2)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year* [a]	1991	1992	1993	1994	1995	1996	1997	1998	*1999*	2000
	kt	kt	kt	kt	kt	kt	kt	kt	kt	*kt*	kt
1. Energy	1,068,296.26	1,076,104.87	1,083,526.98	1,077,164.28	1,133,210.28	1,145,820.01	1,157,958.90	1,154,948.65	1,125,032.90	1,160,147.36	1,180,079.82
A. Fuel Combustion (Sectoral Approach)	1,068,259.64	1,076,051.20	1,083,470.03	1,077,111.06	1,133,159.13	1,145,769.09	1,157,909.53	1,154,900.68	1,124,990.17	1,160,109.30	1,180,043.79
1. Energy Industries	324,253.21	326,986.60	333,717.45	315,598.93	356,359.51	344,948.18	345,134.72	342,054.20	332,405.28	349,785.30	357,574.13
2. Manufacturing Industries and Construction	371,311.49	366,282.86	358,404.85	357,499.46	365,878.17	370,539.38	378,811.73	381,142.92	357,838.95	365,074.78	376,777.84
3. Transport	211,053.69	222,466.79	226,859.69	231,727.93	243,681.03	251,166.53	256,750.56	258,734.10	257,853.86	260,017.18	259,076.39
4. Other Sectors	161,641.24	160,314.95	164,488.04	172,284.75	167,240.42	179,115.00	177,212.53	172,969.46	176,892.07	185,232.04	186,615.43
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Fugitive Emissions from Fuels	36.62	53.67	56.95	53.21	51.15	50.92	49.37	47.97	42.73	38.06	36.03
1. Solid Fuels	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
2. Oil and Natural Gas	36.62	53.67	56.95	53.21	51.15	50.92	49.37	47.97	42.73	38.06	36.03
2. Industrial Processes	59,875.69	60,982.03	60,993.20	59,938.82	61,181.26	61,332.91	61,672.09	58,981.65	53,317.07	53,320.07	53,887.04
A. Mineral Products	55,310.54	56,474.62	56,567.06	55,713.23	56,690.40	56,756.12	57,088.67	54,452.99	49,384.13	49,100.52	49,745.61
B. Chemical Industry	4,209.07	4,184.37	4,101.09	3,894.83	4,145.10	4,219.57	4,203.43	4,144.19	3,639.82	3,965.06	3,893.01
C. Metal Production	356.09	323.04	325.05	330.76	345.76	357.22	379.99	384.48	293.11	254.49	248.42
D. Other Production	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
E. Production of Halocarbons and SF6											
F. Consumption of Halocarbons and SF6											
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Solvent and Other Product Use	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE
4. Agriculture											
A. Enteric Fermentation											
B. Manure Management											
C. Rice Cultivation											
D. Agricultural Soils											
E. Prescribed Burning of Savannas											
F. Field Burning of Agricultural Residues											
G. Other											
5. Land Use, Land-Use Change and Forestry	-69,612.00	-76,779.59	-76,483.67	-78,872.74	-80,341.21	-80,652.33	-85,202.82	-85,514.51	-85,273.68	-85,412.27	-86,015.43
A. Forest Land	-78,590.05	-85,944.00	-86,300.29	-86,649.28	-86,994.43	-87,340.30	-91,312.63	-91,153.89	-90,992.66	-90,833.07	-90,672.55
B. Cropland	3,662.78	2,942.42	3,027.36	2,338.88	2,302.35	2,262.65	2,134.01	2,044.03	2,051.86	2,014.59	1,867.60
C. Grassland	-265.95	-340.12	-294.81	-359.25	-332.49	-309.05	-297.08	-276.82	-254.18	-240.91	-242.91
D. Wetlands	68.08	62.42	201.39	114.73	97.38	306.66	557.46	108.34	444.29	427.92	408.61
E. Settlements	3,532.05	4,371.38	5,049.82	3,535.61	2,692.36	2,665.61	2,048.38	1,747.08	1,779.53	1,444.69	1,120.73
F. Other Land	1,430.85	1,600.94	1,355.71	1,664.99	1,600.86	1,458.58	1,374.31	1,713.10	1,397.49	1,480.94	1,170.19
G. Other	550.24	527.37	477.14	481.58	292.76	303.53	292.74	303.65	300.00	293.57	332.90
6. Waste	12,965.78	12,984.57	14,024.24	13,774.05	16,268.90	16,534.40	16,950.85	17,547.22	17,520.19	17,329.84	17,493.86
A. Solid Waste Disposal on Land	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO
B. Waste-water Handling											
C. Waste Incineration	12,262.95	12,298.12	13,325.34	13,093.30	15,566.99	15,866.57	16,310.38	16,891.99	16,911.07	16,677.27	16,837.95
D. Other	702.83	686.45	698.90	680.75	701.91	667.83	640.47	655.23	609.12	652.58	655.91
7. Other (as specified in the summary table in CRF)	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
Total CO2 emissions including net CO2 from LULUCF	1,071,525.74	1,073,291.88	1,082,060.74	1,072,004.41	1,130,319.24	1,143,035.00	1,151,379.02	1,145,963.02	1,110,596.47	1,145,385.00	1,165,445.29
Total CO2 emissions excluding net CO2 from LULUCF	1,141,137.74	1,150,071.46	1,158,544.41	1,150,877.15	1,210,660.44	1,223,687.33	1,236,581.84	1,231,477.53	1,195,870.15	1,230,797.27	1,251,460.72
Memo Items:											
International Bunkers	30,829.18	32,531.98	32,937.28	34,935.20	36,093.69	38,179.77	30,958.25	35,432.29	37,361.08	36,022.49	36,731.88
Aviation	13,189.32	13,919.12	14,216.76	13,856.19	15,066.49	16,922.99	18,441.91	19,134.37	20,001.55	19,576.46	19,542.61
Marine	17,639.86	18,612.86	18,720.51	21,079.01	21,027.20	21,256.78	12,516.34	16,297.92	17,359.53	16,446.03	17,189.28
Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 Emissions from Biomass	18,747.30	18,870.94	18,419.27	17,568.73	17,803.39	18,487.35	18,547.51	19,107.10	17,556.58	18,260.06	18,846.04

Emission trends (CO_2)
(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2001	2002	2003	2004	2005	2006	2007	2008	*2009*	2010	2011	Change from base to latest reported year
	kt	kt	kt	kt	kt	kt	kt	kt	*kt*	kt	kt	%
1. Energy	1,167,417.49	1,207,919.26	1,213,922.87	1,214,021.73	1,217,734.50	1,199,314.84	1,233,402.38	1,153,081.13	1,088,839.82	1,137,014.96	1,186,637.01	11.08
A. Fuel Combustion (Sectoral Approach)	1,167,385.05	1,207,888.33	1,213,888.39	1,213,986.74	1,217,696.90	1,199,278.95	1,233,364.86	1,153,043.28	1,088,804.67	1,136,981.83	1,186,604.49	11.08
1. Energy Industries	349,730.24	381,372.56	395,368.37	390,980.48	406,038.52	394,358.50	447,301.90	420,886.92	385,493.23	405,372.36	466,617.15	43.91
2. Manufacturing Industries and Construction	366,481.38	372,969.32	373,173.39	378,734.31	371,229.41	373,288.97	370,257.35	335,621.02	319,043.12	342,744.16	335,186.40	-9.73
3. Transport	261,120.73	255,478.88	252,947.16	252,413.86	247,009.69	243,632.49	237,830.98	228,099.17	222,768.36	225,459.83	222,132.59	5.25
4. Other Sectors	190,052.70	198,067.58	192,399.48	191,858.09	193,419.28	187,998.99	177,974.62	168,436.17	161,499.96	163,405.47	162,668.34	0.64
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Fugitive Emissions from Fuels	32.44	30.94	34.48	34.99	37.60	35.89	37.53	37.85	35.15	33.14	32.52	-11.19
1. Solid Fuels	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
2. Oil and Natural Gas	32.44	30.94	34.48	34.99	37.60	35.89	37.53	37.85	35.15	33.14	32.52	-11.19
2. Industrial Processes	52,657.08	49,841.06	49,010.32	48,837.57	49,902.66	49,975.18	49,212.77	45,613.15	40,189.35	41,074.34	41,134.67	-31.30
A. Mineral Products	48,847.78	46,234.63	45,640.14	45,407.93	46,773.88	46,878.88	46,010.32	42,883.28	37,589.16	38,177.25	38,343.73	-30.68
B. Chemical Industry	3,598.60	3,385.48	3,128.60	3,171.80	2,886.85	2,918.74	2,990.43	2,574.10	2,488.20	2,737.23	2,629.25	-37.53
C. Metal Production	210.71	220.95	241.57	257.84	241.93	177.55	212.02	155.77	111.99	159.86	161.70	-54.59
D. Other Production	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	0.00
E. Production of Halocarbons and SF6												
F. Consumption of Halocarbons and SF6												
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Solvent and Other Product Use	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	0.00
4. Agriculture												
A. Enteric Fermentation												
B. Manure Management												
C. Rice Cultivation												
D. Agricultural Soils												
E. Prescribed Burning of Savannas												
F. Field Burning of Agricultural Residues												
G. Other												
5. Land Use, Land-Use Change and Forestry	-86,117.23	-87,208.53	-96,300.05	-95,808.99	-88,851.06	-83,128.10	-82,309.06	-78,158.02	-74,105.06	-75,781.75	-75,444.81	8.38
A. Forest Land	-90,514.55	-90,354.05	-99,126.97	-98,612.86	-92,050.35	-86,496.27	-85,282.04	-81,366.65	-77,894.59	-81,313.62	-78,091.31	-0.63
B. Cropland	1,808.08	1,772.68	1,769.11	1,731.24	1,772.62	1,786.68	1,745.27	1,724.76	1,749.83	1,950.57	1,781.12	-51.37
C. Grassland	-232.92	-212.41	-194.33	-176.91	-159.99	-161.87	-146.49	-139.28	-117.97	-57.04	-90.21	-66.08
D. Wetlands	378.93	94.94	64.08	58.75	15.67	23.44	27.76	16.44	23.84	86.57	60.13	-11.68
E. Settlements	928.60	67.33	-22.92	4.76	365.16	738.78	449.68	410.40	755.17	2,888.36	411.10	-88.36
F. Other Land	1,267.28	1,153.05	964.57	949.74	974.54	750.79	571.76	890.58	1,108.51	420.53	237.58	-83.40
G. Other	247.35	269.92	246.40	236.30	231.29	230.36	325.00	305.74	270.15	242.88	246.78	-55.15
6. Waste	16,245.95	15,636.28	15,571.81	15,024.34	14,491.29	13,655.17	13,537.58	15,135.23	12,436.14	12,978.96	12,912.79	-0.41
A. Solid Waste Disposal on Land	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	0.00
B. Waste-water Handling												
C. Waste Incineration	15,615.42	15,059.23	15,055.29	14,517.64	13,984.48	13,132.81	12,976.38	14,604.82	11,922.45	12,452.05	12,390.51	1.04
D. Other	630.53	577.05	516.53	506.70	506.81	522.36	561.20	530.41	513.69	526.91	522.28	-25.69
7. Other (as specified in the summary table in CRF)	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	0.00
Total CO2 emissions including net CO2 from LULUCF	1,150,203.28	1,186,188.07	1,182,204.95	1,182,074.65	1,193,277.39	1,179,817.09	1,213,843.66	1,135,671.49	1,067,360.25	1,115,286.51	1,165,239.66	8.75
Total CO2 emissions excluding net CO2 from LULUCF	1,236,320.52	1,273,396.60	1,278,505.00	1,277,883.64	1,282,128.45	1,262,945.19	1,296,152.73	1,213,829.51	1,141,465.31	1,191,068.27	1,240,684.47	8.72
Memo Items:												
International Bunkers	33,571.42	36,728.93	37,506.71	39,113.12	41,564.88	38,991.92	37,259.15	34,849.64	30,686.03	31,179.83	31,659.39	2.69
Aviation	18,721.34	21,149.32	20,387.64	21,190.20	21,336.33	19,964.61	18,358.58	17,517.99	15,372.73	16,295.33	18,272.72	38.54
Marine	14,850.08	15,579.61	17,119.07	17,922.92	20,228.55	19,027.31	18,900.57	17,331.65	15,313.30	14,884.50	13,386.66	-24.11
Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 Emissions from Biomass	17,203.99	17,917.42	18,296.50	18,188.60	21,743.33	21,976.71	22,957.60	21,597.88	19,753.79	32,896.45	32,480.57	73.25

Table 2.17 Emission trends (CH_4) (CTF Table 1(b))

Emission trends (CH_4)
(Sheet 1 of 2) CRF: Submission 2014 v1.1, JAPAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year* [a]	1991	1992	1993	1994	1995	1996	1997	1998	*1999*	2000
	kt	kt	kt	kt	kt	kt	kt	kt	kt	*kt*	kt
1. Energy	187.01	175.77	163.74	155.68	138.49	126.09	120.11	106.11	98.06	98.99	95.36
A. Fuel Combustion (Sectoral Approach)	42.39	42.68	43.39	44.29	44.22	49.43	45.80	45.29	43.87	45.26	45.68
1. Energy Industries	1.42	1.48	1.52	1.51	1.61	1.64	1.72	1.81	1.90	2.03	2.03
2. Manufacturing Industries and Construction	16.93	16.96	16.77	16.81	17.23	20.84	18.13	17.24	15.44	15.64	16.90
3. Transport	14.17	14.28	14.43	14.09	14.17	14.71	14.98	15.04	14.51	14.45	14.21
4. Other Sectors	9.88	9.96	10.67	11.89	11.21	12.24	10.97	11.21	12.02	13.13	12.55
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Fugitive Emissions from Fuels	144.63	133.08	120.35	111.39	94.26	76.66	74.31	60.82	54.19	53.73	49.67
1. Solid Fuels	133.64	120.87	107.98	98.85	81.57	64.03	61.77	47.95	41.55	41.22	36.63
2. Oil and Natural Gas	10.99	12.21	12.37	12.55	12.69	12.63	12.54	12.88	12.64	12.51	13.05
2. Industrial Processes	17.03	16.55	15.34	15.26	15.28	15.35	14.86	12.42	11.60	11.25	9.32
A. Mineral Products	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
B. Chemical Industry	16.11	15.67	14.50	14.47	14.45	14.50	13.99	11.55	10.83	10.48	8.52
C. Metal Production	0.92	0.87	0.85	0.80	0.83	0.85	0.87	0.87	0.77	0.77	0.80
D. Other Production											
E. Production of Halocarbons and SF6											
F. Consumption of Halocarbons and SF6											
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Solvent and Other Product Use											
4. Agriculture	841.96	847.78	852.03	856.11	849.69	834.79	816.64	795.47	781.29	766.18	757.49
A. Enteric Fermentation	365.55	370.85	372.87	370.54	366.28	362.21	359.59	357.40	355.56	352.75	350.95
B. Manure Management	140.20	139.88	138.57	135.87	133.11	130.83	129.26	127.31	125.21	122.78	120.97
C. Rice Cultivation	331.41	332.27	336.14	345.12	345.88	337.27	323.51	306.68	296.63	286.89	281.89
D. Agricultural Soils	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	4.79	4.77	4.45	4.57	4.42	4.48	4.28	4.08	3.90	3.75	3.67
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Land Use, Land-Use Change and Forestry	0.41	0.30	0.21	1.15	0.85	0.42	1.37	1.64	0.51	0.25	0.37
A. Forest Land	0.41	0.30	0.21	1.15	0.85	0.42	1.37	1.64	0.51	0.25	0.37
B. Cropland	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
C. Grassland	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
D. Wetlands	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
E. Settlements	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
F. Other Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE
6. Waste	484.05	477.39	474.83	466.54	459.56	447.55	436.13	423.75	408.91	395.54	382.29
A. Solid Waste Disposal on Land	363.68	360.27	358.55	352.22	346.86	336.67	327.13	316.26	303.35	291.14	279.80
B. Waste-water Handling	114.39	111.61	110.73	108.79	106.64	105.10	103.56	102.06	99.95	98.78	97.27
C. Waste Incineration	0.64	0.62	0.64	0.64	0.69	0.71	0.73	0.70	0.69	0.67	0.63
D. Other	5.33	4.89	4.90	4.90	5.36	5.07	4.71	4.73	4.92	4.94	4.58
7. Other (as specified in the summary table in CRF)	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
Total CH4 emissions including CH4 from LULUCF	1,530.46	1,517.78	1,506.15	1,494.75	1,463.86	1,424.20	1,389.11	1,339.40	1,300.38	1,272.21	1,244.83
Total CH4 emissions excluding CH4 from LULUCF	1,530.05	1,517.48	1,505.94	1,493.60	1,463.01	1,423.78	1,387.74	1,337.76	1,299.86	1,271.96	1,244.46
Memo Items:											
International Bunkers	2.05	2.17	2.19	2.40	2.43	2.50	1.71	2.09	2.22	2.12	2.19
Aviation	0.37	0.39	0.40	0.39	0.43	0.48	0.52	0.54	0.57	0.55	0.55
Marine	1.68	1.77	1.78	2.01	2.00	2.03	1.19	1.55	1.65	1.57	1.64
Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 Emissions from Biomass											

Emission trends (CH_4)
(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2001	2002	2003	2004	2005	2006	2007	2008	*2009*	2010	2011	Change from base to latest reported year
	kt	kt	kt	kt	kt	kt	kt	kt	*kt*	kt	kt	%
1. Energy	84.08	63.01	61.13	60.39	62.37	63.20	63.70	61.87	59.97	61.13	58.73	-68.59
A. Fuel Combustion (Sectoral Approach)	44.16	43.66	42.58	42.63	43.53	43.76	43.88	42.43	41.20	43.24	40.91	-3.50
1. Energy Industries	1.98	1.54	1.52	1.43	1.50	1.49	1.62	1.50	1.41	1.55	1.76	24.18
2. Manufacturing Industries and Construction	15.89	16.35	17.54	18.22	18.42	19.62	20.88	20.85	20.78	22.52	22.04	30.21
3. Transport	13.94	13.44	12.87	11.93	11.32	10.58	9.91	9.13	8.57	8.08	7.70	-45.68
4. Other Sectors	12.36	12.32	10.65	11.05	12.29	12.06	11.46	10.95	10.43	11.09	9.41	-4.73
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Fugitive Emissions from Fuels	39.91	19.35	18.54	17.76	18.84	19.44	19.82	19.44	18.77	17.89	17.83	-87.67
1. Solid Fuels	27.16	5.64	4.47	3.17	3.50	3.24	2.45	2.18	2.20	2.12	2.13	-98.41
2. Oil and Natural Gas	12.76	13.72	14.07	14.59	15.34	16.20	17.37	17.26	16.57	15.77	15.70	42.91
2. Industrial Processes	7.02	6.74	6.38	6.84	6.37	6.34	6.39	5.78	5.22	5.66	5.72	-66.38
A. Mineral Products	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	0.00
B. Chemical Industry	6.27	5.95	5.59	6.03	5.57	5.52	5.56	5.07	4.60	4.95	5.00	-68.95
C. Metal Production	0.75	0.79	0.79	0.81	0.80	0.82	0.82	0.72	0.62	0.71	0.72	-21.58
D. Other Production												
E. Production of Halocarbons and SF6												
F. Consumption of Halocarbons and SF6												
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Solvent and Other Product Use												
4. Agriculture	748.90	739.93	732.50	726.71	722.84	719.36	713.36	705.28	693.37	682.59	675.46	-19.78
A. Enteric Fermentation	348.82	346.48	341.11	336.37	333.42	333.33	332.10	329.18	322.52	317.03	312.75	-14.44
B. Manure Management	119.81	118.90	117.17	115.17	113.01	111.14	109.08	106.57	104.02	102.09	101.31	-27.74
C. Rice Cultivation	276.68	271.14	270.98	272.00	273.29	271.79	269.15	266.60	264.04	260.82	258.75	-21.93
D. Agricultural Soils	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field Burning of Agricultural Residues	3.59	3.40	3.25	3.17	3.12	3.10	3.03	2.93	2.78	2.66	2.66	-44.61
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Land Use, Land-Use Change and Forestry	0.59	0.98	0.19	0.58	0.44	0.12	0.10	1.03	0.41	0.20	0.25	-37.13
A. Forest Land	0.59	0.98	0.19	0.58	0.44	0.12	0.10	1.03	0.41	0.20	0.25	-37.13
B. Cropland	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
C. Grassland	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
D. Wetlands	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
E. Settlements	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
F. Other Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Other	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	0.00
6. Waste	360.75	346.37	332.47	318.35	304.37	290.25	277.77	262.79	249.76	238.26	226.70	-53.17
A. Solid Waste Disposal on Land	267.45	254.98	242.42	229.75	217.51	204.78	193.02	178.97	167.49	156.48	147.28	-59.50
B. Waste-water Handling	88.06	85.77	84.09	82.48	80.18	78.67	76.72	75.79	73.58	72.27	72.27	-36.83
C. Waste Incineration	0.60	0.93	0.80	0.73	0.68	0.63	0.58	0.56	0.50	0.46	0.46	-28.04
D. Other	4.64	4.70	5.16	5.39	6.00	6.17	7.45	7.46	8.20	9.05	6.69	25.66
7. Other (as specified in the summary table in CRF)	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	0.00
Total CH4 emissions including CH4 from LULUCF	1,201.34	1,157.03	1,132.66	1,112.87	1,096.39	1,079.26	1,061.31	1,036.76	1,008.73	987.84	966.87	-36.82
Total CH4 emissions excluding CH4 from LULUCF	1,200.75	1,156.05	1,132.47	1,112.29	1,095.96	1,079.14	1,061.21	1,035.72	1,008.32	987.65	966.62	-36.82
Memo Items:												
International Bunkers	1.94	2.08	2.21	2.31	2.53	2.38	2.32	2.15	1.89	1.88	1.79	-12.76
Aviation	0.53	0.60	0.58	0.60	0.60	0.57	0.52	0.50	0.44	0.46	0.52	38.54
Marine	1.42	1.48	1.63	1.71	1.93	1.81	1.80	1.65	1.46	1.42	1.28	-24.14
Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 Emissions from Biomass												

Table 2.18 Emission trends (N_2O) (CTF Table 1(c))

Emission trends (N_2O)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year* [a]	1991	1992	1993	1994	1995	1996	1997	1998	*1999*	2000
	kt	kt	kt	kt	kt	kt	kt	kt	kt	*kt*	kt
1. Energy	21.78	22.68	23.31	23.47	24.42	26.72	27.15	27.88	27.46	28.16	28.26
A. Fuel Combustion (Sectoral Approach)	21.78	22.68	23.31	23.47	24.42	26.72	27.15	27.88	27.46	28.16	28.26
1. Energy Industries	2.98	3.08	3.00	3.03	3.26	4.56	4.66	4.81	4.89	5.21	5.48
2. Manufacturing Industries and Construction	4.36	4.60	4.97	5.10	5.54	6.04	6.23	6.65	6.40	6.69	6.83
3. Transport	13.57	14.09	14.39	14.30	14.56	15.01	15.29	15.44	15.12	15.10	14.80
4. Other Sectors	0.88	0.90	0.95	1.04	1.05	1.12	0.98	0.99	1.04	1.16	1.15
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Fugitive Emissions from Fuels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1. Solid Fuels	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
2. Oil and Natural Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Industrial Processes	26.67	24.32	24.04	23.56	26.77	26.49	29.74	31.59	27.67	6.45	15.13
A. Mineral Products	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
B. Chemical Industry	26.67	24.32	24.04	23.56	26.77	26.49	29.74	31.59	27.67	6.45	15.13
C. Metal Production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Other Production											
E. Production of Halocarbons and SF6											
F. Consumption of Halocarbons and SF6											
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Solvent and Other Product Use	0.93	1.15	1.33	1.33	1.41	1.41	1.36	1.31	1.22	1.17	1.10
4. Agriculture	43.26	42.63	42.22	41.70	40.80	39.77	38.90	38.28	37.84	37.54	37.28
A. Enteric Fermentation											
B. Manure Management	17.92	17.82	17.68	17.38	17.01	16.69	16.49	16.30	16.15	15.98	15.82
C. Rice Cultivation											
D. Agricultural Soils	25.25	24.73	24.46	24.23	23.70	23.00	22.33	21.91	21.61	21.49	21.39
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Land Use, Land-Use Change and Forestry	0.23	0.21	0.20	0.20	0.18	0.16	0.15	0.13	0.12	0.11	0.10
A. Forest Land	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00
B. Cropland	0.23	0.21	0.20	0.19	0.17	0.16	0.14	0.12	0.11	0.10	0.09
C. Grassland	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
D. Wetlands	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
E. Settlements	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
F. Other Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE
6. Waste	9.19	9.38	9.79	9.88	10.40	10.91	11.29	11.57	11.56	11.70	11.52
A. Solid Waste Disposal on Land											
B. Waste-water Handling	4.05	4.13	4.10	4.18	4.15	4.21	4.21	4.25	4.21	4.11	4.01
C. Waste Incineration	4.82	4.95	5.40	5.40	5.93	6.39	6.80	7.04	7.06	7.29	7.23
D. Other	0.32	0.29	0.29	0.29	0.32	0.30	0.28	0.28	0.29	0.30	0.27
7. Other (as specified in the summary table in CRF)	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
Total N2O emissions including N2O from LULUCF	102.04	100.38	100.90	100.12	103.98	105.47	108.59	110.76	105.86	85.14	93.39
Total N2O emissions excluding N2O from LULUCF	101.81	100.17	100.70	99.93	103.80	105.31	108.44	110.63	105.75	85.03	93.29
Memo Items:											
International Bunkers	0.90	0.95	0.96	1.02	1.05	1.12	0.93	1.05	1.11	1.07	1.09
Aviation	0.42	0.44	0.45	0.44	0.48	0.54	0.59	0.61	0.64	0.62	0.62
Marine	0.48	0.51	0.51	0.57	0.57	0.58	0.34	0.44	0.47	0.45	0.47
Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 Emissions from Biomass											

Emission trends (N_2O)
(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2001	2002	2003	2004	2005	2006	2007	2008	*2009*	2010	2011	Change from base to latest reported year
	kt	kt	kt	kt	kt	kt	kt	kt	*kt*	kt	kt	%
1. Energy	28.22	27.20	26.25	25.31	25.09	24.34	24.20	23.17	22.08	21.50	21.32	-2.11
A. Fuel Combustion (Sectoral Approach)	28.22	27.20	26.25	25.31	25.09	24.34	24.20	23.17	22.08	21.50	21.32	-2.11
1. Energy Industries	6.17	5.93	6.01	5.98	6.67	6.60	6.76	6.52	6.24	6.14	6.42	115.80
2. Manufacturing Industries and Construction	6.67	6.72	6.61	6.68	6.57	6.48	6.65	6.41	6.18	6.14	6.08	39.55
3. Transport	14.23	13.39	12.52	11.53	10.71	10.14	9.70	9.20	8.65	8.17	7.78	-42.66
4. Other Sectors	1.15	1.17	1.11	1.12	1.14	1.12	1.08	1.04	1.01	1.05	1.04	18.28
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Fugitive Emissions from Fuels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-8.02
1. Solid Fuels	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
2. Oil and Natural Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-8.02
2. Industrial Processes	4.56	4.00	4.06	5.35	4.19	5.24	2.77	4.07	5.03	3.48	2.54	-90.47
A. Mineral Products	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	0.00
B. Chemical Industry	4.56	4.00	4.06	5.35	4.19	5.24	2.77	4.07	5.03	3.48	2.54	-90.47
C. Metal Production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
D. Other Production												
E. Production of Halocarbons and SF6												
F. Consumption of Halocarbons and SF6												
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Solvent and Other Product Use	1.11	1.08	1.03	0.96	0.86	0.78	0.52	0.42	0.39	0.32	0.31	-66.16
4. Agriculture	37.00	36.83	36.60	36.39	36.09	36.16	35.57	35.50	35.45	36.07	36.19	-16.34
A. Enteric Fermentation												
B. Manure Management	15.68	15.59	15.48	15.39	15.38	15.44	15.51	16.27	16.94	17.58	17.45	-2.62
C. Rice Cultivation												
D. Agricultural Soils	21.26	21.18	21.06	20.94	20.64	20.66	20.00	19.17	18.46	18.44	18.68	-25.99
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field Burning of Agricultural Residues	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05	-43.52
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Land Use, Land-Use Change and Forestry	0.09	0.08	0.06	0.06	0.05	0.04	0.03	0.04	0.03	0.02	0.02	-92.47
A. Forest Land	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	-37.13
B. Cropland	0.08	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	-93.15
C. Grassland	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
D. Wetlands	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
E. Settlements	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
F. Other Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Other	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	0.00
6. Waste	11.38	10.80	10.84	10.83	11.02	10.66	10.17	9.95	9.75	9.58	9.39	2.26
A. Solid Waste Disposal on Land												
B. Waste-water Handling	4.10	4.10	4.13	4.13	4.07	4.11	4.04	4.04	3.99	3.94	3.94	-2.71
C. Waste Incineration	7.00	6.41	6.40	6.37	6.59	6.19	5.68	5.46	5.27	5.10	5.05	4.88
D. Other	0.28	0.28	0.31	0.32	0.36	0.37	0.45	0.45	0.49	0.54	0.40	25.66
7. Other (as specified in the summary table in CRF)	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	0.00
Total N2O emissions including N2O from LULUCF	82.36	79.98	78.85	78.89	77.29	77.23	73.26	73.15	72.73	70.97	69.77	-31.63
Total N2O emissions excluding N2O from LULUCF	82.27	79.91	78.78	78.83	77.25	77.19	73.23	73.11	72.70	70.95	69.75	-31.49
Memo Items:												
International Bunkers	1.00	1.09	1.11	1.16	1.23	1.15	1.10	1.03	0.90	0.92	0.94	4.63
Aviation	0.59	0.67	0.65	0.67	0.68	0.63	0.58	0.55	0.49	0.52	0.58	37.48
Marine	0.40	0.42	0.47	0.49	0.55	0.52	0.51	0.47	0.42	0.41	0.36	-24.14
Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 Emissions from Biomass												

Table 2.19 Emission trends (HFCs, PFCs, SF_6) (CTF Table 1(d))

Emission trends (HFCs, PFCs and SF_6)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year* [a]	1991	1992	1993	1994	1995	1996	1997	1998	*1999*	2000
	kt	kt	kt	kt	kt	kt	kt	kt	kt	*kt*	kt
Emissions of HFCsc - (kt CO2 eq)	17,930.00	18,070.00	19,750.00	21,310.00	28,840.00	20,260.17	19,906.20	19,905.11	19,415.96	19,934.46	18,800.43
HFC-23	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	1.45	1.33	1.26	1.18	1.21	1.06
HFC-32	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00	0.01	0.02
HFC-41	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
HFC-43-10mee	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
HFC-125	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00	0.01	0.02
HFC-134	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
HFC-134a	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	2.01	2.79	3.49	3.87	4.05	4.31
HFC-152a	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	0.01	0.01	0.00	IE, NA, NE, NO	IE, NA, NE, NO	0.02
HFC-143	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
HFC-143a	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
HFC-227ea	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	0.00	0.00	0.00	0.00	0.00
HFC-236fa	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
HFC-245ca	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
Unspecified mix of listed HFCsd - (kt CO_2 eq)	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	680.48	681.88	671.84	595.75	542.31	714.61
Emissions of PFCsc - (kt CO2 eq)	5,670.00	6,370.00	6,370.00	8,860.00	12,274.00	14,271.14	14,772.09	16,187.61	13,401.73	10,428.82	9,583.35
CF_4	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	0.01	0.01	0.01	0.01	0.00	0.00
C_2F_6	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	0.00	0.00	0.00	0.00	0.00	0.00
C 3F8	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
C_4F_{10}	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
c-C_4F_8	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
C_5F_{12}	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
C_6F_{14}	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO
Unspecified mix of listed PFCs(4) - (Gg CO_2 equivalent)	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	14,201.41	14,706.21	16,128.18	13,352.33	10,399.69	9,565.56
Emissions of SF6(3) - (Gg CO2 equivalent)	38,240.00	43,498.00	47,800.00	45,410.00	45,410.00	16,961.45	17,535.35	14,998.12	13,624.11	9,309.93	7,188.49
SF_6	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	0.71	0.73	0.63	0.57	0.39	0.30

Emission trends (HFCs, PFCs and SF_6)
(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2001	2002	2003	2004	2005	2006	2007	2008	*2009*	2010	2011	Change from base to latest reported year
	kt	kt	kt	kt	kt	kt	kt	kt	*kt*	kt	kt	%
Emissions of HFCsc - (kt CO2 eq)	16,168.06	13,693.03	13,761.68	10,552.49	10,518.22	11,742.22	13,279.24	15,298.30	16,554.17	18,307.23	20,467.03	14.15
HFC-23	0.80	0.52	0.43	0.09	0.04	0.06	0.02	0.04	0.00	0.00	0.00	100.00
HFC-32	0.05	0.08	0.14	0.21	0.30	0.39	0.49	0.61	0.72	0.84	1.01	100.00
HFC-41	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
HFC-43-10mee	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
HFC-125	0.05	0.08	0.14	0.21	0.30	0.39	0.49	0.61	0.72	0.84	1.01	100.00
HFC-134	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
HFC-134a	4.38	4.61	4.76	4.32	3.61	2.92	2.86	2.87	2.82	2.75	2.60	100.00
HFC-152a	0.08	0.16	0.40	0.84	1.22	1.41	1.44	1.68	1.58	1.30	1.26	100.00
HFC-143	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
HFC-143a	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
HFC-227ea	0.01	0.01	0.02	0.04	0.05	0.04	0.04	0.05	0.04	0.03	0.03	100.00
HFC-236fa	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
HFC-245ca	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
Unspecified mix of listed HFCsd - (kt CO_2 eq)	937.16	1,261.10	1,965.94	2,942.83	4,020.51	5,607.42	7,330.76	8,635.51	10,020.30	11,499.81	13,314.77	100.00
Emissions of PFCsc - (kt CO2 eq)	7,953.56	7,433.60	7,178.70	7,478.43	6,990.73	7,311.27	6,400.59	4,615.07	3,265.25	3,408.71	3,016.35	-46.80
CF_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C_2F_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C 3F8	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
C_4F_{10}	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
c-C_4F_8	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
C_5F_{12}	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	IE, NA, NE, NO	0.00
C_6F_{14}	IE, NA, NE, NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Unspecified mix of listed PFCs(4) - (Gg CO_2 equivalent)	7,937.84	7,418.74	7,163.42	7,463.49	6,975.70	7,295.94	6,384.79	4,598.55	3,251.74	3,394.87	3,001.27	100.00
Emissions of SF6(3) - (Gg CO2 equivalent)	5,962.42	5,579.50	5,253.91	5,095.89	4,807.94	4,910.86	4,407.45	3,795.22	1,851.27	1,862.42	1,637.85	-95.72
SF_6	0.25	0.23	0.22	0.21	0.20	0.21	0.18	0.16	0.08	0.08	0.07	100.00

2.2 Status of the Development of a National System Based on Article 5.1 of the Kyoto Protocol

2.2.1 Description of Japan's Institutional Arrangement for GHG Inventory Preparation

The Ministry of the Environment (MOE), with the cooperation of relevant ministries, agencies and organizations, prepares Japan's national inventory and compiles supplementary information required under Article 7.1, which is submitted annually to the Conference of the Parties through the UNFCCC Secretariat in accordance with the UNFCCC and the Kyoto Protocol.

The MOE assumes overall responsibility for the national inventory and therefore makes every effort to improve the quality of the inventory. The MOE organizes Committee for Greenhouse Gas Emission Estimation Methods ("the Committee") in order to integrate the latest scientific knowledge into the inventory and to modify it based on more recent international provisions. The estimation of GHG emissions and removals, the key category analysis and the uncertainty assessment are then carried out while taking into consideration the decisions of the Committee, Substantial activities, such as the estimation of emissions and removals and the preparation of the Common Reporting Formats (CRF) and National Inventory Report (NIR), are done by the Greenhouse Gas Inventory Office of Japan (GIO), which belongs to the Center for Global Environmental Research of the National Institute for Environmental Studies. The relevant ministries, agencies, and organizations provide the GIO with the appropriate data (e.g., activity data, emission factors, and GHG emissions and removals) through the compilation of various statistics and also provide relevant information on supplementary information required under Article 7.1. The relevant ministries and agencies check and verify the inventories (i.e., CRF, NIR), including the spreadsheets that are actually utilized for the estimation, as part of the Quality Control (QC) activities.

The checked and verified inventories are determined as Japan's official values. The inventories are then published by the MOE and are submitted to the UNFCCC Secretariat by the Ministry of Foreign Affairs.

Figure 2.22 shows the overall institutional arrangement for Japan's inventory preparation as identified above.

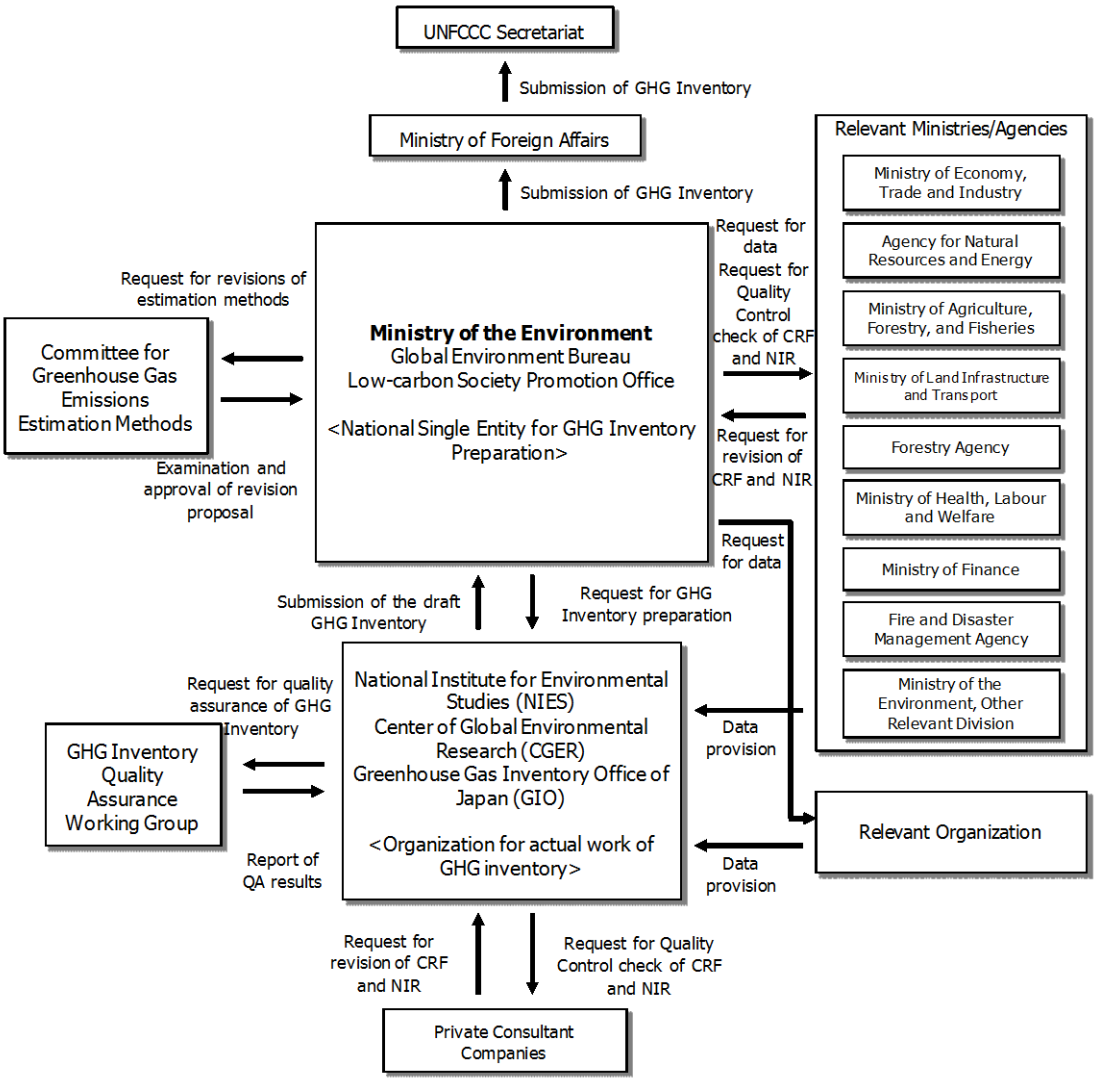


Figure 2.22 Japan's Institutional Arrangements for the National Inventory Preparation

2.2.2 Roles and Responsibilities of Each Entity Involved in the Inventory Preparation Process

The following are the agencies involved in the inventory compilation process, and the roles of those agencies.

a. Ministry of the Environment (Low-carbon Society Promotion Office, Global Environment Bureau)

- The single national agency responsible for preparing Japan's inventory, which was designated pursuant to the Article 5.1 of Kyoto Protocol.
- It is responsible for editing and submitting the inventory.

b. Greenhouse Gas Inventory Office of Japan (GIO), Center for Global Environmental Research, National Institute for Environmental Studies

- Performs the actual work of inventory compilation. Responsible for inventory calculations, editing, and the archiving and management of all data.

c. Relevant Ministries/Agencies

The relevant ministries and agencies have the following roles and responsibilities regarding inventory compilation.

- Preparation of activity data, emission factor data, and other data needed for inventory compilation, and submission of the data by the submission deadline.
- QC of the data provided to the Ministry of the Environment and the GIO.
- Confirmation and verification of the inventory (CRF, NIR, spreadsheets, and other information) prepared by the Ministry of the Environment and the GIO.
- When necessary, responding to questions from expert review teams about the statistics controlled by relevant ministries and agencies, or about certain data they have prepared, and preparing comments on draft reviews.
- When necessary, responding to visits by expert review teams.

d. Relevant Organizations

Relevant organizations have the following roles and responsibilities regarding inventory compilation.

- Preparation of activity data, emission factor data, and other data needed for inventory compilation, and submission of the data by the submission deadline.
- When necessary, responding to questions from expert review teams about the statistics controlled by relevant organizations, or about certain data they have prepared, and preparing comments on draft reviews.

e. Committee for the Greenhouse Gas Emissions Estimation Methods

The Committee for the Greenhouse Gas Emissions Estimation Methods ("the Committee") is a committee created and run by the Ministry of the Environment. Its role is to consider the methods for calculating inventory emissions and removals, and consider the selection of parameters such as activity data and emission factors. Under the Committee, the inventory working group (WG), which that examines crosscutting issues, and breakout groups that consider sector-specific problems (Breakout group on Energy and Industrial Processes, Breakout Group on Transport, Breakout Group on F-gas [HFCs, PFCs, SF_6, and NF_3], Breakout Group on Agriculture, Breakout group on Waste, and Breakout Group on LULUCF) are set up. In addition, the Taskforce on NMVOC is set up as an additional sub-group under the Inventory WG, and the Taskforce examines NMVOC emission estimation methodologies. The inventory WG, breakout groups, and taskforce consist of experts in various fields, and consider suggestions for inventory improvements. Improvement suggestions are considered once more by the Committee before approval.

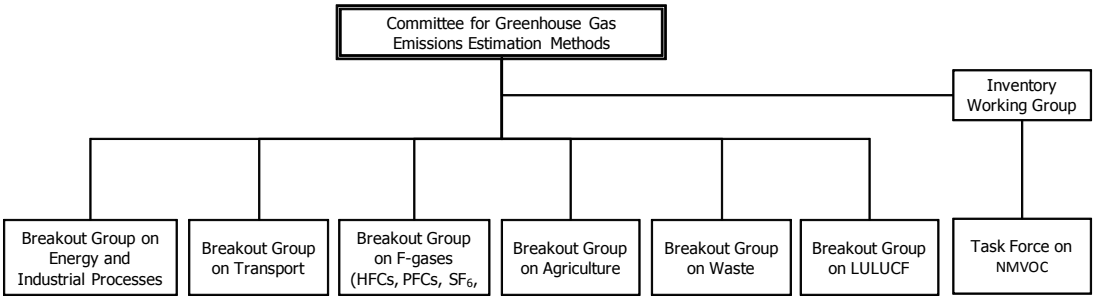


Figure 2.23 Structure of the Committee for the Greenhouse Gas Emissions Estimation Methods

f. Private Consulting Companies

Private consulting companies that are contracted by the Ministry of the Environment to perform tasks related to inventory compilation play the following roles in inventory compilation based on their contracts.

- QC of inventory (CRF, NIR, spreadsheets, and other information) compiled by the Ministry of the Environment and the GIO.
- When necessary, providing support for responding to questions from expert review teams and for preparing comments on draft reviews.
- When necessary, providing support for responding to visits by expert review teams.

g. GHG Inventory Quality Assurance Working Group (Expert Peer Review) (QAWG)

The GHG Inventory Quality Assurance Working Group (the QAWG) is an organization that is established for QA activities, and is composed of experts who are not directly involved in inventory compilation. Its role is to assure inventory quality and to identify places that need improvement by conducting detailed reviews of each emission source and sink in the inventory.

2.2.3 Brief Description of the Inventory Preparation Process

2.2.3.1 Annual Inventory Preparation Cycle

Table 2.20 shows the annual inventory preparation cycle. In Japan, in advance of the estimation of the national inventory to be submitted to the UNFCCC (submission deadline: April 15), preliminary figures are estimated and published as a document for an official announcement. (In preliminary figures, only GHG emissions excluding removals are estimated.)

Table 2.20 Annual Inventory Preparation Cycle

*Inventory preparation in fiscal year "n"

	Process	Relevant Entities	Calender Year n+1								CY n+2			
			Fiscal Year n+1											FY n+2
			May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
1	Discussion on the inventory improvement	MOE, GIO		→	→	→	→							
2	Holding the meeting of the Committee	MOE, (GIO, Private consultant)		→	→	→	→	→	→	→	→			
3	Collection of data for the national inventory	MOE, GIO, Relevant Ministries/Agencies, Relevant organization, Private consultant								→	→	→	→	
4	Preparation of a draft of CRF	GIO, Private consultant									→	→	→	
5	Preparation of a draft of NIR	GIO, Private consultant									→	→	→	
6	Implementation of the external QC and the coordination with the relevant ministries and agencies	MOE, GIO, Relevant Ministries/Agencies, Private consultant										→	→	→
7	Correction of the drafts of CRF and NIR	MOE, GIO, Private consultant											→	→
8	Submission and official announcement of the national inventory	MOE, Ministry of Foreign Affairs, GIO												★
9	Holding the meeting of the QA-WG	MOE, GIO	→	→	→	→								

(★) Inventory submission and official announcement must be implemented within 6 weeks after April 15.

2.2.3.2 Inventory Preparation Process

1) Discussion on inventory improvement (Step 1)

The MOE and the GIO identify the items that need to be addressed by the Committee, based on the results of the previous inventory review by the UNFCCC, the recommendations of the Inventory Quality Assurance Working Group (QAWG), and the items needing improvement as identified at former Committee meetings, as well as any other items requiring revision as determined during previous inventory preparations. The schedule for the expert evaluation (Step 2) is developed by taking the above-mentioned information into account.

2) Holding the meeting of the Committee for the Greenhouse Gas Emission Estimation Methods (evaluation and examination of estimation methods by experts) (Step 2)

The MOE holds a meeting of the Committee, in which estimation methodologies for the annual inventory and the issues that require technical review are discussed by experts with different scientific backgrounds.

3) Collection of data for the national inventory (Step 3)

The data required for preparing the national inventory and the supplementary information required under Article 7.1 of the Kyoto Protocol are collected.

4) Preparation of a draft of CRF draft (including the implementation of the key category analysis and the uncertainty assessment) (Step 4)

The data input and estimation of emissions and removals are carried out simultaneously by utilizing files containing spreadsheets (JNGI: Japan's National GHG Inventory files), which have inter-connecting links among themselves based on the calculation formulas for emissions and removals. Subsequently, the key category analysis and the uncertainty assessment are also carried out.

5) Preparation of the draft of NIR (Step 5)

The draft of the NIR is prepared by following the general guidelines made by the MOE and the GIO. The MOE and the GIO identify the points that need to be revised or require an additional description by taking the discussion at Step 1 into account. The GIO and the selected private consulting companies prepare the new NIR by updating the data, and by adding to and revising descriptions used in the previous NIR.

6) Implementation of the external QC and coordination with relevant ministries and agencies (Step 6)

As a QC activity, the selected private consulting companies check the JNGI files and the initial draft CRF (the 0^{th} draft) prepared by the GIO (external QC). The companies not only check the input data and the calculation formulas in the files, but also verify the estimations by re-calculating the total amounts of GHG emissions determined by utilizing the same files. Because of this cross-check, any possible data input and emission estimation mistakes are avoided. They also check the content and descriptions of the initial draft of NIR (the 0^{th} draft) prepared by the GIO. JNGI files, the draft CRF, and the draft NIR, which have been checked by the private consulting companies, are regarded as the primary drafts of the inventories.

Subsequently, the GIO sends out the primary drafts of the inventories and official announcements as electronic computer files to the MOE and the relevant ministries and agencies, and asks them to check the contents of the primary drafts. The data that are estimated based on confidential data are only sent out for confirmation to the ministry and/or agency that provided these confidential data.

7) Correction of the drafts CRF and NIR (Step 7)

When revisions are requested as a result of the check of the primary drafts of the inventories and official announcements by the relevant ministries and agencies (Step 6), the MOE, GIO, and the relevant ministries and/or agencies that submit requests for revisions coordinate the contents of the revisions and then revise the primary drafts and prepare the secondary drafts. The secondary drafts are sent out again to the relevant ministries and/or agencies for conclusive confirmation. If there are no additional requests for revisions, the secondary drafts are considered to be the final versions.

8) Submission and official announcement of the national inventory (Step 8)

The MOE submits the completed inventory to the Ministry of Foreign Affairs, and the Ministry of Foreign Affairs submits the inventory to the UNFCCC Secretariat. At the same time as the submission, information on the estimated GHG emissions and removals are officially announced and published on the MOE's homepage (http://www.env.go.jp/) with additional relevant information. The inventory is also published on the GIO's homepage (http://www-gio.nies.go.jp/index-j.html).

9) Holding the meeting of the Greenhouse Gas Inventory Quality Assurance Working Group (Step 9)

The QAWG, which is composed of experts who are not directly involved in or related to the inventory preparation process, is organized in order to guarantee the inventory's quality and to discover possible improvements.

The QAWG reviews the appropriateness of the estimation methodologies, activity data, emission factors, and the contents of the CRF and NIR. GIO integrates the items identified for improvement by the QAWG into the inventory improvement plan, and utilizes them in discussions on the inventory estimation methods and in subsequent inventory preparation.

10) Information on the QA/QC Plan

The QA/QC Plan is an internal document that documents the contents of QA/QC activities in all processes from the start of the National Inventory Report compilation to the final reporting, preparation schedule, and role distribution of each involved entity. It organizes and systematizes the QA/QC activities in the inventory preparation and clarifies what each entity involved in inventory preparation is supposed to do. Additionally, it is prepared for the purpose of guaranteeing the implementation of QA/QC activities.

The QA/QC Plan clearly states the roles and responsibilities of each entity in the inventory preparation process and defines each inventory preparation process. The relevant entities are MOE, GIO, relevant ministries, relevant agencies, relevant organizations, the Committee, selected private consulting companies, and the QAWG. The QC activities (e.g., checking estimation accuracy, archiving documents) are carried out in each step of the inventory preparation process in accordance with the *GPG (2000)* and the *GPG-LULUCF* in order to control the inventory's quality based on the QA/QC Plan. As a QA activity, the QA/QC Plan prescribes implementing a detailed review of each source or sink, to be conducted by experts who are not directly involved in or related to the inventory preparation process (QA activities by QAWG).

2.3 National Registry

This table describes the national registry that provides supplementary information as stated in Article 7.2 of the Kyoto Protocol. The following information is based on Decision 13/CP.10 ANNEX II para. 1.[31]

Item	Content
(a) The name and contact information of the registry administrator designated by the Party to maintain the national registry.	[Contact information] ・ Mr. Kazuyoshi Hasunuma, Global Environment Partnership and Technologies Office, Industrial Science and Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (TEL: +81-3-3501-1757, E-mail: kyomecha-tourokubo@meti.go.jp) ・ Mr. Yuji Mizuno, Market Mechanism Office, Global Environment Bureau, Ministry of the Environment (TEL: +81-3-5521-8354, E-mail: kyomecha-registry@env.go.jp)
(b) The names of other Parties with which the Party cooperates by maintaining their national registries in a consolidated system.	None relevant.
(c) Description of the database structure and capacity of the national registry.	[Database structure] A server equipped with disk array storage from Sun Microsystems, Inc. is used as the database server. Disk array storage is a mirroring framework that allows for replacing a failed hard disk without stopping operations. The software of the database server is implemented using an Oracle relational database management system. [Capacity] The database server possesses sufficient data capacity based on forecasted workload during the first and second commitment periods. In the event of an increase in the necessary capacity, additional hard disks could be attached to the database server.
(d) A description of how the national registry conforms to technical standards for data exchange between registry systems for the purpose of ensuring the accurate, highly transparent, and efficient exchange of data between national registries, the CDM registry, and the transaction log.	・In 2006, certain Data Exchange Standards (DES) prepared by the UNFCCC Secretariat were updated four times (versions 1.1a, 1.1b, 1.1c, and 1.1 Final). The national registry was revamped to comply with the new version, including correcting response codes and the WSDL. ・In October 2007, DES annex E (list of checks to be undertaken by the ITL, version 1.1.001) was released, and the internal checks for the national registry were changed in order to be consistent with the updated Annex E ・In August 2008, part of the DES was updated as new checks were added relating to the commitment period reserve associated with the "joint achievement," which is defined in Article4 of the Kyoto Protocol. DES Annex E (version 1.1.2) was released and the internal checks of the national registry were updated in order to be consistent with the updated DES. ・In March 2009, version 1.4 of the technical specifications for the standard electronic format (SEF) was released. A function was therefore added to output XML files containing information on unit holdings and transactions undertaken, which allows the registry administrators to generate the SEF. ・In May 2010, part of the DES was updated as a transaction message flow was changed. DES (version 1.1.6) was released and the new transaction message flow was implemented in the registry in order to be consistent with the updated DES.
(e) A description of the procedures	[Means to minimize discrepancies]

[31] FCCC/CP/2004/10/Add. 2, pp. 15–16.

Item	Content
employed in the national registry to minimize discrepancies in the issuance, transfer, acquisition, cancellation, and retirement of ERUs, CERs, tCERs, lCERs, AAUs and/or RMUs, as well as in the supplementing of tCERs and 1CERs. In addition, the procedure taken to forcefully terminate transactions when a discrepancy is notified and to correct problems in the event of a failure to terminate the transactions.	The following are some of the checks implemented in the registry to minimize discrepancies. (1) Data type validity for information input manually (e.g., numbers, alphanumeric characters) (2) Data value validity for complying with Kyoto unit types. (e.g., whether an expiry date is set for tCERs). (3) The existence validity of corresponding Kyoto units in transferring accounts at the time of transaction. [Procedures for forced termination of discrepant transactions] Transactions are automatically terminated when discrepancies regarding them have been identified. [Procedure in the event of a failure to terminate discrepant transactions] The registry logs information on failed transactions for which discrepancies were identified and forced terminations subsequently failed. The system administrator periodically checks the archive logs to resolve problems. In addition, in the event that there was a failure to terminate a discrepant transaction, the monitoring system automatically detects the failure and notifies the system administrator of it via email.
(f) An overview of security measures employed to prevent unauthorized tampering and operator errors, and to update methods oversight.	・VPN communication and SSL encryption were selected for use in accordance with the DES (Version 1.0). ・Fingerprint authentication was introduced to limit users that can operate the terminals of the registry administrators, and access was restricted by providing the registry administrators with a private connection. ・The information security of the current national registry was audited by a corporation that had acquired BS7799/ISMS certification, which is an international standard for security management. ・The servers of the national registry system are established in an Internet data center (IDC) with a 24-hour surveillance system. ・All PCs and servers used for the national registry have virus detection software installed and virus pattern files are automatically updated on a regular basis.
(g) A list of information publically assessable through the user interface of the national registry.	・Account information and a list of authorized legal entities (up-to-date information and by account type). ・Total amount of Kyoto units held and issued for each calendar year (by unit type, by account type). ・Total amount of Kyoto units held for each calendar year at the beginning and end of each year (by unit type, by account type). ・ Total amount of Kyoto units subject to external transfers for each calendar year (by unit type, by partner party). ・Total amount of expired, cancelled, and replaced Kyoto units for each calendar year (by unit type, by transaction type). ・Summary information on transactions undertaken for each calendar year (by unit type). ・Information on corrected transactions (by unit type).
(h) The Internet address of the national registry's interface.	http://www.registry.go.jp/index_e.html
(i) A description of measures taken to safeguard, maintain, and recover data in order to ensure that data storage is	[Data protection] The national registry is established at an Internet data center (IDC) with the following characteristics.

Item	Content
preserved and registry services are recovered in the event of a disaster.	・An anti-seismic building with high aseismic capacity. ・Electrical facilities that guarantee over 24 hours of continuous operation in the event of a power failure. ・Fire-resistant construction possessing a gas-type fire extinguishing system. [Data management] Online backup as well as redundant configuration of duplicates is implemented. [Data recovery] Separate system recovery manuals have been created for both hardware and software failure. In addition, disaster recovery exercises are conducted regularly and procedures are checked in order to recover the system promptly and infallibly in the event of a failure.
(j) The results of tests developed for testing the performance, procedures, and security measures of the national registry conducted in accordance with the provisions of Decision 19/CP.7 relating to technical standards for data exchange between registry systems.	In July 2007, a test was conducted between the ITL and the national registry of Japan based on DES annex H Version 1.1.002. The test was a success as the anticipated results were achieved in each of the test areas. In addition, the following tests were conducted between the ITL and the national registry before and after the go-live. -Go-live test In November 2007, a test was conducted in preparation for the Japanese registry connecting to the ITL for live operation. The test was completed without any problems and the live operation commenced. -ETS go-live test In October 2008, a test was conducted in accordance with the CITL and national registries of the EU connecting to the ITL for live operation. The test was completed without any problems. -SEF coordinated testing In December 2008, predefined test transactions were conducted in a test environment. SEF results were output by the national registry of Japan and consistency was confirmed between the SEF generated by the registry and one generated by the ITL. -Annex H testing for CP2 In September 2012, Annex H testing for CP2 was added in DES (version 1.1.9). In November 2012, the interoperability test for CP2 was conducted between the national registry of Japan and the ITL in a test environment. -Developer test Tests using the developer environment and registry environment provided by the UNFCCC are conducted as necessary. Before conducting the tests listed above, internal tests were conducted to check the functionality, operability, performance, security, and reliability of the registry system.

Chapter 3

Policies and Measures

3.1 Policy Making Process

3.1.1 Information Regarding Institutional Arrangements in Japan

3.1.1.1 Development of Japan's Promotion System

In the Government, related ministries and agencies will closely cooperate with each other, led by the "Global Warming Prevention Headquarters" chaired by the Prime Minister and all Cabinet ministers as member, and the "Directors' Meeting of the Global Warming Prevention Headquarters" as a ministries' director-general level meeting.

For regions, relevant ministries and agencies will work together to back up initiatives to address global warming by local governments by utilizing the "Regional Committees for Promoting Energy and Global Warming Countermeasures" established in each regional block, in cooperation with local governments, Regional Councils on Global Warming Countermeasures, Regional Biomass Councils and so on.

3.1.1.2 Progress Management of Policies and Measures

The Government will strictly manage the progress of policies and measures stated in this chapter.

The Government will strictly assess and verify voluntary initiatives conducted by business operators in accordance with the "Commitment to a Low Carbon Society". As for measures and policies stated in the Japan Revitalization Strategy endorsed by the Cabinet on June 25, 2013, the Government will implement the conventional PDCA cycle and verify the achievement status of the set performance targets, anything lacking when those targets are not achieved, as well as what issues exist in the current policies and measures, and points to be improved including abolishment of ineffective policies and measures. The Government will estimate the greenhouse gas emission levels biannually (preliminary and definite values) to check the emission trends by sector and by gas.

3.1.2. Policies and Measures on Mitigation Actions and Their Effects

3.1.2.1 Policies and Measures for Greenhouse Gas Emissions Reductions and Removals

3.1.2.1.a Policies and Measures for Greenhouse Gas Emissions Reductions

a) Energy-Originated CO_2

1) Formulation of Low-carbon Urban/Regional Structures and Socioeconomic Systems

Since urban/regional structures and transportation systems will continue to influence CO_2 emissions in the mid- and long-term time frames through increases/decreases in traffic and other factors, the Government will encourage low-carbon urban/regional development in the mid- and long-term time frame by low-carbonizing urban/regional structures and socio-economic system through the promotion of non-fossil-fuel energy use such as solar power, supports for actions on GHG emissions reduction led by citizens and business operators and promotion of rearrangement and improvement of regional environment (i.e. promotion of convenience of public transportation) based on the action plans for low carbon society in the local level which are in accordance with the Act on Promotion of Global Warming Countermeasures (Act No. 117 of 1998) and such activities are expected to be associated with city plans, the Plan on Establishment of Agricultural Promotion Regions, and other countermeasures. At the same time, concerning the cities with high energy demands, activities should be conducted such as improvement of energy use through holistic and efficient use of energy, implementation of countermeasures against urban heat island, and formulation of Compact Cities by concentrating urban functions. Moreover, such activities should be in accordance with local low-carbon city plans based on the Low Carbon City Act (Act No. 84 of 2012) and be consistent with action plans for low carbon society and master plans for city planning in the local level.

2) Policies and Measures by Sector (Industrial, Residential & Commercial, Transport, etc.)

A. Initiatives in the Industrial Sector (Manufacturers, etc.)

(a) Promotion and Reinforcement of Voluntary Action Plans of Industry (voluntary initiatives by business operators in accordance with the Commitment to a Low Carbon Society)

Through the formulation and publication of the Guidelines for Controlling Greenhouse Gas Emissions based on the Act on Promotion of Global Warming Countermeasures, the Government will encourage business operators to actively implement environmentally-friendly business actions on a voluntary basis.

Although the Guidelines for Controlling Greenhouse Gas Emissions have been formulated in some sectors, the guidelines will be reviewed as necessary in reference to the development of available cutting-edge technologies (best available technologies: BATs).

The industrial community has made certain achievements to reduce emissions in the industry, commercial, transport and energy conversion sectors by voluntarily developing and implementing greenhouse gas emissions reduction plans (Voluntary Action Plans). As initiatives after FY2013, each industry group formulates and implements greenhouse gas emission reduction plans (the Commitment to a Low Carbon Society) with the pillars of '2020 targets for global warming countermeasures of domestic business activities,' with the assumption of the maximum use of the world's most advanced low-carbon technologies, 'contribution to emissions reduction in the other sector through providing low-carbon products and services,' 'promoting international contributions (contributions to emissions reduction in the other countries),' and 'developing and introducing innovative technologies' in order to pursue voluntary initiatives by business operators. The formulation and progress statuses of those initiatives will continue to be strictly assessed and verified by the Government.

(b) Promotion of Introduction of Highly Energy-efficient Equipment and Devices

Encouraging business operators to invest in energy saving, the Government will implement support measures including replacement with cutting-edge energy-saving equipment at the time of replacing facilities and equipment at plants and operation sites. Approximately 90 percent (energy consumption basis) of business operators of the industrial sector are subject to Act on the Rational Use of Energy (Act No. 49 of 1979) and the Government will provide guidance etc. to those who have problems with improving energy intensity and complying with judgment criteria, based on periodical reports etc.

In addition to the manufacturing industry, the Government will work on the diffusion of fuel-efficient and low-carbon construction machinery in the construction industry and support for the implementation of and R&D for global warming countermeasures in the agriculture, forestry and fishing industries.

B. Initiatives in the Commercial and Other Sector

(a) Low-carbonization and Energy-savings in Equipment and Devices

The Government improves energy-saving performance of devices through application of the Top Runner Program that requires manufacturers and importers of products to meet criteria which is in line with standards of currently most-advanced devices and assumed technological advances in about 3 to 10 years. The Government is expanding the application of the Top Runner Program onto

equipment and devices such as electric water heaters (heat pump water heaters), multifunction machinery and printers, and LED light bulbs were newly added in 2013.

Through the formulation and publication of the Guidelines for Controlling Greenhouse Gas Emissions Based on the Act on Promotion of Global Warming Countermeasures, the Government will encourage business operators to implement energy-saving and low-carbonization business actions on their equipment.

(b) Improvement of the Energy-efficiency Performance and Low-carbonization of Housing and Buildings

While giving full consideration to the necessity and levels of regulations and their balance, and other matters, the Government will make it mandatory in stages to comply with energy conservation standards for newly constructed housing and buildings by 2020. The Government will develop an environment for smooth implementation of steps toward this end while giving full consideration to improving the construction techniques of small- and medium-sized builders and carpenters and the positioning of traditional wooden houses. Specifically, the Government will further diffuse energy-saving measures and provide support in the development of new technologies and services as well as construction methods that contribute to better energy conservation in housing, building materials, devices and so on. In addition, the Government introduced the Top Runner Program for construction materials, and thermal insulation material was added. Furthermore, the Government will also promote diffusion of low carbon building with a higher energy-efficiency performance. The Government will enhance and diffuse an objective and clarified system for verifying and labeling comprehensive environmental performances of housing and buildings, which includes energy conservative performances, Non-Energy Benefit (NEB) standards including in-room environment and the level of CO_2 emission at each stage of life cycle.

Through promoting the concept of 'Net Zero Energy' for housing and buildings with increasing energy consumption, the Government will aim to realize the concept for the average energy consumption of new housing and buildings by 2030.

Furthermore, the Government will pursue supports such as retrofits to improve energy-efficiency and low carbonization, improvement of the use of equipment and devices, provision of consultation on potential capacity of GHG emissions reduction, promoted use of data of energy consumption and so on in order to improve the energy-saving performance of the entire stock (existing housing and buildings). Also the Government will discuss multilateral measures which are expected to be in need in the future specifically for replacing equipment with high-performed one.

(c) Smart Consumption of Energy by Using Energy Management

The Government will improve the method for using devices by dramatically enhancing the energy consumption efficiency of equipment and utilize the developed network, while realizing the smart consumption of energy through 'Energy management' through which consumers voluntarily participate in and contribute to the demand and supply as well as management of energy with a view to create a society with optimum, efficient energy consumption.

Specifically, the Government will promote the setting and expansion of diverse electricity bill menus through conducting operation tests of demand response system in four smart community regions and the Electricity System Reform. In addition, the Government will promote the introduction of smart meters as infrastructure and install them in all households and plants in the early 2020s. At the same time, the Government will promote the introduction of the energy management systems such as HEMS (Home Energy Management System) and BEMS (Building Energy Management System), develop an environment where the entire Japan consumes energy in a smart manner, and promote actions utilizing energy consumption data with the aim of optimizing energy consumption.

For the infrastructure used in the operations of water supply, sewage system and waste management, the use of renewable energy and energy-saving will be promoted to curb GHG emissions from the commercial sector.

The Government will engage in the diffusion and commercialization of services using the green ICT which is expected to lead to cleaner and more economically-efficient society. The policy is including the development of new Green Data Centre and aiming at curbing CO_2 emissions through the use of green ICT.

(d) Initiatives by Public Organizations

The Government will reduce greenhouse gas emissions with regard to its own administration and undertakings at a level which is equivalent or superior to initiatives in the current national commitment plan, even during the period before the new national commitment plan is formulated in line with the new plan for global warming prevention.

The Government will conclude "contracts considering reduction of greenhouse gases and other emissions" mainly in six areas (namely, supply of electricity, automobiles, vessels, ESCO, buildings, and industrial waste) based on the "Law Concerning the Promotion of Contracts Considering Reduction of Emissions of Greenhouse Gases and Other Emissions by the State and Other Entities (Act No. 56 of 2007)", as well as its basic policy.

In order to spur demands for products that contribute to greenhouse gas emissions reduction and other eco-friendly goods and services, the Government will take the initiative in procuring such

goods and services based on the "Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Act No. 100 of 2000; hereinafter referred to as the "Green Purchasing Law")". Prefectures and municipalities will take actions such as implementing countermeasures with regards to the natural and social conditions of region and reducing GHG emissions from their administrative operations.

C. Initiatives in the Residential Sector

(a) Low-carbonization and Energy-savings in Equipment and Devices (Reprinted)

(b) Improvement of the Energy-efficiency Performance and Low-carbonization of Housing and Buildings (Reprinted)

(c) Diffusion of Combined Heat and Power

Since simultaneous generation and use of electricity and heat enables effective consumption of energy, the Government promotes the diffusion of combined heat and power such as household fuel cells ("Ene-farm"). In order to accelerate the introduction of fuel cells to Japan's market ahead of the world, the Government promotes advanced research and development and strive to lower cost while promoting thorough standardization of this technology, with an eye to introducing 5.3 million household fuel cells ("Ene-farm") into the market by 2030 (1.4 million by 2020).

(d) Support for the Development and Diffusion of CO_2 saving measures

The Government will work on the "visualization" of CO_2 emissions by various product types by displaying information on emissions and other items during the product's life cycle. Moreover, the Government will work to promote innovative changes towards low-carbon lifestyle through the introduction of HEMS, which operates lighting, air conditioners and other devices to optimally adjust to interior conditions, promotion of the use of HEMS data, and promotion of "Home CO_2 advisor service."

D. Initiatives in the Transport Sector

(a) Promotion of the Use and Diffusion of Vehicles with Lower Environmental Load

For highly energy-efficient next-generation vehicles (including hybrid vehicles, electric vehicles, plug-in hybrid vehicles, fuel-cell vehicles, clean diesel vehicles and compressed natural gas vehicles), the Government will aim to increase the share of these vehicles in the new car sales from 50 percent to 70 percent by 2030 by promoting measures to create initial demand, support R&D to improve performance and build efficient infrastructure.

Specifically, in addition to promoting the development of recharging infrastructure, the Government will support the purchase of EVs to create mass production effects and to promote price reduction and also support research and development to extend a cruising range and reduce cost.

In order to enable the release of fuel-cell vehicles to the market in 2015, the Government will review regulations on fuel-cell vehicles and hydrogen infrastructure and support the introduction of hydrogen stations (preliminary introduction in approximately 100 locations mainly in four major metropolitan areas by FY2015) with the aim to achieve the world's fastest diffusion of fuel-cell vehicles.

In order to promote such diffusion of next-generation automobiles, the Government will work to provide preferential tax treatment such as tax cuts for eco-friendly automobiles.

(b) Promotion of Traffic Flow Management and Promotion of the Environmentally-friendly Usages of Vehicles

The Government will promote the environmentally-conscious form of driving by pursuing the diffusion of Eco-drive Management Systems (EMS) for vehicle transport operators. At the same time, the Government will promote the smoother traffic flows by improving main traffic network using loop roads and multi-level crossovers which are effective to reduce CO_2 emissions, reducing roadworks, introducing to manage the crossings whose gates always seem to be closed, and promotion of the development of traffic safety facilities such as traffic signals. Furthermore, the Government will also rearrange the traffic environment to be safer and more comfortable for bike users improve the administration of pricing on highway use, and promote the introduction of Intelligent Transport System (ITS) which is effective for drivers to select the best routes to their destinations.

Also for general roads, the Government will engage in traffic flow management such as reduction of traffic congestions by applying ITS.

(c) Promotion of Public Transport Utilization

The Government will promote the use of public transport systems through various measures including improving the service and convenience of railways and buses (facilitating connections, diffusing IC travel card, making vehicles and passenger terminal facilities barrier-free, developing public transport systems such as new line of railway, Light Rail Transit (LRT) and Bus Rapid Transit (BRT) etc.), and promotion of eco-commuting.

(d) Promotion of Low-Carbonized Transportation through Railway, Vessel, and Aviation

The Government will promote the low carbonization of vessels, railways and aircraft including energy saving in domestic vessels through manufacturing of Super Eco-Ships, alternation to the manufacturing of vessels with energy-saving equipment, energy saving in domestic aviation through efficient operating method for aircrafts and low-carbonization of airport facilities, and energy saving in railways by advancing the Eco-Rail Line project, which introduces highly energy-efficient vehicles and renewable energies in railway facilities etc.

(e) Improvement of the Efficiency of Logistics Systems and Promotion of Modal Shifts, etc.

The Government will improve the efficiency of truck transport by encouraging the use of larger trucks such as large CNG trucks and promoting cooperative transport and delivery by logistics operators etc. within regions.

In addition, the Government will promote modal shifts from truck transport such as a shift to rail freight through installation of large containers (31 ft), which is efficient to promote phasing out from larger trucks use, and the "Eco- Rail Mark" etc., a shift to coastal shipping through introduction of truck with separable trailers and the "Eco-Ship Mark", reduction of the total distance of land transportation of international cargo through the rearrangement of freight terminals etc. for international vessel transportation, and so on. Furthermore, the Government will aim at further reduction of environmental load by strengthening a partnership between owners of goods and operators of logistics.

The Government will also promote low energy conservation of harbor areas, and facilitation of renewable energy introduction and its use at the harbors which are the node of vessel transportation and land transportation.

In addition, concerning biofuel, the Government will promote the research and development of technologies aimed at practical use.

E. Initiatives in the Energy Conversion Sector

(a) Power from Renewable Energy Sources

Carbon dioxide emission levels from renewable energy are smaller compared to thermal power. Thus, promoting further introduction of renewable energies is vital for conducting measures in the energy conversion sector.

In addition to the viewpoint of improving energy security through the use of domestic energy resources, promoting renewable energy also represents an important growth strategy, since it stimulates creation of a new energy-related industry and expansion of job opportunities, which

supports the national developing strategy. The Government will promote the thorough use of renewable energy sources including onshore and offshore wind power, solar power, small-scale hydro power, geothermal power and biomass and expand their introduction to the maximum extent possible for the coming three years.

As the first step, the Government will enhance the steady and stable operation of feed-in tariff scheme, implement rearrangement and operation tests of the power grid, streamline the procedure of environmental impact assessment (usually procedures take three to four years, hence, reduce the period by half), implement other regulatory and institutional reform such as rationalization of safety regulations etc. to stimulate investment of private finance.

In terms of wind power generation, the Government will promote its introduction by urgent introduction of large storage batteries for the power system, creating a condition for early strengthening of Hokkaido-Honshu Electric Power Interconnection Facility, rearrangement and operation tests for the power grid, and regulatory and institutional reform including streamlining the procedure of environmental impact assessment and rationalization of safety regulation. In particular, for offshore floating wind power generation, the Government aims to overcome its technical challenges, establish evaluation methods for safety, reliability and economic aspect and environmental assessment method through demonstration projects by 2015. At the same time, the government will achieve commercialization by around 2018 while promoting establishment of international standards.

Concerning solar power generation, the Government will promote the introduction within the country through feed-in tariff scheme and regulatory and institutional reform, and aim for its diffusion by reducing power generation costs through development and implementation of innovative technologies.

For the promotion of geothermal power generation, the Government will enhance the introduction by regulatory and institutional reform including streamlining the procedure of environmental impact assessment and rationalization of safety regulations to enhance the use of small-scale geothermal power generation using the existing wells at hot springs, promoting understanding of people in the local level, and research projects on potential feasibility of geothermal power.

For the promotion of small-scale hydro power generation, the Government will continue to arrange business environment which promotes the introduction.

For biomass energy, the Government will focus on the promotion of industrialization and introduction of biomass energy by establishing the framework to promote actions aiming at developing the primary sector with using the renewable energy, will promote the use of urban biomass use such as sewage sludge, and aim at achieving the use of local biomass energy in 100 regions in 5 years.

Other than the abovementioned energy sources, the Government will take actions for early commercialization of ocean power generation through technology development and demonstration.

In addition to these activities, the Government will, among others, promote the demonstration and introduction of the independent and decentralized energy system with renewable energies as a core, in regions such as remote islands.

(b) Renewable Heat Energy

The Government will promote the use of renewable heat energy sources that are specific to particular regions, such as solar heat, biomass heat, geo-heat, hot springs heat, river heat, sewage heat and ice melt heat, and also the use of exhaust heat such as waste heat from incineration, in order to realize efficient energy supply in local regions.

(c) Persuasion of High Efficiency in Thermal Power Generation

The government will advance introduction of highly efficient thermal power generation (coal/LNG) with environmental considerations, and make efforts to improve power generation efficiency further by advancing technology development.

Specifically, the Government will promote development of framework for managing CO_2 emissions trend with participation of the whole stakeholders of power generation, which should be consistent with the national GHG emissions reduction target based on the review of energy policies and energy mix. Moreover, speeding-up and clarification of environmental assessment should be promoted and the Government will arrange environment for the private sector so that the sector can easily invest in the highly-efficient (coal or LNG) thermal power generation.

At the same time, the Government will support technological development. The Government aims to achieve practical use of advanced ultra-supercritical (A-USC) thermal power generation in 2020s (generating efficiency: around 39% at present to improve to around 46%). The Government aims to establish technology of integrated coal gasification fuel cell combined cycle (IGFC) by 2025 and achieve practical use in 2030s (generating efficiency: around 39% at present to improve to around 55%) For LNG thermal power generation, the Government aims to achieve practical use of gas turbine of 1700 °C class by around 2020 (generating efficiency: around 52% at present to improve to around 57%). Also concerning carbon dioxide capture and storage (CCS), the Government will accelerate technological development for practical use around 2020s and conduct survey on potential CO_2 storage sites for CCS precondition in order to obtain outcomes at an early date. Also the Government will consider the possibility of coal thermal power plants being equipped with CCS by 2030 on the precondition of commercialization, make it clear what to

expect on CCS Ready along with a considerations about the progress of survey on the sites and commercialization, and consider the possibility of the introduction of CCS Ready as early as possible.

(d) Utilizing Nuclear Power Generations whose Safety is Confirmed

The Government will leave judgment of the safety of nuclear power plants to the specialist of the Nuclear Regulation Authority. When the Nuclear Regulation Authority admits the compliance to regulatory standards, the government will respect the judgment and will proceed with the restart of the nuclear plant. In this case, the Government will make efforts to obtain understanding and cooperation of relevant parties including the municipality of each nuclear facility site.

b) Non Energy-originated CO_2

The Government will reduce CO_2 emissions in the cement production process by reducing the production volume of clinker through increased production proportion and expanded use of blended cement, which is made by mixing blast-furnace slag with clinker, an intermediate cement product. Specifically, in public works administrated by the government, the use of blended cement will be promoted in accordance with “Green Purchasing Law”.

In addition, the Government will reduce CO_2 emissions from waste incineration by promoting waste reduction and recycling. The Government will promote 3Rs initiatives for achieving the targets set out in the Basic Plan for Establishing a Recycling-Based Society (hereinafter referred to as Basic Recycling Plan), formulated in accordance with the “Basic Act on Establishing a Sound Material-Cycle Society (Law No. 110, 2000; hereinafter referred to as the Basic Recycling Law)” as well as the waste reduction targets set out in the “Waste Management and Public Cleansing Law (Law No. 137, 1970; hereinafter referred to as Waste Management Law)” in line with the target set in Basic Recycling Law. Specifically, the Government will promote waste reduction and recycling by thorough waste sorting and collection as well as imposition of charges for waste collection by municipal governments, actions complying with individual recycling laws and actions based on the Guidelines for Controlling Greenhouse Gas Emissions. Also, CO_2 emissions should be reduced through reducing the amount of incinerated wastes by promoting the arrangement of waste disposal facilities which contribute to the realization of 3Rs in line with the waste disposal facility development plan based on the Waste Management Law.

c) Methane and Nitrous Oxide

1) Methane (CH_4)

The Government will promote the reduction of direct landfill of organic waste such as garbage, which will in turn reduce methane emissions associated with waste landfill. The Government will also promote the 3Rs initiatives for achieving the targets set out in the Basic Recycling Plan

formulated in accordance with the Basic Recycling Law and the waste reduction targets stipulated in the Waste Management Law in line with the targets in the Basic Recycling Law. Specifically, the Government will promote waste reduction and recycling through the following measures: reviews of disposal methods and thorough waste sorting and collection by municipal governments, reducing illegal dumping of industrial wastes through more strict waste disposal systems and the development of model disposal operators; and promoting actions based on the Guidelines for Controlling Greenhouse Gas Emissions. At the same time, the Government will reduce the amount of direct landfill of organic waste by promoting the improvement of the systems for waste disposal facilities of municipalities, including through banning the direct disposal to landfill of organic wastes in principle, in accordance with the waste disposal facility development plan based on the Waste Management Law.

Moreover, methane emissions associated with rice cultivation can be reduced by changing the way organic matter is managed in line with local conditions, including replacing the conventional approach of plowing in rice straw with application of compost.

2) Nitrous Oxide (N_2O)

Upgrading combustion technology at sewage sludge incineration facilities will help to reduce nitrous oxide emissions associated with combustion. To this end, the Government has standardized the level of sophistication of combusting sewage sludge at sewage treatment facilities, and the Government will ensure the implementation of this, in addition to developing and diffusing sewage sludge combustion technology which emits lower nitrous oxide than ever before.

The Government will reduce nitrous oxide emissions associated with the waste incineration by promoting the upgrade of combustion technology at general waste incineration facilities such as implementing consecutive operation of consecutive incinerator. Moreover, the Government will reduce nitrous oxide emissions by promoting the 3Rs initiatives for achieving the targets set out in the Basic Recycling Plan formulated in accordance with the Basic Recycling Law and the waste reduction targets stipulated in the Waste Management Law in line with the targets in the Basic Recycling Law, and by promoting the arrangement of waste disposal facilities which contribute to the realization of 3Rs in line with the waste disposal facilities development plan based on the Waste Management Law.

The Government will aim at the emissions reduction of nitrous oxide associated with the application of fertilizers through the use of lower fertilizer application rates, split-application regimes and slow-release fertilizers.

d) Fluorinated Gases: HFC, PFC, SF_6 and NF_3

Phasing out of ozone-depleting HCFC refrigerants in equipment such as air conditioners and shifting to HFC as an alternative have caused an increase in HFC emissions, and this is expected to grow further in the future. Legislations such as the Law for Ensuring the Implementation, "Law concerning the Recovery and Destruction of Fluorocarbons (Act No. 64 of 2001; hereinafter referred to as Fluorocarbons Recovery and Destruction Law)", "Act on Recycling, etc. of Specified Kinds of Home Appliances (Act No. 97 of 1998)" and "Act on Recycling End-of-Life Vehicles (Act No. 87 of 2002)" require that HFC refrigerants, like CFCs and HCFCs, be properly collected at a time of disposing equipment. However, in addition to the HFC discharged at the time of equipment disposal, HFCs leaked during the normal operation of equipment and discharged due to the breakdown of equipment are in issue. Because of this situation, the Fluorocarbons Recovery and Destruction Law was amended in June 2013 to take measures to encourage more rational use and more proper management of fluorocarbons among operators at all stages of the fluorocarbon life cycle. The title of the Law was also changed to "Act on Rational Use and Proper Management of Fluorocarbons (hereinafter referred to as Fluorocarbons Law)".

It is important to ensure the appropriate management and disposal of the four main fluorinated gases; HFC, PFC, SF_6 and NF_3 (NF_3 is a new addition in 2013 under the Kyoto Protocol), which are used as refrigerants for refrigeration and air conditioning equipment. At the same time, it is also important to pursue development and diffusion of other substitutes that have a low global warming potential (GWP) and/or are fluorocarbon-free. Given that it will take some time to achieve the conversion of refrigerants in existing refrigeration and air conditioning equipment on the market, it is important to pursue a rapid implementation of measures through the appropriate application of the Fluorocarbons Law. The Government will promote practical efforts on phasing down of fluorocarbons by gas suppliers, eliminating fluorocarbons and lowering GWP of products by manufacturers, preventing leakage of fluorocarbons from refrigeration and air conditioning equipment for business use during normal operation period (refrigerant management by end-users), and enhancing and strengthening regulations on recycling and destruction programs designed to check proper disposal and prevent refrigerant discharge.

3.1.2.1.b Greenhouse Gas Sink Policies and Measures

(a) Measures for Managing Forest Carbon Sink

Through implementation of measures designed to achieve the objectives regarding the multiple roles of forests as well as the supply and usage of forest products outlined in the "Basic Plan for Forest and Forestry endorsed by the Cabinet in July 2011 in accordance with the Forest and Forestry Basic Act (Law No. 161, 1964)", the Government will aim to attain the forest sink target that the amount of removals by forest management for the period between FY2013 and FY2020 will be, on average, 3.5% of the total GHG emissions in FY1990 (approximately 44 million t-CO_2), which is the agreed upper limit of removals by forest management for the second commitment

period of the Kyoto Protocol. The level of removals will correspond with approximately 2.8% or more of the total GHG emissions in FY2005 (approximately 38 million t-CO_2).

In order to attain this target, the Government will, with gaining understanding by and cooperation from local governments, various stakeholders and the general public, carry out a variety of measures including thinning an annual average of 520 thousand hectares, appropriate forest development such as planting, proper management and conservation of protection forests, use of timber and woody biomass and so on. In order to fully secure contribution by forest sink in the future to meeting the target of 80% reduction of greenhouse gas emissions by 2050, the Government will promote establishment of seed orchards and scion gardens which are necessary to replace existing breeds of major forestry species with seeds and seedlings that grow well and development of appropriate forest resources through steady planting and other measures.

In addition, the Government will consider new schemes to secure financial resources for forest carbon sink management, including a fiscal policy and levying the cost of forest development on the public. The Government will also promote the public-private joint initiatives in a steady and comprehensive manner, including community afforestation programs and forest environment campaigns designed to gain the extensive understanding and support of the public.

(b) Measurement for Sink Source in Agricultural Soil

It is proven that the carbon storage in Japanese agricultural lands and pasture soils can be increased by continuous usage of organic matter in fertilizers and green manures. By promoting these methods, it contributes to the increased carbon storage in both agricultural lands and pasture soils.

(c) Promotion of Urban Greening

For the urban greening, actions will be continuously promoted such as park maintenance, greening in roads and bays, and creation of the new greening spaces at buildings. Improvement in report and verification system for the urban greening will also be strategically carried out.

3.1.2.2 Cross-sectional Strategies

a) GHG Emissions Accounting Reporting and Disclosure Program

Based on the “Act on Promotion of Global Warming Countermeasures”, Greenhouse gas emitters who exceed the given threshold volume are obligated to measure and report their emission volumes annually to the Government, and the Government firmly administrates the monitoring and reporting system by collecting and sorting out the reported data and disclose it to the public and the Government will further enhance and strengthen this system.

b) Making the Tax System Greener

The Government will pursue greening of the entire tax system including energy and vehicle taxes. The Government will utilize the tax revenue of "Tax for Climate Change Mitigation", designed to add an extra tax multiplier commensurate with CO_2 emission levels from the all fossil fuel combustion and will firmly implement the various policies to curb energy-originated CO_2 emissions. Additionally, the Government will also strengthen greener taxation system on vehicle taxes by ensuring the concept of "Reducing taxes for Goods, Increasing taxes for Bads" according to the environmental impact.

c) Domestic Emission Trading Scheme

The Government has been considering an emission trading scheme carefully, taking into consideration the burden on domestic industry and associated impacts on employment; ongoing developments of emission trading schemes overseas; evaluation of existing major climate change policy measures such as voluntary actions implemented by the industry sector; and the progress toward the establishment of a fair and effective international framework where all major emitters participate.

d) Preliminary Studies, Forecast and Evaluation of GHG Projects

In order to encourage active efforts by business operators to reduce GHG emissions, the Government will assess environmental impact to ascertain that projects incorporate appropriate environmental conservative considerations during the construction phase and at service delivery.

e) Promotion of Environmental Considerations in Business Activities

Government will encourage business operators to implement environmentally-conscious business activities on a voluntary and active basis by formulating and publishing the Guidelines for Controlling Greenhouse Gas Emissions Based on the Act on Promotion of Global Warming Countermeasures. In addition, the Government will review the guidelines based on the trends of available cutting-edge technologies in the field. By releasing stakeholder environmental reports in accordance with the Act Concerning the Promotion of Business Activities with Environmental Consideration by Specified Corporation, etc. by Facilitating Access to Environmental Information, and Other Measures (Law No. 77, 2004), the Government will encourage the use of environmental information by stakeholders and by the general public and provide the conditions for business activities with environmental consideration to be highly valued by society and by markets.

f) Greening Finance

The Government will provide financial supports to mobilize private funds into low-carbon projects. More specifically, it will provide equity investment into projects where private financial resources are not sufficient and encourage leasing of low-carbon equipment to reduce the burden of up-front costs.

In addition, the Government will promote loans based on environmental responsibility ratings and socially responsible investment (SRI).

g) Promotion of a credit scheme for promoting Emission Reduction Activities in Japan (J-Credit system)

In order to actively encourage stakeholders in Japan to reduce GHGs emissions through the introduction of energy-saving equipment, the use of renewable energy and carbon sinks through appropriate forest management, the Government operates the "J-Credit scheme" established in April 2013 as a new credit certification scheme. The generated credits are used for achieving the goals of the Commitment to a Low-Carbon Society and for carbon offset, among others.

h) Development of Public Campaigns

The Government will work to enhance public and business operators' awareness and understanding of the global warming issues, by providing clear and useful information about adverse impacts of global warming on the public and society backed by the latest scientific information, through dialog and various forms of media. In this way, the Government will aim to foster a spirit of understanding and cooperation towards the global warming countermeasures while encouraging people to change their lifestyles towards the ones appropriate for a low-carbon society, and establishing the benefits of such changes.

For the sake of this purpose, actions on Cool BIZ, Warm BIZ, carbon offset mechanism, eco-driving, and car sharing will be promoted.

i) Technology Development for Global Warming Countermeasures

Developing and verifying technologies for global warming countermeasures are initiatives to realize the future reduction of a large amount of greenhouse gas emissions by promoting the expansion of greenhouse gas emission reductions and the decrease of reduction costs and thereby widely diffusing them in society.

The Government will therefore promote the technological development and verification in order to realize the lower cost, higher efficiency and longer life etc. of renewable energy etc. and energy conservation.

Table 3 Progress in achievement of the quantified economy-wide emission reduction target: information on mitigation actions and their effects

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief Description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)
									2020
Emissions Reduction of Energy-Originated CO_2									Note 1
Development of Low-Carbon Urban/Regional Structures and Socioeconomic Systems									
Promotion of Global Warming Countermeasures Based on the Action Plan of Each Local Government	Cross-Sectoral	CO2, CH4, N2O, HFCs, PFCs, SF6	Support development of low-carbon communities which is coordinated with local city plans and led by local governments	Law/Standard Budget/Subsidy Awareness Raising	Implemented	Local governments will formulate and implement the local action plans based on the Act on Promotion of Global Warming Countermeasures (come in effect since 1998) which are expected to be coordinated with local city plans. The Government will provide guidelines for developing plans as well as support implementing actions based on their plans.	2008	MOE	-
Promotion of Developing Low-Carbon Community	Cross-Sectoral	CO2	Encourage low-carbonization of communities through concentrating city functions and low-carbonization of transport systems	Law/Standard Taxation Budget/Subsidy	Implemented	The Government will facilitate the formulation of low carbon city plans led by the local government based on "Low Carbon City Act (come in effect since December 2010)" as well as facilitate actions to integrate various urban functions, to promote the use of public transportation, to enhance efficiency of energy use, to preserve urban green areas, and to promote urban greening, based on the plans.	2012	MLIT, METI, MOE	-
Holistic and Efficient Use of Energy	Energy	CO2	Support the installation of, and promote the diffusion and extended usage of, innovative and cutting-edge system which utilizes area-wide energy use at block and district.	Budget/Subsidy Awareness Raising	Implemented	The Government will provide support to develop facilities which contribute to area-wide energy use with utilization possibility, innovativeness and leadership in multiple districts on the project areas.	2008	MLIT, METI	-
Industry Sector									
Promotion and Reinforcement of Voluntary Action Plans of Industry	Energy Industry/Industrial Processes	CO2	Reduce CO2 emissions from the industry, commercial, transport, and energy conversion sector by promoting voluntary and active activities of business operators to actively implement environmentally-friendly business actions on a voluntary basis with respect to the environment conservation.	Voluntary Agreement	Implemented	In industry sector, each industry group formulates and implements GHG emissions reduction plan (the Commitment to a Low Carbon Society) including 2020 emissions reduction target with an assumption of maximum use of world most-advanced low-carbon technologies (best available technologies, BAT). And the government will strictly assess and verify such initiatives.	Since 1997 (Depends on a group)	METI MOE Industry Group Related Ministries and Agencies (for Assessment and Verification)	NE
Promotion of Introduction of Highly Energy-efficient Equipment and Devices	Energy	CO2	Reduce CO2 emissions from energy consumption in the manufacturing sector by promoting the diffusion of energy-saving equipment in the sector.	Budget/Subsidy Financing	Implemented	On the top of the introduction of various energy-efficient equipment and devices based on the Commitment to a Low Carbon Society, the Government will implement supporting programs to promote the diffusion of low-carbon industrial furnaces which lead to massive improvement of energy efficiency compared to conventional equipment and devices.	2008	METI	NE
	Energy	CO2	Reduce CO2 emissions from energy consumption by construction work by promoting the diffusion of low-fuel or low-carbon construction machinery.	Budget/Subsidy Financing Other	Implemented	The Government will certify, and support the introduction of, construction machinery which passes the given criteria of fuel efficiency and the machinery using leading technologies such as hybrid or electrically geared system.	2010	MLIT	NE
	Energy	CO2	Reduce CO2 emissions associated with energy consumption in agriculture and fishery sector by diffusing energy saving facilities/devices in greenhouse horticulture, appliances for agriculture, and fishing vessels.	Budget/Subsidy Awareness Raising Technology Development	Implemented	The Government will support the introduction of, and develop further technologies of, heat pump units to greenhouse horticulture, appliances for agriculture such as heating equipment using woody biomass, high-speed pudding machines, energy-efficient outboard motors for fishing vessels, and fish-luring lights using LED etc.	2007	MAFF	NE

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief Description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)
									2020
Commercial and others									
Improving the Energy Efficiency of Equipment and Devices based on the Top Runner Program	Energy	CO2	Improve energy consumption when devices are used, through the continuous improvements in device quality by the Top Runner standard. (Devices currently subject to the program: industrial air conditioners, industrial electronic refrigerators, industrial electronic freezers, energy converters, multi-functional printers and electric water heaters)	Law/Standard Budget/Subsidy	Implemented	The Government will continue to reconsider about target devices for the Top Runner Programme that requires manufacturers and importers of products to meet criteria which is in line with standards for currently most-advanced devices and assumed technological advances in about 3 to 10 years. (LED light bulbs and other devices are already added on the list in 2013.) At the same time, consideration will be carried out in order to revise the standards on devices which reaches their target year.	1998	METI	NE
Improvement of the Energy Efficiency Performance and Low-Carbonization of Buildings	Energy	CO2	Reduce CO2 emissions from energy consumption in buildings by promoting their energy saving through "regulations," "assessment and display" and "providing incentives."	Law/Standard Budget/Subsidy Other	Implemented	Regarding newly constructed buildings, the Government will implement support to raise public awareness to encourage diffusion of the revised energy conservation standard. The Government will make it mandatory in stages to comply with energy conservation standards for newly constructed buildings by 2020. To promote further improvement of energy efficiency, the Government will promote diffusion of low carbon buildings with a higher energy-efficiency, and provide support for implementing pilot projects which can realize low CO2 emissions. The Top-Runner Program was introduced on construction materials, and thermal insulation material was added. And regarding existing buildings, the Government will persue retrofits to improve energy efficiency, improvement of the use of equipment and devices, provision of consultation on potential capacity of GHG emissions reduction, promoted use of data of energy consumption and so on in order to improve the energy efficiency of the entire building stocks. Also the Government will discuss multilateral measures which are expected to be in need in the future specifically for replacing equipment with high-performed one. The Government will encourage the enhancement and diffusion of objective and clarified system for verifying and labelling of comprehensive environmental performances.	2003 (When the reporting period of energy-saving performance started, based on the Energy Saving Law)	MLIT, METI, MOE	NE
Smart Consumption of Energy by Using Energy Management etc.	Energy	CO2	Support the introduction of Energy Management Systems such as BEMS, HEMS and MEMS in order to promote wider diffusion of those systems.	Taxation Budget/Subsidy Other	Implemented	The Government will promote the introduction of smart-meter as infrastructure and install them in all households and plants in the early 2020s. At the same time, the Government will promote the introduction of Energy Management Systems (HEMS, BEMS, etc.) and the utilization of energy consumption data with the aim of optimizing energy consumption. Efficient energy management system will be introduced such as 'demand response', which adjusts energy demand in response to the energy supply condition. Also, the Government will support the introduction of technologies etc. for CO2 emissions reduction when developing social system such as water supply, sewage system, waste management and ICT.	1998 (Supporting programmes for business operators to enhance energy efficiency etc.)	METI, MOE, MIC, Related Ministries and Agencies	NE
Initiatives by Public Organizations	Energy	CO2	Implement necessary actions to achieve targets based on the commitment plans of each ministry and agency in accordance with the national commitment plan. In order to spur demands for products that contribute to greenhouse gas emissions reduction and other eco-friendly goods and services, the Government and independent administrative agencies etc. will promote the conversion of demand and they will make environmentally-conscious contracts which will contribute to GHG emissions reduction.	Law/Standard	Implemented	The Government will reduce greenhouse gas emissions with regard to its own administration and undertakings at a level which is equivalent or superior to initiatives in the current national commitment plan, even during the period before the new national commitment plan is formulated in line with the new plan for global warming prevention. The Government and independent administrative agencies etc. will take the initiative in procuring such goods and services that contribute to GHG emissions reduction as well as will make environmentally-conscious contracts which will contribute to GHG emissions reduction, mainly in six areas (namely supply of electricity, automobiles, vessels, ESCO, buildings, and industrial waste).	2001	All Ministries and Agencies	NE

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief Description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)
									2020
Residential Sector									
Improving the Energy Efficiency of Equipment and Devices based on the Top Runner Program [reprinted]	Energy	CO2	Improve energy consumption when devices are used, through the continuous improvements in device quality by the Top Runner standard. (Devices currently subject to the program: industrial air conditioners, industrial electronic refrigerators, industrial electronic freezers, energy converters, multi-functional printers and electric water heaters)	Law/Standard Budget/Subsidy	Implemented	The Government will continue to reconsider about target devices for the Top Runner Programme that requires manufacturers and importers of products to meet criteria which is in line with standards for currently most-advanced devices and assumed technological advances in about 3 to 10 years. (LED light bulbs and other devices are already added on the list in 2013.) At the same time, consideration will be carried out in order to revise the standards on devices which reaches their target year.	1998	METI	NE
Improvement of the Energy Efficiency Performance and Low-Carbonization of Housing	Energy	CO2	Reduce CO2 emissions from energy consumption in houses by promoting energy saving in housing through "regulations," "assessment and display" and "providing incentives."	Law/Standard Taxation Budget/Subsidy Financing Technology Development Awareness Raising Other	Implemented	Regarding newly constructed houses, the Government will implement support to raise public awareness to encourage diffusion of the revised energy saving standard. The Government will make it mandatory in stages to comply with energy conservation standards for newly constructed houses by 2020. In order to develop an enabling environment for such measures, the Government will support the improvement of the energy-saving design and construction techniques of small- and medium-sized builders and carpenters who are the main player for house supply, as well as the arrangement of evaluation system of energy saving performance. To promote diffusion of low carbon houses with a higher energy-efficiency, and for implementing pilot projects which will lead to low CO2 emissions. The Top-Runner Program was introduced on construction materials, and thermal insulation material was added. And regarding existing houses, the Government will persue retrofits to improve energy efficiency, improvement of the use of equipment and devices, provision of consultation on potential capacity of GHG emissions reduction, promoted use of data of energy consumption and so on in order to improve the energy efficiency of the entire house stocks. Also the Government will discuss multilateral measures which are expected to be in need in the future specifically for replacing equipment with high-performed one. The Government will encourage the enhancement and diffusion of objective and clarified system for verifying and labelling of comprehensive environmental performances.	2003 (When the reporting period of energy-saving performance started, based on the Energy Saving Law)	MLIT, METI, MOE	NE
Promotion of Combined Heat and Power and Household Fuel Cells	Energy	CO2	Reduce CO2 emissions from energy consumption in houses by promoting the introduction of combined heat and power such as fuel cells for household use.	Budget/Subsidy Technology Development	Implemented	Since simultaneous generation and use of electricity and heat enables effective consumption of energy, the Government promotes the diffusion of combined heat and power such as household fuel cells.	2009	METI	NE
Other Supportive Measures	Energy	CO2	Promote innovative changes towards low-carbon lifestyle by providing information, “visualization” of CO2 emissions as well as promoting low-carbon activities.	Budget	Implemented	The Government will work on the “visualization” of CO2 emissions by various product type by displaying information on emissions and other items during the product’s life cycle. Moreover, the Government will work to promote innovative changes towards low-carbon lifestyle through the introduction of Home Energy Management Systems (HEMS), which operates lighting, air conditioners and other devices to optimally adjust to interior conditions, promotion of the use of HEMS data, and promotion of “Home CO2 advisor service".	2010	MOE, METI	NE

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief Description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)
									2020
Transport Sector									
Improvement in the Fuel Efficiency of Vehicles and Diffusion of Them (Measures for each vehicle as a unit)	Transport	CO2	Reduce CO2 emissions from energy consumption in the transport sector by supporting the introduction of highly energy-efficient next-generation automobiles (hybrid vehicles (HEV), plug-in hybrid vehicles (PHEV), fuel-cell vehicles (FCV), clean diesel vehicles (CDV) and promoting the extensive diffusion of those automobiles, while continuing to improve the performance of vehicles according to fuel efficiency standards.	Law/Standard Taxation Budget/Subsidy Technology Development	Implemented	For electric vehicles, the Government will promote the development of recharging infrastructure, support the purchase of vehicles to create mass production effects and to promote price reduction, and also support research and development to extend a cruising range and reduce the production costs. In order to enable the release of fuel-cell vehicles to the market in 2015, the Government will review regulations on fuel-cell vehicles and hydrogen infrastructure and support the introduction of hydrogen stations. And the Government will promote further improvement of performance of automobiles through fuel efficiency standards (as the "Top Runner Standard") and take preferential tax treatment measures targeted at gasoline-based vehicles in accordance with their fuel efficiency.	1979 (When the Fuel Efficiency Standards were determined based on the Energy Saving Law)	MLIT, METI	NE
Promotion of Traffic Flow Management/Promotion of the Environmentally-friendly Usages of Vehicles	Transport	CO2	Reduce CO2 emissions from energy consumption in the transport sector through the following measures: improving the main traffic network using loop roads, and promoting the development of Intelligent Transport Systems (ITS) and roads for bike.	Budget/Subsidy Awareness Raising	Implemented	The Government will improve the main traffic network using loop roads which iseffective to reduce CO2 emissions and will provide information which is effective for drivers to select the best routes to their destinations, such as information on traffic congestions, by utilizing Intelligent Transport System (ITS) spots set on highways. The Government will also rearrange the traffic environment for bike users.	2012 (Priority Plan for Social Infrastructure Development)	MLIT	NE
Promotion of the Use of Public Transports	Transport	CO2	Reduce CO2 emissions from energy consumption in the transport sector by improving the service and convenience of trains and buses as well as promoting eco-commuting.	Taxation Budget/Subsidy Awareness Raising	Implemented	The Government will reconstruct the public transport networks in communities and improve their convenience by installing BRT and LRT, developing new line railroad, installing transport connection information system and location system for buses etc.	1992	MLIT	NE
Promoting Low-Carbonization of Railway, Vessel and Aviation)	Transport	CO2	Reduce CO2 emissions from energy consumption in the transport sector by promoting the development and introduction of energy-efficient railways, vessels and aircraft.	Taxation Budget/Subsidy Financing Technology Development	Implemented	The Eco-Rail Line project, which will implement the introduction of highly energy efficient vehicles and renewable energy to railway facilities etc. will be promoted. Manufacturing of "super-eco ships" and alternation to the manufacturing of vessels with energy-efficient equipment will be promoted. The Government will promote efficient operating method for aircrafts and low-carbonization of airport facilities including increased use of ground power unit (GPU) etc.	2005	MLIT	NE
More Efficient Logistics/Modal shifts etc.	Transport	CO2	Reduce CO2 emissions from energy consumption in the transport sector by improving the efficiency of truck transport and promoting modal shifts to trains and coastal shipping.	Taxation Budget/Subsidy Financing Awareness Raising	Implemented	The Government will improve the efficiency of truck transport by encouraging the use of larger trucks such as large CNG trucks and promoting cooperative transport and delivery by logistics operators etc. within regions. Introduction of large containers (over 31ft), which is efficient to promote phasing out from larger trucks use and promotion of the "Eco-Rail Mark" etc. will be promoted to achieve the modal shift to rail freight transport and introduction of trucks with separable trailers and promotion of the "Eco-Ship Mark" etc. will be promoted to achieve the modal shift to coastal shipping. The Government will aim at further reduction of environmental load by strengthening a partnership between owners of goods and operators of logistics.	2001	MLIT, MOE, METI	NE

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief Description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)
									2020
Energy Conversion Sector									
Promotion of Power from Renewable Energy Sources	Energy	CO2	Reduce CO2 emissions from energy supply by promoting the thorough use of renewable energies such as onshore/offshore wind power, solar power, small-scale hydro power, geothermal power and biomass.	Law Budget/Subsidy Taxation Technology Development	Implemented	The Government will steadily and stably operate feed-in-tariff scheme on renewable energies. In terms of wind power generation, the Government will promote its introduction by regulatory and institutional reform including the streamlining the procedure of environmental impact assessment and rationalization of safety regulations urgent introduction of large storage batteries for the power system, creating a condition for early strengthening of Hokkaido-Honshu Electric Power Interconnection Facility, and the rearrangement and operation tests for the power grid. For the promotion of geothermal power generation, the Government will work on the regulatory and institutional reform including streamlining the procedure of environmental impact assessment and rationalization of the safety regulations to enhance the use of small-scale geothermal power generation using the existing wells at hot springs, and promote understanding of people in the local level. For biomass energy, the Government will focus on the promotion of industrialization and introduction of biomass energy by establishing the framework to promote actions aiming at developing the primary sector with using the renewable energy and achieving the use of local biomass energy in approximately 100 regions in 5 years. The Government will support arrangement of infrastructure and conduct technological demonstration etc. for the energy use of urban biomass use such as sewage sludge. The government aims to overcome technical challenges of offshore floating wind power generation, establish evaluation methods for safety, reliability and economic aspect and environmental assessment method through demonstration projects by 2015. At the same time, the government will achieve commercialization by around 2018 while promoting establishment of international standards.	n/a	METI MOE Related Ministries and Agencies	NE
More Efficient Thermal Power Generation	Energy	CO2	Advance introduction of highly efficient thermal power generation (coal/LNG) with environmental considerations, and make efforts to improve power generation efficiency further by advancing technology development with regard to the clarified and accelerated environmental assessment agreed by the Ministry of the Environment and the Ministry of Economy, Trade and Industry.	Law/Standard Budget/Subsidy Technology Development	Implemented	The Government will promote development of framework for managing CO2 emissions with participation of the whole stakeholders of power generation, which should be consistent with the national GHG emissions reduction target based on the review of energy policies and energy-mix. And environmental assessments will be implemented with the focus of applying most-advanced technologies of electricity generations etc. which have already been commercialized and under operation. Speeding-up the process of environmental assessment on replacements and introduction/expansion of thermal power plants will also be promoted. The Government will promote technology development of the Advanced Ultra-Supercritical pressure steam power plants, the Integrated Coal Gasification Fuel Cell Combined Cycle (IGFC) , and LNG gas turbines of 1700°C, which aims at commercialization of the technologies. Concerning carbon dioxide capture and storage (CCS), the Government will accelerate technological development for practical use around 2020s and conduct survey on potential CO2 storage sites for CCS precondition in order to obtain outcomes at an early date. Also the Government will consider the possibility of coal thermal power plants being equipped with CCS by 2030 on the precondition of commercialization, make it clear what to expect on CCS Ready along with considerations about the progress of survey on the sites and commercialization, and consider the possibility of the introduction of CCS Ready as early as possible.	n/a	METI, MOE	NE

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief Description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)	
									2020	
Emissions Reduction of Non Energy-originated CO2									10000	
Increased Use of Blended Cement	Industry/Industrial Processes	CO2	Reduce CO2 emissions in the cement production process by reducing the production volume of clinker through increased production proportion and expanded use of blended cement, which is made by mixing blast-furnace slag with clinker, an intermediate cement product.	Law/Standard Awareness Raising	Implemented	Based on the Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Green Purchasing Law), the Government will encourage the use of blended cement in public construction. Buildings using blended cement will be certificated as low-carbon buildings based on the "Low Carbon City Act".	Year 2001 (Based on the Green Purchasing Law, blended cement is designated as the eco-friendly goods.)	MOE, METI	660	
Promotion of Waste Reduction and Recycling	Waste Management/Waste	CO2	Reduce CO2 emissions from waste incineration by promoting the waste reduction and recycling.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	The Governmenet will promote 3 Rs initatives for achieving the targets set out in the "Basic Plan for Establishing a Recycling-Based Society", formulated in accordance with the "Basic Act on Establishing a Sound Material-Cycle Society" (Basic Recycling Law) as well as the waste reduction targets set out in the "Waste Management and Public Cleansing Law" in line with the target set in Basic Recycling Law. Specifically, the Government will promote waste reduction and recycling by thorough waste sorting and collection as well as imposition of charges for waste collection by municipal governments, actions complying with individual Recycling Laws and actions based on the Guidelines for Controlling Greenhouse Gas Emissions. Also, the amount of incinerated wastes will be reduced by promoting the arrangement of waste disposal facilities which contribute to the realization of 3Rs in line with the waste disposal facilities development plan based on the "Waste Management and Public Cleansing Law".	2013	MOE	200	Note 2
Emissions Reduction of Methane									5000	
Reducing Direct Landfill Disposal of Organic Waste	Waste Management/Waste	CH4	Reduce methane emissions associated with waste landfill, by promoting the reduction of organic waste such as garbage going directly to landfill.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	The Government will promote 3 Rs initiatives for achieving the targets set out in the "Basic Plan for Establishing a Recycling-Based Society", formulated in accordance with the "Basic Act on Establishing a Sound Material-Cycle Society" (Basic Recycling Law) as well as the waste reduction targets set out in the "Waste Management and Public Cleansing Law" in line with the target set in Basic Recycling Law. Specifically, the Government will promote waste reduction and recycling by thorough waste sorting and collection as well as imposition of charges for waste collection by municipal governments, reducing illegal dumping of industrial wastes through more strict waste disposal systems and the development of model disposal operators, and actions complying with individual Recycling Laws and actions based on the Guidelines for Controlling Greenhouse Gas Emissions. At the same time, the Government will reduce the amount of direct landfill of organic waste by promoting the improvement of the systems for waste disposal facilities of municipalities, including through banning the direct disposal to landfill of organic wastes in principle, in accordance with the waste disposal facilities development plan based on the "Waste Management and Public Cleansing Law".	2013	MOE	400	Note 2
Improvement of the Management of Organic Matter and Water	Agriculture	CH4	Reduce methane emissions associated with rice cultivation by promoting the replacement from plowing in rice straw which has relatively higher methane emission intencity with application of compost which has lower emission intencity.	Law/Standard Budget/Subsidy	Implemented	The Government will support the initiatives to enable replacing the conventional approach of plowing in rice straw with application of compost such as installing compost generating facilities and converting agricultural activities into ones which are effective for global warming mitigation. Through the reduction of methane emissions, the Government will contribute to sustainable agricultural production harmonized with the environment.	2007	MAFF	NE	

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief Description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)		
									2020		
Emissions Reduction of Nitrous Oxide									2000		
Upgrading Combustion Technology at Sewage Sludge Incineration Facilities	Waste Management/Waste	N2O	Reduce nitrous oxide from the incineration of sewage sludge by improving the incineration technology of facilities for sewage sludge and converting it into solid fuel.	Taxation Budget/Subsidy Technology Development	Implemented	The Government will support the development of turbo incinerators and will support construction and update of high-temperature incinerators. The Government will also conduct practical research of technologies of solid fuel power generator which uses waste heat, and will provide tax exemption on investing in obtaining facilities for storing solid fuel derived from sewage mire.	2001 (the level of sophistication of combusting sewage sludge at sewage treatment facilitie was standardized)	MLIT	NE		
Upgrading Combustion Technology at General Waste Incineration Facilities	Waste Management/Waste	N2O	Reduce nitrous oxide from waste incineration by promoting more advanced incineration technology for facilities for general waste and the 3Rs for waste products.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	The Government will promote the upgrade of combustion technology at general waste incineration facilities such as implementing consecutive operation of consecutive incinerator. The Government will reduce the amount of waste incineration by promoting the 3Rs initiatives for achieving the targets set out in the "Basic Plan for Establishing a Recycling-Based Society", formulated in accordance with the "Basic Act on Establishing a Sound Material-Cycle Society" (Basic Recycling Law) as well as the waste reduction targets set out in the "Waste Management and Public Cleansing Law" in line with the target set in Basic Recycling Law, and by promoting the arrangement of waste disposal facilities which contribute to the realization of 3Rs in line with the waste disposal facilities development plan based on the "Waste Management and Public Cleansing Law".	2013	MOE	NE		
Appropriation and Reduction of the Amount of Fertilizer Used	Agriculture	N2O	Reduce nitrous oxide emissions associated with the application of fertilizers through the use of lower fertilizer application rates, split-application regimes and slow-release fertilizers.	Law/Standard Budget/Subsidy	Implemented	For nitrous oxide associated with the application of fertilizers, the Government will provide support for fertilization plan revision to reduce amount of fertilizer as well as agricultural activities which are effective for the global warming mitigation. Through the reduction of nitrous oxide, the Government will contribute to sustainable agriculture production harmonized with the environment.	2007	MAFF	NE		
Emissions Reduction of Fluorinated Gases											
Holistic Policies to Reduce the Emissions of Fluorinated Gases	Industry/Industrial Processes	HFCs	Control the emission volume of fluorocarbons by promoting the rational use of fluorocarbons by the person concerned at each stage of the life cycle of fluorocarbons and also by promoting the proper management of fluorocarbons.	Law/Standard Taxation Budget/Subsidy Technology Development Awareness Raising Education Voluntary Agreement	Implemented	According to the Act on Rational Use and Proper Management of Fluorocarbons (June 2013), the Government will work on the following: practically phasing down fluorocarbons by gas suppliers, eliminating fluorocarbons from products and lowering GWP of products by manufacturers of equipment and products, preventing leakage of fluorocarbons from refrigeration and air conditioning equipment for business use during normal operation period by end-users, and enhancing and strengthening regulations on recycling and destruction programs. In addition, the Government will promote the technological development of fluorocarbon-free equipment and support for the introduction of such equipment as well as the promotion of the Voluntary Action Plan in industry.	2001 (Fluorocarbons Recovery and Destruction Law was adopted)	MOE, METI		9,700	Note 3

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief Description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)	
									2020	
Greenhouse Gas Sink Policies										
Forest Sink Strategies	LULUCF	CO2	Maintain and strengthen the CO2 absorption functions of forests through appropriate management of forests such as thinning.	Law/Standard Budget/Subsidy Technology Development Awareness Raising	Implemented	In accordance with "Basic Plan for Forest and Forestry" and "Act on Special Measures concerning Advancement of Implementation of Forest Thinning, etc." (2013), the Government will aim to secure the upper forest absorption level agreed in COP17, 3.5% (average of the period from 2013 to 2020) and contribute to the forest sector in the future. In order to achieve these objectives, the Government will work on the following through a variety of policy approaches: appropriate forest development such as thinning and afforestation, the proper management and preservation of protected and other forests, promoting the use of timber and woody biomass, promoting forest development programs where people participate in, accelerated implementation of initiatives to establish sustainable forest management practices, and promoting measures to diffuse seeds and seedlings that grow well.	2007	MAFF	38,000	Note 4
Measurement for Sink Source in Agricultural Soil	LULUCF	CO2	Improve the carbon storage in both agricultural lands and pasture soils to enhance carbon sink.	Law/Standard Budget/Subsidy Technology Development Awareness Raising	Implemented	It is proven that the carbon storage in Japanese agricultural lands and pasture soils can be increased by continuous usage of organic matter in fertilizers and green manures. By promoting these methods, it contributes to the increased carbon storage in both agricultural lands and pasture soils.	2008	MAFF	NE	
Promotion of Urban Greening	LULUCF	CO2	Promote urban greening to preserve and strengthen their carbon sink capacity.	Law/Standard Budget/Subsidy Technology Development Awareness Raising	Implemented	Actions will be promoted such as park maintenance, greening in roads and bays, and creation of the new greening spaces at buildings. Improvement in report and verification system for the urban greening will also be strategically carried out.	2006	MLIT	NE	

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief Description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)
									2020
Cross-Sectoral Policies									IE
GHG Emissions Accounting, Reporting and Disclosure Program	Cross-Sectoral	CO2, CH4, N2O, HFCs, PFCs, SF6	Make it mandatory for those who exceed more than a certain amount of greenhouse gas emissions to calculate emission volume and report it to the Government. The reported data is collected and published by the Government.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	The Government will further enhance and strengthen a system for accounting, reporting and disclosing greenhouse gas emissions data while steadily operating it in accordance with the Act on Promotion of Global Warming Countermeasures.	2006	MOE, METI	-
Making the Tax System Greener	Cross-Sectoral	CO2	The Government will pursue greening of the entire tax system including energy and vehicle taxes.	Taxation	Implemented	The Government will utilize the tax revenue of "Tax for Climate Change Mitigation", designed to add an extra tax multiplier commensurate with CO2 emission levels from the all fossil fuel combustion and will firmly implement the various policies to curb energy-originated CO2 emissions. Additionally, the Government will also strengthen greener taxation system on vehicle taxes by ensuring the concept of "Reducing taxes for Goods, Increasing taxes for Bads" according to the environmental impact.	n/a	MOE	-
Promotion of Environmentally-conscious business activities	Cross-Sectoral	CO2, CH4, N2O, HFCs, PFCs, SF6	Formulate and publish the guidelines for measures to be taken by business operators in controlling greenhouse gas emissions generating from their business activities.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	The Government will promote voluntary and active actions by business operators to implement environmentally-conscious business activities through the formulation of 'Guidelines for Controlling Greenhouse Gas Emissions' based on the Law for Promotion of Global Warming Countermeasures. In addition, the Government will review the guidelines based on the trends of available cutting-edge technologies in the fields.	2008	MOE, METI, MAFF	-
Greening Finance	Cross-Sectoral	CO2, CH4, N2O, HFCs, PFCs, SF6	Develop support measures to stimulate private investments in greenhouse gas reduction measures by supporting low-carbon projects through investments and promoting the use of lease methods. The Government will promote loans based on environmental responsibility ratings and socially responsible investments (SRI).	Budget/Subsidy Awareness Raising	Implemented	The Government will establish a fund for promoting regional low-carbon investments that invests in low-carbon projects in order to stimulate private investment. To reduce the burdens of a large amount of initial investment costs for households and business operators, the Government will subsidize them when they lease low-carbon equipment. The Government will promote environmental finance by providing interst subsidies and support the principles for financial action towards a sustainable society, etc.	2007	MOE	-
Promoting J-Credit system	Cross-Sectoral	CO2, CH4, N2O, HFCs, PFCs, SF6	Certify greenhouse gas emission reductions and absorptions in Japan.	Budget/Subsidy	Implemented	The Government will operate a system that certifies emission reductions and absorptions in Japan as J-credits, which can be used for various purposes such as achieving the goals of the Commitment to a Low-Carbon Society as well as carbon offsets.	2013	MOE, METI, MAFF	-
Developing Public Campaigns	Cross-Sectoral	CO2, CH4, N2O, HFCs, PFCs, SF6	Foster the understanding of global warming countermeasures and promote the transformation of lifestyle habits into one that are appropriate for a low carbon society as well as the penetration of its effects.	Budget/Subsidy Awareness Raising	Implemented	The Government will enhance public understanding of global warming issues by providing clear information on adverse impacts of global warming. In addition, the Government will aim to transform the current lifestyle of people into the one appropriate for a low carbon society, by promoting "Cool Biz," "Warm Biz," and carbon offsets as well as the diffusion of eco-drive and car sharing.	2005	MOE	-

*1: Targets will be reviewed based on the progress of discussions about forthcoming energy policy and energy mix etc., and emissions reduction effect of energy-originated CO2 through each policy will also be scrutinised.

*2: Estimated figures of mitigation impacts of 'Promotion of Waste Reduction and Recycling' in 'Emissions Reduction of Non Energy-originated CO2' and 'Reducing Direct Landfill Disposal of Organic Waste' in 'Emissions Reduction of Methane' are under scurutiny. Mitigation impacts of other policies for emissions control of non energy-originated CO2, methane and nitrous oxide as well as greenhouse gas sink will also be scruitinised.

*3: Mitigation impact of 'Holistic policies to reduce the emissions of fluorinated gases' is estimated to be 9,700-15,600ktCO2.

*4: Mitigation impact of 'Forest Sink Strategies' is estimated to be more than 38,000ktCO2.

3.1.3 Policies and Measures Based on Kyoto Protocol

3.1.3.1 Formulating International Regulation on CO_2 Emissions from Aviation and Maritime Transport Industries

It is difficult in international transportation industries (including international aviation and maritime transport industries) to decide how to allocate CO_2 emissions allowances to each country since they operate transnationally, thus the industries are excluded from the subjected industries of the Kyoto Protocol and it is currently discussed how to reduce the emissions from the industries by the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO).

In the international aviation industry, some emissions reduction policies have already practiced such as improvement of fuel efficiencies of aircrafts by 2% annually and the emissions reduction target has set as reducing or at least stabilizing CO_2 emissions from the industry after 2020, which was set by ICAO. Meanwhile Japan has also actively been committing into the discussions.

In the international maritime vessel industry, the International Convention for the Prevention of Pollution from Ships was partly amended by IMO in 2011 so that the newly produced ships would be under regulation of fuel efficiency standards and the amendment was based on the proposal from Japan. The Ministry of Land, Infrastructure, Transport and Tourism has strategically suggested promote innovative development of technologies associated with a production of low-emission ships and the practical use of natural gas-fuelled ships parallel with the negotiation over the introduction of the fuel efficiency regulation. The provisional amendments which are expected to be implemented from now onwards will possibly lead to the enhancement of competence of Japan over the international maritime transport industry as well as the significant reduction of CO_2 emissions from the industry.

3.1.3.2 Actions to Minimize Adverse Impacts in Accordance with Article 3, Paragraph 14

Japan has given a priority to the efforts below, taking into consideration that these efforts are important to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention in implementing the commitments under Article 3, paragraph 1 of the Kyoto Protocol.

At the same time, it should be noted that it is difficult to accurately assess specific adverse impacts due to the implementation of response measures and also impossible to evaluate efforts to minimize those adverse impacts since the method of evaluation has not been established internationally.

1. Technical Assistance in the Energy and Environmental Sectors

Based on the Japan's Cooperation Initiative for Clean Energy and Sustainable Growth presented at the 2nd East Asia Summit in January 2007 and the agreement reached at Asian Ministerial Energy Roundtable held in April 2009, we provided the cooperation in human resource development through accepting trainees and dispatching experts in the area of energy conservation and renewable energy to countries in East Asia and Middle East. We also assisted these countries in the establishment and implementation of legal systems for energy conservation and renewable energy. In addition, in joint policy studies among research institutions from Japan and countries like China and India, we compared country policies related to energy conservation that will benefit the host countries' policy making process and also estimated possibilities of energy use reductions of highly energy-consuming industries.

Additionally, technical assistance in the field of energy and environment by Japan has been provided throughout the world, contributing to the sustainable economic growth of developing countries. As cooperation through Japan International Cooperation Agency (JICA), depending on the needs of developing countries, Japan has been providing assistance in human resource development such as dispatching experts and providing training programs in Japan.

2. Assistance to Oil Producing Countries in Diversifying Their Economies

In April 2009, the 3rd Asian Ministerial Energy Roundtable was held in Japan where we requested that regulatory agencies take more coordinated actions to strengthen surveillance on commodity futures trading markets and enhance its transparency for the stabilization of the oil market. Furthermore, parties have agreed to conduct specific projects such as 1) formulation of a demand and supply projection in Asia, 2) sharing of leading projects concerning energy conservation and renewable energy, and 3) provision of training opportunities (e.g., Japan will accept 2000 trainees over 3 years).

3. Development of Carbon Capture and Storage (CCS) Technologies

Recognizing that CCS is an innovative technology that may achieve highly efficient carbon emissions reductions, Japan has been implementing large-scale demonstration projects toward practical use of CCS by 2020, as well as researches and developments on cost reductions and safety improvements. Also, Japan actively exchanged information on CCS technologies with other countries such as the United States of America and European countries.

In terms of institutions regarding the sub-seabed geological storage of CO_2 (offshore CCS), Japan amended the Marine Pollution Prevention Law in 2007 and built up the system of permission by the Minister of the Environment with the point of view of preserving the marine environment. It examined the methods of the potential environmental impact assessment and monitoring technology.

Chapter 4

Projections and the Total Effect of Policies and Measures

4.1 Projection

4.1.1 Overview

Japan's greenhouse gas emission reduction and removal target is a 3.8% emission reduction in 2020 compared to the 2005 level (1,351 million t-CO_2 equivalent). Emission reduction targets and projections in FY2020 for each specific greenhouse gas (GHG), namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6) and nitrogen trifluoride (NF_3), are set as shown below.

4.1.2 Energy-originated CO_2

Energy-originated CO_2 covers more than 90% of Japan's GHG emission. Based on statistics, it could be broken down into 5 sectors: Industry; Commercial and other; Residential; Transport; and Energy conversion. The effects of policies and measures can be observed in each sector as well. Table 4.1 shows emission projection for each sector. This is an indicative level which is estimated to be achievable with the economic growth currently expected and where policies for each sector on energy demand accomplish expected outcomes. It is necessary to note that emission levels shown in Table 4.1 are indicative levels, estimated using emission intensity in FY2012, which is the latest results, because projection on nuclear power plant activities for FY2020 is currently unavailable and emission factor for power generation in FY2020 is unable to be set. The estimation figures may vary depending on future circumstances.

*Estimated indicative targets in each sector are set under the expectation that final energy consumption will be reduced by: -2 million kl (-1.1%) in industry, -5 million kl (-6.5%) in commercial and others, -10 million kl (-17.9%) in residential and -25 million kl (25.8%) in transport sector compared to FY2005 with policies and measures which are considered to be available at this point. These estimated targets will be reviewed based on consideration of energy policies and energy mix.

Table 4.1 Estimated emissions of energy-originated CO_2 in each sector

		Base year (FY2005)	FY2012 (preliminary figures)	Estimated emissions of each sector in FY2020	
		A	-	B	(B-A)/A
		Million t-CO_2	Million t-CO_2	Million t-CO_2 (Note 1)	(Increase rate of each sector compared to base year)
Energy-originated CO_2		1,203	1,207	1,208	+0.4%
	Industry	459	431	484	+5.4%
	Commercial and Other	236	259	263	+11.4%
	Residential	174	203	176	+1.1%
	Transport	254	227	190	-25.2%
	Energy conversion (Note 2)	79	86	95	+20.3%

(Note 1) Because projection on nuclear power plant activities for FY2020 is currently unavailable and emission factor for power generation in FY2020 is unable to be set, these figures were estimated using emission intensity in FY2012, which is the latest result.
(Note 2) Because power supply mix in FY2020 is currently unavailable, the future energy consumption of own use in power plants is unavailable as well. Hence, the energy consumption level for FY2020 is assumed to be the same as in FY2005.

4.1.3 Non-energy-originated CO_2

The target for non-energy-originated CO_2 is set as -12.5% (approximately 70 million t-CO_2) compared to FY2005.

4.1.4 Methane

The target for methane is set as -21.7% (approximately 18 million t-CO_2) compared to FY2005.

4.1.5 Nitrous Oxide

The target for nitrous oxide is set as -8.3% (approximately 22 million t-CO_2) compared to FY2005.

Table 4.2 Estimated emission amount of non-energy-originated CO_2, methane and nitrous oxide

	Base year (FY2005)	Estimated emission amount of each gas in FY2020	
	A	B	(B-A)/A
	Million t-CO_2	Million t-CO_2	Compared to base year
Non-energy-originated CO_2	80	70	-12.5%
Methane	23	18	-21.7%
Nitrous oxide	24	22	-8.3%

(Note) The Global Warming Potentials, based on the IPCC Second Assessment Report, are used.

4.1.6 Fluorinated Gases

Since refrigerants in refrigerators and air-conditioners have shifted from HCFCs, which are ozone depleting substances, to HFCs, it is expected that the emissions of fluorinated gases (HFCs, PFCs, SF_6 and NF_3) will increase. The goal is set as no more than +109.1% (approximately 46 million t-CO_2) emissions compared to CY2005. However, since estimation for some HFCs, PFCs and NF_3 are not available at this point, the estimation of these gases are excluded.

It is necessary to note that the figures may vary depending on future circumstances. Particularly, in regards to HFC refrigerants, due to the enactment of the "Act on Rational Use and Proper Management of Fluorocarbons" in 2013, shifting to non-fluorocarbon and low-GWP refrigerants as well as improving management of refrigerants will be implemented, which will lead to substantial emissions reduction. The result is expected to save 9.7 million to 15.6 million t-CO_2 compared to the case where no additional actions are implemented. After measures of the above-mentioned law are concretized, the figure with additional measures will be reviewed. Thus, the mitigation effect of this law is not reflected in Table 4.3. Instead, the figure is based on the case where no additional actions are implemented.

Table 4.3 Estimated emissions of fluorinated gases and each gas

	Base year (FY2005)	Estimated emissions of fluorinated gases and each gas	
	Million t-CO_2	Million t-CO_2 (Note 1)	Compared to base year
Fluorinated gases	22	46	+109.1%
HFCs	11	41	+272.7%
PFCs	7	3	-57.1%
SF_6	5	2	-60.0%
NF_3 (Note 2)	-	-	-

(Note) The Global Warming Potentials, based on the IPCC Second Assessment Report, are used.
(Note 1) Expected reduction effect by "Law for Partial Amendment to Law Concerning the Recovery and Destruction of Fluorocarbons" in 2013 is not reflected in the table. The figure is planned to be reviewed after measures of the above-mentioned law are concretized.
(Note 2) Emissions of some HFCs, PFCs and NF_3, additional gases for the second commitment period of the Kyoto Protocol as agreed at the COP 17 and other conferences, are not estimated and reflected in this table.

4.1.7 CO_2 Removals by Sinks

With regard to forest carbon sinks, the target was determined that the amount of removals by forest management for the period between 2013FY and 2020FY will be, on average, 3.5% of the total GHG emissions in 1990FY (approximately 44 million t-CO_2), which is the agreed upper limit of removals by forest management for the second commitment period of the Kyoto Protocol. The level of removals will correspond with approximately 2.8% or more of the total GHG emissions in 2005FY (approximately 38 million t-CO_2).

4.1.8 Summary

Estimated emissions of each greenhouse gas in 2020 are as follows.

Table 4.4 Information on greenhouse gas projections under a 'with measures' scenario (CTF Table6(a))

	GHG emissions and removals [b]							GHG emission projections	
	(kt CO_2 eq)							(kt CO_2 eq)	
	Base year (2005)	1990	1995	2000	2005	2010	2011	2020	2030
Sector [d,e]									
Energy	976,252.65	863,418.34	900,625.35	926,880.11	976,252.65	916,799.27	969,774.14	NE	NE
Transport	250,568.51	215,556.95	256,126.99	263,964.14	250,568.51	228,163.05	224,705.75	NE	NE
Industry/industrial processes	73,919.77	130,627.29	121,798.33	94,686.17	73,919.77	65,948.24	67,260.82	NE	NE
Agriculture	26,366.07	31,090.31	29,860.50	27,464.89	26,366.07	25,517.48	25,402.27	NE	NE
Forestry/LULUCF	-88,827.76	-69,532.34	-80,593.70	-85,977.95	-88,827.76	-75,771.61	-75,434.10	NE	NE
Waste management/waste	24,299.70	25,978.36	29,315.17	29,092.22	24,299.70	20,952.60	20,585.38	NE	NE
Other (specify)									
Gas									
CO_2 emissions including net CO_2 from LULUCF	1,193,277.39	1,071,525.74	1,143,035.00	1,165,445.29	1,193,277.39	1,115,286.51	1,165,239.66	NE	NE
CO_2 emissions excluding net CO_2 from LULUCF	1,282,128.45	1,141,137.74	1,223,687.33	1,251,460.72	1,282,128.45	1,191,068.27	1,240,684.47	1,278,000.00	NE
CH_4 emissions including CH_4 from LULUCF	23,024.28	32,139.58	29,908.16	26,141.51	23,024.28	20,744.71	20,304.37	NE	NE
CH_4 emissions excluding CH_4 from LULUCF	23,015.10	32,131.07	29,899.43	26,133.73	23,015.10	20,740.57	20,299.01	18,000.00	NE
N_2O emissions including N_2O from LULUCF	23,960.37	31,633.60	32,696.73	28,950.52	23,960.37	21,999.45	21,629.00	NE	NE
N_2O emissions excluding N_2O from LULUCF	23,946.25	31,562.46	32,646.83	28,920.82	23,946.25	21,993.44	21,623.64	22,000.00	NE
HFCs	10,518.22	17,930.00	20,260.17	18,800.43	10,518.22	18,307.23	20,467.03	41,000.00	NE
PFCs	6,990.73	5,670.00	14,271.14	9,583.35	6,990.73	3,408.71	3,016.35	3,000.00	NE
SF_6	4,807.94	38,240.00	16,961.45	7,188.49	4,807.94	1,862.42	1,637.85	2,000.00	NE
Other (specify)									
Total with LULUCF [f]	1,262,578.93	1,197,138.92	1,257,132.65	1,256,109.59	1,262,578.93	1,181,609.03	1,232,294.26	46,000.00	NE
Total without LULUCF	1,351,406.69	1,266,671.27	1,337,726.35	1,342,087.54	1,351,406.69	1,257,380.64	1,307,728.35	1,364,000.00	NE

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] In accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", at a minimum Parties shall report a 'with measures' scenario, and may report 'without measures' and 'with additional measures' scenarios. If a Party chooses to report 'without measures' and/or 'with additional measures' scenarios they are to use tables 6(b) and/or 6(c), respectively. If a Party does not choose to report 'without measures' or 'with additional measures' scenarios then it should not include tables 6(b) or 6(c) in the biennial report.

[b] Emissions and removals reported in these columns should be as reported in the latest GHG inventory and consistent with the emissions and removals reported in the table on GHG emissions and trends provided in this biennial report. Where the sectoral breakdown differs from that reported in the GHG inventory Parties should explain in their biennial report how the inventory sectors relate to the sectors reported in this table.

[c] 20XX is the reporting due-date year (i.e. 2014 for the first

[d] In accordance with paragraph 34 of the "Guidelines for the preparation of national communications by Parties included in

[e] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture,

[f] Parties may choose to report total emissions with or without LULUCF, as appropriate.

Custom Footnotes

Because projections of CO2, CH4, N2O emissions including from LULUCF for 2020 have not been estimated, the "Total with LULUCF" for 2020 is just only the total amount of HFC, PFC and SF6 emissions.

The emission intensity for FY2012 is used to project energy-originated CO2 in the estimation for "Total without LULUCF" for 2020. Also, the emission reduction impact from measures such as refrigerant management is not reflected in the emissions from the fluorinated gases.

4.2 Estimation Method

4.2.1 Approaches to Projection

4.2.1.1 Target Gases

For future emission estimations, six sorts of gases are covered: carbon dioxide, methane, nitrous oxide, HFCs, PFCs and SF_6.

Emissions for some HFCs, PFCs and NF_3, which are additional gases for the second commitment period of the Kyoto Protocol as agreed at the COP17 and other such conferences, are not estimated and covered.

4.2.1.2 Estimation Method

Taking into account the projections on economic growth rate and population etc., the GHG emissions are calculated based on the estimation method as indicated in 4.2.2 to 4.2.4.

(Reference) Estimation for 2020, as formulated by the Government

		Results				Estimation
Assumption	Unit	1990	2000	2005	2010	2020
Actual GDP	Trillion JPY (at chained 2005 prices)	-	476.72	507.16	510.99	610.6
Nominal GDP	Trillion JPY	-	510.83	505.35	479.20	620.7
Total population	Thousands	123,611	126,926	127,768	128,057	124,100
Private households	Thousands	40,670	46,782	49,063	51,842	53,053

*GDP
Results: Cabinet Office "National Accounts of Japan in FY2011, retroactive estimations (with reference to the figures of FY2005/93SNA)"
Estimation: Cabinet Office "Mid- and Long-Term Estimation about Economic and Fiscal Policy", (submitted to the Council on Economic and Fiscal Policy on 8.8.2013)
Total population
Results: Ministry of Internal Affairs and Communications "Population Census"
Estimation: National Institute of Population and Security Research "Population Projection for Japan (Assumptions of medium-variant fertility and medium-variant mortality)" (January 2012)
Private households
Results: Ministry of Internal Affairs and Communications "Population Census"
Estimations: National Institute of Population and Security Research "Household Projection for Japan (National-Level Estimation)", (January FY2013)

4.2.2 Estimation Method for Energy-originated CO_2 Emissions

Indicative levels have been set as estimated to be achievable with the economic growth currently expected and where policies for each sector on energy demand accomplish expected outcomes. It is necessary to note that emission levels shown in Table 4.1 are indicative levels, estimated using emission intensity in FY2012, which is the latest results, because projection on nuclear power plant activities for FY2020 is currently

unavailable and emission factor for power generation in FY2020 is unable to be set. The estimation figures may vary depending on future circumstances.

Table 4.5 Results and estimated emissions reduction of final energy consumption

Million kL (crude oil equivalent)

Sector	Results		Estimated emissions reduction in FY2020 compared to FY2005 (*)	
	FY2005	FY2012	Amount	Reduction rate (%)
Industry	182	160	-2	-1.1
Commercial and other	77	72	-5	-6.5
Residential	56	53	-10	-17.9
Transport	97	86	-25	-25.8
Total	413	371	-	-

(*) Because power supply mix in FY2020 is currently unavailable, the future energy consumption of own use in power plants is unavailable as well. Hence, the energy consumption level for FY2020 is assumed to be the same as in FY2005.

Reference: Agency for Natural Resources and Energy "FY2012 Energy Supply and Demand Report (Preliminary Report)"

Table 4.6 Energy consumption and emissions of energy-originated CO_2 in FY2012 (preliminary results)

Sectors	Energy consumption (Million kL) [FY2012]	Energy-originated CO_2 emissions (Million t-CO_2) [FY2012]
Industry	160	431
Commercial and other	72	259
Residential	53	203
Transport	86	227
Energy conversion	31	86

Reference: Agency for Natural Resources and Energy "FY2012 Energy Supply and Demand Report (Preliminary Report)", Ministry of the Environment Japan "FY2012 GHG Emissions Data of Japan (Preliminary Data)"

4.2.3 Estimation Method for Non-energy-originated CO_2, CH_4, N_2O and Fluorinated Gases

Based on estimation in the GHG inventory, projected future emissions are set in sectors shown in below.

Table 4.7 Target sectors in future estimation

Gases	Target sectors in estimation
CO_2	Fugitive emissions from fuels
	Industrial processes
	Waste
CH_4	Fuel combustion
	Fugitive emissions from fuels
	Industrial processes
	Agriculture
	Waste
N_2O	Fuel combustion
	Fugitive emissions from fuels
	Industrial process
	Solvent and other product use
	Agriculture
	Waste
Fluorinated gases	Industrial processes

Future emission is calculated based on estimation method of the GHG inventory. Fundamentally, estimation is based on calculation multiplying projected activity data by projected emission factor for each emission source. The projection in FY2012 onwards is estimated based on results from FY1990 to FY2011 in the GHG inventory. Emissions with GHG reduction measures are calculated by subtracting the estimated reductions in the future from estimated emissions without GHG reduction measures.

-Projection on activity data

Activity data projection is set based on government's projections including GDP, circumstances of related national policies as well as projections of related industries. When GHG reduction measures can affect activity data, the activity data will be amended based on strength of each reduction measures.

-Projection on emission factor

For emission sources without reduction measures, the emission factors in FY2011 are used, assuming that level of the technology and emission will remain the same as FY2011. For emission sources with reduction measures, emission factors are adjusted based on strength of each reduction measure from those in FY2011.

4.2.4 Estimation Method for the Amount of Carbon Sink in Forests

The carbon removals by forests are estimated by a process as follows: the figures used for estimation are based on the 2020 target declared in the Basic Plan for Forest and Forestry which was revised in 2011; the net growth of forests is calculated by subtracting the amount of harvesting from the net stock changes of forests; then the net growth of forests is converted into CO_2 equivalent by multiplying a coefficient.

Table 4.8 Estimation of the amount of carbon sink in forests

Headings	Major Assumptions	Notes
Area of Forest	25.1million ha (2020)	Target declared in the Basic Plan for Forest and Forestry
Stock of Forests	5.2billion m^3 (2020)	Target declared in the Basic Plan for Forest and Forestry
Timber Supply	39million m^3 (2020)	Target declared in the Basic Plan for Forest and Forestry

Chapter 5

Vulnerability Assessment, Climate Change Impacts, and Adaptation Measures

This chapter examines current theories on the expected impacts of climate change in Japan. In order to identify the climate change impacts in Japan, we will review the latest Japanese research on climate change and discuss its implications.

5.1 Climate Change Observation and Forecasting in Japan

5.1.1 Historical Observations

Japan's average temperature varies widely from year to year, but over the long term, it has been on an upward trend, rising at a rate of 1.15°C per 100 years, which is higher than the global average of 0.68°C per 100 years[1]. Both the number of extremely hot days with maximum temperature of 35°C and higher and tropical nights with minimum temperatures of 25°C and higher appear to be on the rise. Changes in precipitation are also evident, with the number of days with rainfall of 1mm or more declining while the number of days with rainfall of 100mm or more is on the rise. According to the Automated Meteorological Data Acquisition System (AMeDAS) observations, the frequency of hourly heavy rains of 50mm or more is extremely likely to have increased, although more data needs to be collected before reaching a conclusion whether there is any causal link between the trend and global warming.

5.1.2 Key Projections

If CO_2 concentrations increase in line with Scenarios B1, A1B and A2[2], Japan's average temperature is projected to increase by 2.1 - 4.0°C, which exceeds the global average of 1.8 - 3.4°C. Based on climate change model projections, temperature increases will be larger in Northern Japan, while the number of extremely hot days and tropical nights will increase significantly in Okinawa and Amami, Western Japan, and Eastern Japan. Meanwhile, the number of cold and extremely cold days will decline primarily in Northern Japan. Furthermore, the

[1] IPCC Working Group I (2013)

[2] Climate change projections are based on climate modeling using a number of scenarios of changes in greenhouses gas and aerosol concentrations in the atmosphere. SRES has proposed six scenarios, labeled B1, A1T, B2, A1B, A2, and A1FI, describing future global socioeconomic conditions and associated carbon dioxide emissions and concentration levels. The most commonly used scenarios are B1, A1B, and A2. Scenario A2 has the highest carbon dioxide concentrations in the year 2100, followed by scenarios A1B and B1.

frequency of hourly heavy rains will increase in all regions, while the number of dry days with daily precipitation less than 1mm is expected to increase in almost every region.

Other projections include the following.

- Excluding Hokkaido and parts of the Honshu interior, snowfall and snow depth is expected to decrease.
- Studies indicate that the probability of typhoon strikes will decline but that typhoons with low central pressure will approach Japan more frequently.
- Sea surface temperature in the waters around Japan in expected to increase over the long term.
- Sea levels are expected to rise over the long term. However, it is necessary to consider the periodic variations of the sea level around Japan as uncertainty of the prediction.

5.2 Climate Change Impacts

5.2.1 Water Resources and Water Environment

Due to climate change, some regions are expected to see an increase in the number of days without rain as well as increased occurrences of drought due to decreased snowfall. Except for northern Japan and the central mountainous region, there is a risk that river discharge will decrease, leading to severe drought. In regions where snowmelt water is used, maximum river discharge may fall during the snowmelt period and its peak may occur earlier than usual, thereby leading to the possibility of decreased river discharge when water is most in demand. The impact of climate change on water temperature and water quality and their interaction is very complex. In rivers, lakes, and marshes, thus it is hard to predict the occurrence, frequency and intensity of the impacts, water quality may deteriorate due to less water vertical circulation and the increase in phytoplankton caused by rising water temperatures in lakes and marshes. In outlying islands, there is also a possibility that the rise in sea level could lead to increased salt water intrusion into the groundwater.

5.2.2 Coastal Areas and Flooding

In addition to the increase in drought risk, the risk of disaster due to heavy rain could also increase. One study of class A rivers throughout the country projects the probability of floods exceeding the rivers' prescribed target flood safety levels to be 1.8 to 4.4 times the current value. In addition, there is a possibility that the risk of mass movement in mountainous areas will also increase. Some slopes in hilly and mountainous areas have experienced considerably large deep-seated landslides, which are landslides in which the underlying bedrock collapses along with the topsoil, and the risk of these landslides may increase.

There is a large area of land at 0m above sea level along Japan's three major bays (Tokyo Bay, Ise Bay and Osaka Bay), but assuming a sea level rise of 60cm, the area of land at 0m above sea level and the population in those zones would both increase by as much as 50%; therefore, future sea level rise has the potential to cause serious problems. Furthermore, changes in the course and intensity of typhoons could lead to an increased risk of high waves in coastal areas along the Pacific Ocean.

5.2.3 Natural Ecosystems

The impacts which are likely caused by climate change on flora are already evident. Changes in vegetation, distributional and population changes of certain wild mammal and bird species, the northerly expansion of some insects, coral bleaching and changes in animal herds have all been confirmed. In the future, these impacts are expected to continue expanding.

In recent years, damage to crops by wild boar (*Sus scrofa*), Sika deer (*Cervus Nippon*) and other animals has spread, and the potential impact of the Sika deer feeding damage on trees and forest ecosystems has also been pointed out. The distributions of habitats of wild boar and Sika deer appear to be expanding, and possible causes for this include an increase of abandoned farmland, a declining number of hunters, changes in snow conditions due to rising temperatures, reduced amounts of snowfall and shortened periods of snow cover. Aside from mammals, northerly expansion and widened distributions have been observed and reported for Great Mormon butterflies, Indian Fritillary butterflies and *Ictinogomphus pertina* dragonflies. As for flora, researchers have found that the elevation where Maries' firs can grow is gradually getting higher and that the distribution of broad-leaved evergreens like the Japanese evergreen oak is expanding.

It is thought that the distribution range of coral along Japan's coasts will be affected by rising sea temperatures and acidification Projections show that while the areas with water temperatures suitable for coral distribution will advance northward, they will be encroached upon by zones of increased bleaching and zones unfit for coral skeleton formation. For this reason, the waters along Japan's coasts that are suited for the distribution of tropical and subtropical coral are projected to shrink by half by 2020-2030 and to disappear by 2030-2040.

Furthermore, Cherry blossoms have been flowering earlier in the year, while Acer leaves have been changing color later. Meanwhile, animals are being seen and heard earlier. For example, the first warbler's call is being heard earlier in the year, which shows that climate change is causing shifts in the natural phenomena that have traditionally heralded the seasons in Japan.

5.2.4 Food Production

Researchers already know that the temperature after heading has a significant impact on the quality of wet rice. In the record heat of 2010, many regions experienced average temperatures of

28–29°C during the ripening period, and there were many occurrences of white immature grains with partly milky-white kernels. In every region except Hokkaido, the quality of rice deteriorated remarkably. In a rice cultivation experiment conducted with CO_2 levels set at 200ppm higher than current levels, rice yields increased, but a large ratio of white immature kernels were produced. This marked the first time that elevated CO_2 levels were shown to exacerbate high temperature damage.

The southern green stink bug is a pest that lives on rice, wheat and soybean plants, and its distribution in the 1960s was limited to warm areas along the Pacific Ocean in southwestern Japan. Now, however, it has spread to western Japan and parts of eastern Japan. Stink bugs live in regions where the average temperature in January is 5°C or higher, and there are reports that their range is expanding northward as temperatures rise.

Over the long term, sea surface temperature in the waters around Japan have been increasing, and the high rate of increase in the central Sea of Japan (1.72°C per 100 years) has impacted fisheries resources. Spanish mackerel (a species of mackerel found in warm seas) have been caught primarily in the Seto Inland Sea and the East China Sea, but since the late 1990s, the summer to autumn water temperature of the Sea of Japan has increased, so the catch volume from the Sea of Japan has surged. Since 2006, catches landed along the coast of Wakasa Bay in Fukui and Kyoto prefectures now account for most of Japan's Spanish mackerel catch volume. On the other hand, the distribution of Japanese common squid that hatch in an area between the southwestern Sea of Japan and the East China Sea from September to December and move north as they grow (i.e., the autumn spawning group), has shifted northward due to the rise in the water temperature of the Sea of Japan, which now makes it difficult for fishing grounds to form along the Honshu coast from summer to autumn when water temperatures are high. As a result, there are some areas were catches have declined dramatically since the late 1990s.

5.2.5 Health Risks

The distribution of the tiger mosquito, potential vector of dengue fever, is almost the same as the area where the annual average temperature is 11°C or higher. Since 1950, this range has been gradually expanding northward into the Tohoku region. In a study aimed at projecting the future distribution of the tiger mosquito, the suitable habitat is projected to reach the northern tip of Honshu by 2035 (figure on left, shown in red) and expand into Hokkaido by 2100. The expansion of the tiger mosquito's distribution itself does not directly lead to the transmission of dengue fever, but it indicates that the size of the area where there is a potential risk of dengue fever pandemic is expanding.

Heat stroke is a direct effect of heat and is thought to be strongly correlated with climate change. The number of annual deaths from heat stroke since 1995 has been trending upward over time. In 2010, especially, a record heat wave yielded a record number of fatalities. The incidence of heat

stroke tends to increase as maximum daytime temperatures rise. One report indicates that when temperatures exceed 35°C, there is higher incidence of heat stroke among people aged 65 years or older.

5.3 Adaptation to Climate Change

5.3.1 Existing Measures

As described in Section 5.2, we have seen how the impacts of climate change have already started to appear in Japan, along with a range of adaptive measures designed to address the problem of global warming. It is projected, however, that climate change will cause more effects on people's lives in the future.

The primary industry sector is developing a range of measures including monitoring, evaluation and forecasting of environmental impacts, species design and breeding programs for hotter conditions, production technology under high temperatures, and disaster management programs preparing for disasters caused by concentrated heavy rain in mountainous areas. Coastal disaster prevention, meanwhile, is focused on forward-looking measures such as preventing threats posed by rising sea levels and high tides, designing monitoring and forecasting programs, defining the required levels of protection, and assessing disaster risks, along with physical protection in the form of seawalls and coastal planting programs. Flood protection strategies are outlined in the June 2008 report of the Council for Social Infrastructure entitled Climate Change Adaptation Strategies to Cope with Water-related Disasters due to Global Warming (Policy Report), which prompted the introduction of a number of measures such as a formal system for evaluating flood dangers associated with rivers.

Strategies to combat climate change have the benefit of a considerable body of global warming monitoring and forecasting research. The Meteorological Agency introduced the annual Climate Change Monitoring Report in 1996 and issues a Global Warming Forecast every few years. There have also been many monitoring and forecasting studies, particularly in the area of forecasting and evaluating global warming impacts. The Meteorological Agency, together with the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of the Environment, released an opinion statement in 2009 called Climate Change and Its Impacts in Japan discussing warming and the predicted impacts of warming. A second version was released in 2013.

Collaborations among several government ministries and agencies have produced a number of outcomes in terms of adaptation projects, including: short-term strategies to adapt to climate change impacts considered likely to be already present; medium- to long-term strategies (including specific strategies, broad-ranging strategies, and foundation-strengthening strategies) designed to address impacts projected to emerge in 20 or 30 years; the report of the Committee for Investigating the Approach to Adapting to Climate Change, Adapting to Climate Change (released

in November 2010), which sets out a coordinated and consistent approach to strategies for promoting public awareness and dissemination of useful information; and the Climate Change Impacts Statistics Portal, launched in March 2012 to provide a platform for sourcing, analyzing, and publishing existing statistics and data on the impacts of warming.

5.3.2 Future Measures

A coordinated national approach comprising the following three elements is required in order to address climate change impacts that are already in evidence as well as climate change impacts deemed unavoidable in the medium to long term.

1. Climate monitoring;
2. Climate change projections for the future; and
3. Systematic evaluation of projected climate changes impacts.

To this end, the government will formulate an adaptation program that applies to the government as a whole, to be completed by the summer of 2015.

Chapter 5 References

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Chapter 6

Fund Source and Technology Transfer (including the information of Article 10 and 11 of the Kyoto Protocol)

6.1 Finance

In December 2009, Japan announced the assistance of approximately USD 15 billion including public and private financing, of which public finance comprises approximately USD 11 billion, for developing countries up to 2012 to address climate change (hereinafter referred to as the Fast-Start Finance). This Fast-Start Finance aims to assist developing countries, especially those making efforts to reduce GHG emissions as well as those which are vulnerable to the negative impacts of climate change, taking into account the developments in the international negotiations and the state of Japan's reconstruction after the Great East Japan Earthquake, an unprecedented disaster in 2011. Japan has made utmost effort to play its part of the commitment made by developed countries to provide 30 billion to developing countries in three years from 2010 to 2012 as agreed by the Cancun Agreements. Faced with the Great East Japan Earthquake occurred in 2011, Japan was determined to overcome the catastrophe and to continue to faithfully implement the commitment on the Fast-Start Finance to fulfill a positive role in the international community.

Japan's assistance to developing countries is composed of two main types of assistance. One is Official Development Assistance (ODA) such as grant aid, technical assistance, concessional loan and contribution to multilateral funds, which are implemented by relevant ministries and agencies, Japan International Cooperation Agency (JICA) and other institutions. The other includes Other Official Flow (OOF) such as co-financing of the Japan Bank of International Cooperation (JBIC), and private financing catalyzed by the basis of public financing.
Out of approximately USD 15 billion of the Fast-Start Finance announced in December 2009, USD 17.6 billion including public and private financing has been implemented as of December 2012. However, if the Fast-Start Finance is limited to projects or programs based on public financing newly implemented during the period between January 2010 and December 2012, the amount of the implemented assistance would be USD 13.5 billion. Taking into account the discussions at the UNFCCC negotiations, the Fast-Start Finance implemented by Japan from January 2010 onward and composed of public financing is explained more in detail as below.

As for the financial support for the developing countries beyond 2013 to address climate change, in the "Proactive Diplomatic Strategy for Countering Global Warming" made in November 2013, Japan made a financial pledge 1.6 trillion yen to assist developing countries to strengthen "partnership" with various

countries and stakeholders. Japan will also strengthen partnership with developing countries in order to build foundations for promoting diffusion of law carbon technologies. The following are the tangible policies described in the “Proactive Diplomatic Strategy for Countering Global Warming”.

-Mobilizing ODA, other official flows, and private finance, Japan will provide total 1.6 trillion yen (approx. 16 billion dollars) during the 3-year period between 2013 and 2015. (Among them, public finance amounts to 1.3 trillion yen (approx. 13 billion dollars).

-Effective assistance will be provided to small island developing states and other countries vulnerable to the negative impacts of climate change while prioritizing areas in disaster risk reduction. New schemes including stand-by loan for disaster recovery (Stand-by Emergency Credit for Urgent Recovery (SECURE)) and preferential terms for concessional loan will be utilized.

-To take a leadership role in assisting developing countries, Japan will utilize multilateral forums, such as cooperation with other countries for the Third UN World Conference on Disaster Reduction to be held in Japan in 2015.

-To achieve the long-term goal of mobilizing jointly $100 billion per year of both public and private finance by 2020, various public financial instruments will be utilized in encouraging the participation of private companies in the climate change field and significantly increasing the private finance.

-The above-mentioned assistance programs will also contribute to the overseas diffusion of Japan’s highly competitive low-carbon technologies and infrastructure, and will build a win-win relation between Japan and the developing countries.

6.1.1 National Approach to Tracking and Reporting Provision of Support

There are mainly 5 types for Japan’s Fast-Start Finance; i.e. (1) grant aid (2) loan (3) technical assistance (4) contribution to international organizations (5) OOF and others. Ministry of Foreign Affairs, Ministry of Agriculture, Forestry and Fisheries, Ministry of Economy, Trade and Industry, Ministry of the Environment, Ministry of Land, Infrastructure, Transport and Tourism and JICA are implementing agencies of the types (1)-(3). The type of (4) is contributions to the development organizations or multilateral funds such as GEF, CIF, UNDP, UNEP, WFP and ITTO, which are implementing agencies of this type of assistance. Regarding the type (5), relevant Japanese ministries and JBIC are the main implementing agencies. Ministry of Foreign Affairs gathers abovementioned information and compiles the Japanese Fast-Start Finance information.

6.1.2 Meeting Developing Country Needs

As Japan's Fast-Start Finance, 952 projects have been implemented in as many as 114 countries as of December 2012. Through the Japanese Embassies and JICA's overseas offices stationed in a number of developing countries, the Japanese Government has been developing projects of the Fast-Start Finance in close consultation with the government of developing countries and international organizations in response to the needs of recipient countries. Japan has been providing assistance through various channels, including grant aid, concessional loan and technical assistance, taking into account local economic situations and content of projects.

6.1.3 Assistance through Bilateral and Regional Frameworks and Multilateral Channels

6.1.3.1 Overview

The main components of our assistance which amount to USD 13.5 billion as of December 2012 are as follows. It should be noted that Japan's assistance for developing countries accords importance to establishing a mechanism that not only ensures the effective use of public financing, but also facilitates the mobilization of private financing. Large-scale projects on infrastructure, such as the introduction of facilities with high energy efficiency and the construction of electric power transmission facilities, will require massive investment, and thus leveraging the private financing would be crucially important (this is why Japanese private financing of over USD 3 billion had been mobilized for assistance to developing countries, as of December 2012).

-Mitigation: USD 9.99 billion

Assisting developing countries in such areas as promotion of renewable energy including solar energy, wind energy and geothermal, and introduction of facilities with high energy efficiency, to contribute to reducing GHG emissions.

- Projects for introduction of clean energy by solar electricity generation system (24 countries, 130 million)
- Wind power plant projects (Egypt, 338 million)
- Geothermal power plant projects (13 countries and regions including Kenya, Indonesia and Peru, 979 million)
- Electric transmission projects (Olkaria to Kisumu in Kenya: 108 million, Iringa to Shinyanga in Tanzania: 53 million, Habarana to Veyangoda in Sri Lanka: 83 million)

-Adaptation: USD 1.37 billion

Strengthening developing countries' capability to cope with natural disasters caused by climate change, and providing necessary equipment and facilities to take precaution measures against and to recover from natural disasters including floods and droughts.

- Program for the improvement of capabilities to cope with natural disasters caused by climate change (25 countries, 164 million)
- Infrastructure rehabilitation projects for typhoon damage (Philippines, 86 million)
- Project for flood protection and drainage improvement (Cambodia, 30 million)

・Technical assistance on climate change prediction (South Africa: 1. 9 million)
・Capacity building for disaster management in coastal area (Samoa: 6.48 million)
・Rural water supply projects (Ethiopia, Kenya, Djibouti, Sudan, Togo and Malawi: 34 million)
・Desalination project (Tunisia: 8.9 million)

-Mitigation and Adaptation: USD 2.10 billion

Assisting developing countries to tackle climate change issues (both Mitigation and Adaptation) by providing contribution to multilateral fund and program loan to address climate change.

・Contribution to Global Environment Facility (GEF) (96 million)
・Contribution to Climate Investment Funds (CIF) (967 million)
・Climate Change Program Loan (Indonesia and Viet Nam, 410 million)
・Policy dialogue with African countries (in Tokyo, October 2011) and SIDS countries (in Tokyo, July 2012)

-REDD+: USD 723million

Assisting developing countries to conduct survey on forest resources, formulate forest management plan and facilitate forestation by providing necessary equipments in order to promote sustainable use and conservation of forests.

・Forest conservation programs (21 countries, 158 million)
・Contribution to UN-REDD (3.2 million)

Table 6.1 Provision of public financial support: summary information in 2011

Allocation channels	*Year*									
	Japanese yen - JPY					*USD* [b]				
	Core/ general [c]	*Climate-specific* [d]				*Core/ general* [c]	*Climate-specific* [d]			
		Mitigation	*Adaptation*	*Cross-cutting* [e]	*Other* [f]		*Mitigation*	*Adaptation*	*Cross-cutting* [e]	*Other* [f]
Total contributions through multilateral channels:	75,639.89			37,174.70	0.00	657.77			323.28	0.00
Multilateral climate change funds[g]	49,268.97			37,174.70	0.00	428.45			323.28	0.00
Other multilateral climate change funds[h]	37,062.00			37,062.00		322.30			322.30	
Multilateral financial institutions, including regional development banks	16,535.86			NE		143.80			NE	
Specialized United Nations bodies	9,835.06			NE		85.52			NE	
Total contributions through bilateral, regional and other channels		324,094.10	56,446.79	58,521.00			2,818.22	490.86	508.87	
Total	75,639.89	324,094.10	56,446.79	95,695.70	0.00	657.77	2,818.22	490.86	832.15	0.00

Footnotes
The unit of JPY is "million yen" and the unit of USD is "million dollars"
The exchange rate is 115JPY/USD.

Each Party shall provide an indication of what new and additional financial resources they have provided, and clarify how they have determined that such resources are new and additional. Please provide this information in relation to table 7(a) and table 7(b).

Documentation Box:
New and Additional Climate Finance
Japan defines new and additional climate finance as newly committed or disbursed finance which contributes to climate change measures in developing countries.
International assistance for climate change is essential to strengthening momentum for greenhouse gas emission reductions all over the globe, and continues to be a major priority for Japan. Japan seeks new funding from Diet on an annual basis. Our reported climate finance is newly committed or disbursed finance during a given period. In other words, we do not include previously committed or disbursed climate finance.

Table 6.2 Provision of public financial support: summary information in 2012

Allocation channels	*Year*									
	Japanese yen - JPY					*USD* [b]				
	Core/ general [c]	*Climate-specific* [d]				*Core/ general* [c]	*Climate-specific* [d]			
		Mitigation	*Adaptation*	*Cross-cutting* [e]	*Other* [f]		*Mitigation*	*Adaptation*	*Cross-cutting* [e]	*Other* [f]
Total contributions through multilateral channels:	81,024.21			37,229.90	575.00	704.57			323.76	5.00
Multilateral climate change funds[g]	49,899.17			37,229.90	575.00	433.93			323.76	5.00
Other multilateral climate change funds[h]	37,062.00			37,062.00		322.30			322.30	
Multilateral financial institutions, including regional development banks	21,172.91			NE		184.10			NE	
Specialized United Nations bodies	9,952.13			NE		86.54			NE	
Total contributions through bilateral, regional and other channels		371,016.47	46,210.78	15,772.57			3,226.18	401.82	137.14	
Total	81,024.21	371,016.47	46,210.78	53,002.47	575.00	704.57	3,226.18	401.82	460.90	5.00

Footnotes
The unit of JPY is "million yen" and the unit of USD is "million dollars"
The exchange rate is 115JPY/USD.

Each Party shall provide an indication of what new and additional financial resources they have provided, and clarify how they have determined that such resources are new and additional. Please provide this information in relation to table 7(a) and table 7(b).

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International assistance for climate change is essential to strengthening momentum for greenhouse gas emission reductions all over the globe, and continues to be a major priority for Japan. Japan seeks new funding from Diet on an annual basis. Our reported climate finance is newly committed or disbursed finance during a given period. In other words, we do not include previously committed or disbursed climate finance.

6.1.3.2 Multilateral Channels

- Cooperation with international organization

・Support for organizing Adaptation Fund Workshop in Africa, Asia and East Europe (Adaptation)
While the Cancun Agreements adopted at COP16 requested Parties to conduct workshops in each region to inform Parties of the process and requirements of the accreditation of National Implementation Agencies which have a direct access to resources of Adaptation Fund, Japan has provided financial support to hold this workshop in Africa, Asia and East Europe.

・Cooperation with UNDP (Adaptation)

In islands states in Oceania and Caribbean Sea, Japan has been providing, in collaboration with UNDP, technical support for managing natural disaster risk and sharing know-how in adaptation to climate change.

・Cooperation with ITTO (Mitigation/Adaptation)

Japan has supported the implementation of ITTO projects to promote conservation and sustainable management of tropical forests, and proper use of tropical forest resources

・Replenishment to GEF (Mitigation/Adaptation)

Japan made a contribution of US $96 million to the 5th replenishment of the Global Environment Facility (GEF), which is a multilateral financial mechanism to support developing countries' efforts to preserve and improve global environment.

・Contribution to CIF (Mitigation/Adaptation)

Japan also made a contribution of US$ 967 million to Clean Technology Fund, which supports projects for reducing GHG emissions, and to Strategic Climate Fund, which supports measures such as adaptation against the adverse effects of climate change in developing countries.

Table 6.3 Provision of public financial support: contribution through multilateral channels in 2011

Donor funding	*Total amount*				*Status* [b]	*Funding source* [f]	*Financial instrument* [f]	*Type of support* [f, g]	*Sector* [c]
	Core/general [d]		*Climate-specific* [e]						
	Japanese yen - JPY	*USD*	*Japanese yen - JPY*	*USD*					
Total contributions through multilateral channels	75,639.89	657.77	37,174.70	323.28					
Multilateral climate change funds [g]	49,268.97	428.45	37,174.70	323.28					
1. Global Environment Facility	12,094.27	105.17	NE	NE	Committed	ODA	Grant	Cross-cutting	Cross-cutting
2. Least Developed Countries Fund	0.00	0.00	0.00	0.00	Provided				
3. Special Climate Change Fund	0.00	0.00	0.00	0.00	Provided				
4. Adaptation Fund	0.00	0.00	0.00	0.00	Provided				
5. Green Climate Fund	NA	NA	NA	NA	Provided				
6. UNFCCC Trust Fund for Supplementary Activities	112.70	0.98	112.70	0.98	Provided	ODA	Grant	Cross-cutting	Cross-cutting
7. Other multilateral climate change funds	37,062.00	322.30	37,062.00	322.30					
Climate Investment Fund	37,062.00	322.30	37,062.00	322.30	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Multilateral financial institutions, including regional development banks	16,535.86	143.80	NE	NE					
1. World Bank	8,527.70	74.15	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation	747.60	6.50	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
3. African Development Bank	142.40	1.24	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
4. Asian Development Bank	6,601.58	57.41	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
5. European Bank for Reconstruction and Development	30.64	0.27	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	485.94	4.23	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
7. Other									
Specialized United Nations bodies	9,835.06	85.52	NE	NE					
1. United Nations Development Programme	9,254.05	80.47	NE	NE					
Total	9,254.05	80.47	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	581.01	5.05	NE	NE					
Total	581.01	5.05	NE	NE	Provided	Other (ODA, Other)	Grant	Cross-cutting	Cross-cutting
3. Other									

Abbreviations: ODA = official development assistance, OOF = other official flows.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should explain, in their biennial reports, the methodologies used to specify the funds as provided, committed and/or pledged. Parties will provide the information for as many status categories as appropriate in the following order of priority: provided, committed, pledged.

[c] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[d] This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

[e] Parties should explain in their biennial reports how they define funds as being climate-specific.

[f] Please specify.

[g] Cross-cutting type of support refers to funding for activities which are cross-cutting across mitigation and adaptation.

Custom Footnotes

The unit of JPY is "million Yen". The unit of USD is "million dollars"

The exchange rate is 115 JPY/USD.

It is difficult to quantitatively specify the amount of contributions for climate-specific purpose because whether the funds provided to each institutions are used for climate change related sectors or not depends on the judgement of each institution. Therefore, the amount of contribution for "Climate-specific" are reported as "NE".

Table 6.4 Provision of public financial support: contribution through multilateral channels in 2012

Donor funding	*Total amount*				*Status*[b]	*Funding source*[f]	*Financial instrument*[f]	*Type of support*[f, g]	*Sector*[c]
	Core/general[d]		*Climate-specific*[e]						
	Japanese yen - JPY	*USD*	*Japanese yen - JPY*	*USD*					
Total contributions through multilateral channels	81,024.21	704.57	37,804.90	328.76					
Multilateral climate change funds[g]	49,899.17	433.93	37,804.90	328.76					
1. Global Environment Facility	12,094.27	105.17	NE	NE	Committed	ODA	Grant	Cross-cutting	Cross-cutting
2. Least Developed Countries Fund	0.00	0.00	0.00	0.00	Provided				
3. Special Climate Change Fund	0.00	0.00	0.00	0.00	Provided				
4. Adaptation Fund	0.00	0.00	0.00	0.00	Provided				
5. Green Climate Fund	575.00	5.00	575.00	5.00	Provided	ODA	Grant	Other ()	Other (Other)
6. UNFCCC Trust Fund for Supplementary Activities	167.90	1.46	167.90	1.46	Provided	ODA	Grant	Cross-cutting	Cross-cutting
7. Other multilateral climate change funds	37,062.00	322.30	37,062.00	322.30					
Climate Investment Fund	37,062.00	322.30	37,062.00	322.30	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Multilateral financial institutions, including regional development banks	21,172.91	184.10	NE	NE					
1. World Bank	12,331.59	107.23	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation	700.40	6.09	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
3. African Development Bank	372.60	3.24	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
4. Asian Development Bank	6,936.13	60.31	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
5. European Bank for Reconstruction and Development	36.12	0.31	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	796.07	6.92	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
7. Other									
Specialized United Nations bodies	9,952.13	86.54	NE	NE					
1. United Nations Development Programme	9,442.65	82.11	NE	NE					
Total	9,442.65	82.11	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	509.48	4.43	NE	NE					
Total	509.48	4.43	NE	NE	Provided	Other (ODA, Other)	Grant	Cross-cutting	Cross-cutting
3. Other									

Abbreviations: ODA = official development assistance, OOF = other official flows.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should explain, in their biennial reports, the methodologies used to specify the funds as provided, committed and/or pledged. Parties will provide the information for as many status categories as appropriate in the following order of priority: provided, committed, pledged.

[c] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[d] This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

[e] Parties should explain in their biennial reports how they define funds as being climate-specific.

[f] Please specify.

[g] Cross-cutting type of support refers to funding for activities which are cross-cutting across mitigation and adaptation.

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It is difficult to quantitatively specify the amount of contributions for climate-specific purpose because whether the funds provided to each institutions are used for climate change related sectors or not depends on the judgement of each institution. Therefore, the amount of contribution for "Climate-specific" are reported as "NE".

6.1.3.3 Bilateral and Regional Frameworks Channels

- Grant Aid in bilateral cooperation

・Prevention of Disaster and Rehabilitation (Adaptation)

In 25 countries, Japan provided financial support for the rehabilitation and maintenance of disaster prevention equipment, recovery measures against natural disasters and water supply by groundwater development, as measures taken for adaptation to climate change, including large scale typhoon or cyclone.

In Samoa, as a part of measures against climate change and disaster prevention in Oceania, Japan provided financial support to introduce meteorological observing equipment and communication systems in meteorological bureau and international airport. Besides, in Solomon Islands, Japan provided financial support to improve shortwave radio network to broadcast emergency news related to natural disaster all over the country. In Honduras, Japan constructed land slide prevention facilities such as catchment wells, ditches, earth removal and earth fill and also introduced earth slide monitoring, warning and escaping systems in high risk areas.

In Morocco, where a large number of victims are caused by natural disaster once in several years, Japan has been making efforts to introduce observation and warning devices in river basins and technical supports for activities related to evacuation, in order to reduce damages caused by flood. In Bhutan, Japan provided financial support for reconstruction of the bridges which were damaged by cyclone and vulnerable bridges to be easily damaged by heavy rain in the future.

・Water and Sanitation (Adaptation)

Japan repaired the water supply facilities in the areas which have been suffering from drought caused by climate change. For example, in Ethiopia, Japan constructed and repaired the water supply facilities and provided equipments for reconstructing wells in 10 districts where water supply was extremely poor and underwater development was technically and geologically difficult. In addition, in Sudan Japan improved water supply facilities and implemented plans to supply safe water stably with the residents. Moreover, in Togo, Japan supported the construction of 10 water supply facilities with engine pomp as well as constructed 100 water supply facilities with human-powered pomp and repaired 50 facilities.

・Introduction of solar power plant (Mitigation)

In 24 countries, Japan contributed to stabilizing electricity supply in developing countries while contributing to reducing GHG emissions, by introducing solar power equipments in the public spaces such as school, airport, water plant and reservoir and thus replacing a part of consuming electricity with renewable energy. In some projects, Japan also provided necessary technical training to manage, maintain and control equipment.

・Forest Conservation (REDD+)

As a measure to contribute to encouraging REDD+ efforts, Japan provided technical support such as analyzing satellite images and financial support for equipment for monitoring and related capacity building in the following actions; preparing forest distribution map, preventing excessive logging, preventing forest fire and taking actions on ensuring alternative energy to firewood in 21 countries.

- Loan support in bilateral cooperation

・Improvement of energy access through the maintenance of electricity transmission equipment (Mitigation)

Japan has been contributing to reducing GHG emissions by electrification of local areas and the improvement of transmission efficiency, while aiming for a transfer to clean energy. In Kenya, Japan built 140 MW geothermal power plants in Olkaria, and supported Olkaria to Kisumu power transmission construction project to enable renewable energy transmission from Olkaria to Kisumu. In Tanzania, Japan has been improving transmission efficiency by expanding a part of the power transmission from Iringa to Shinyanga, in order to stabilize its electricity supply. In Cameroon, Japan has aimed at enhancement of electric power transmission capacity and dissemination of electricity supply to non-electrificated areas by constructing electric power substations and electrical line as an electric distribution facilities.

・Introduction of wind power plant (Mitigation)

Japan has been constructing 220 MW wind power plant in Gulf of El Zayt, Red Sea coast, Egypt.

・Introduction of highly efficient power-saving facilities (Mitigation)

In Uzbekistan, Japan introduced highly energy-efficient combined cycle gas turbine to aim at stable electric supply, achieving both emission reduction and economic growth.

・Climate Change Program Loan (Mitigation/Adaptation)

Japan’s loan aid is implemented by JICA and one of its characteristic programs is Climate Change Program Loan (CCPL). It helps to develop the multi-year national climate change policy of developing countries, which is called the “policy matrix”, based on policy dialogues and supports the activities of private sector to implement those policies. In the process, Japan flexibly coordinates various ODA instruments such as loan aid or technical cooperation. Japan revises the policy matrix by doing monitoring and evaluation every year, and then considers the second and subsequent phase of program loan.

Japan has already signed CCPL agreements with Indonesia and Vietnam, and is now considering introducing it in other countries.

- Technical Assistance in bilateral cooperation

・Prevention of Disaster and Rehabilitation (Adaptation)

In the Republic of South Africa, Japan provided technical support to enhance the functions of meteorological forecasting system, in order to improve the capability of coping with environmental issues such as climate change. In Mozambique, Japan is making efforts to enhance the adaptation capability to climate change, strengthening the basic capability for taking countermeasures against

coastal erosion. In Fiji, Japan strengthened the disaster prevention capacity in the local communities to enhance system which enables the residents to escape appropriately in case of flood.

・Water and Sanitation (Adaptation)

In Nigeria, Japan is making efforts to improve local water supply through the capacity building of local staff in charge of water supply and sanitation, in order to better cope with the changes of precipitation pattern caused by climate change. In Burkina Faso, Japan provided technical support to develop, demonstrate water supply and sanitation system which was suitable to that area, as well as to help prepare its introduction.

・NAMA (Mitigation)

Japan supported the capacity building to formulate and implement NAMA in Serbia, Asian countries including Vietnam and African countries.

・Improvement of Energy Efficiency (Mitigation)

In Papua New Guinea, Japan conducted a survey on the current electricity demand and supply and its forecast, as well as a survey on the fuel replacement (from light diesel oil to natural gas) for thermal power plant, the introduction of the cogeneration system, the improvement of energy efficiency (such as heat quantity, transmission) and enlargement of electric-generating capacity, and thus assisted efforts of PNG to reduce GHG emissions.

・Promotion of REDD+ efforts (Mitigation/REDD+)

In Brazil, Japan developed a wide-area assessment technology to evaluate carbon dynamics of various forests in Amazon to promote conservation of functions of forests.

Table 6.5 Provision of public financial support: contribution through bilateral, regional and other channels in 2011

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Total contributions through bilateral, regional and other channels	439,061.89	3,817.95						
Afghanistan /	1,425.00	12.39	provided, committed	ODA	Grant	Adaptation	Water and sanitation, Other (Others)	
Africa /	333.00	2.90	provided, committed	ODA	Grant	Mitigation	Cross-cutting	
Albania /	175.00	1.52	provided	ODA	Grant	Cross-cutting	Other (Others)	
Angola /	52.00	0.45	provided	ODA	Grant	Mitigation	Forestry	
Asia /	30.00	0.26	provided	ODA	Grant	Adaptation	Agriculture	
Asia /	418.00	3.63	provided	ODA	Grant	Mitigation	Cross-cutting	
Asia, Africa /	137.00	1.19	provided, committed	ODA	Grant	Mitigation	Forestry	
Asia, Latin America /	270.00	2.35	committed	OOF	Grant	Mitigation	Forestry	
Asia Pacific /	747.00	6.50	committed	ODA	Grant	Mitigation	Energy	
Bangladesh /	15,907.00	138.32	provided, committed	ODA	Other (Concessional Loan, Grant)	Adaptation	Water and sanitation, Other (Others)	
Bangladesh /	81.30	0.71	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy	
Bangladesh, Bhutan, Nepal /	85.00	0.74	provided	ODA	Grant	Mitigation	Cross-cutting	
Benin /	115.00	1.00	committed	ODA	Grant	Adaptation	Other (Others)	
Bhutan /	2,193.00	19.07	provided, committed	ODA	Other (Concessional Loan, Grant)	Mitigation	Energy, Water and sanitation	
Bhutan /	1,019.00	8.86	committed	ODA	Grant	Adaptation	Other (Others)	
Botswana /	6.00	0.05	provided	ODA	Grant	Mitigation	Energy	
Brazil /	37,178.00	323.28	provided, committed	Other (ODA, OOF)	Other (Non-Concessional Loan, Concessional Loan, Grant)	Mitigation	Energy, Water and sanitation, Forestry, Other (Others)	
Cambodia /	3,718.00	32.33	provided, committed	ODA	Grant	Adaptation	Agriculture, Other (Others)	
Cambodia /	129.00	1.13	provided	ODA	Grant	Mitigation	Energy, Forestry	
Cambodia, Indonesia, Laos, Thailand, Viet Nam /	145.00	1.26	provided	ODA	Grant	Adaptation	Agriculture	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Cambodia, Laos, Thailand, Viet Nam /	86.00	0.75	committed	ODA	Grant	Adaptation	Agriculture	
Cameroon /	3,111.00	27.06	provided, committed	ODA	Other (Concessional Loan, Grant)	Mitigation	Energy, Forestry	
Cameroon /	210.00	1.82	provided	ODA	Grant	Adaptation	Agriculture, Forestry	
Central America /	6,900.00	60.00	committed	OOF	Non-Concessional Loan	Mitigation	Energy	
China /	1,663.00	14.46	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy, Other (Others)	
China, Viet Nam /	69.90	0.61	committed	OOF	Grant	Mitigation	Energy	
Colombia /	81.00	0.70	provided, committed	ODA	Grant	Mitigation	Energy, Forestry, Other (Others)	
Côte d'Ivoire /	470.00	4.09	committed	ODA	Grant	Adaptation	Other (Others)	
Developing Countries /	44.44	0.39	provided, committed	ODA	Grant	Adaptation	Agriculture, Other (Others)	
Developing Countries /	113.00	0.99	committed	Other (ODA, OOF)	Grant	Mitigation	Forestry, Cross-cutting, Other (Others)	
Developing Countries /	32.00	0.28	committed	ODA	Grant	Cross-cutting	Forestry	
Djibouti /	489.00	4.25	committed	ODA	Grant	Adaptation	Water and sanitation	
Egypt /	83.00	0.72	provided	ODA	Grant	Mitigation	Energy	
Egypt /	227.00	1.97	provided	ODA	Grant	Adaptation	Water and sanitation	
El Salvador /	28.00	0.24	provided	ODA	Grant	Mitigation	Energy	
Ethiopia /	115.00	1.00	provided	ODA	Grant	Cross-cutting	Forestry, Other (Others)	
Ethiopia /	1,159.00	10.08	committed	ODA	Grant	Adaptation	Other (Others)	
Fiji /	38.00	0.33	provided	ODA	Grant	Cross-cutting	Forestry	
Gabon /	52.00	0.45	provided	ODA	Grant	Mitigation	Forestry	
Ghana /	51.00	0.44	committed	ODA	Grant	Mitigation	Forestry	
Great Rift Valley Area (Djibouti, Ethiopia, Rwanda) /	59.70	0.52	committed	OOF	Grant	Mitigation	Energy	
Guatemala /	27.49	0.24	committed	ODA	Grant	Mitigation	Forestry	
Guyana /	591.00	5.14	committed	ODA	Grant	Adaptation	Other (Others)	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Honduras /	1,098.00	9.55	committed	ODA	Grant	Adaptation	Other (Others)	
India /	24,578.00	213.72	committed	ODA	Concessional Loan	Cross-cutting	Forestry	
India /	164,361.70	1,429.23	provided, committed	Other (ODA, OOF)	Other (Concessional Loan, Grant)	Mitigation	Water and sanitation, Energy, Forestry	
India /	135.00	1.17	provided	ODA	Grant	Adaptation	Water and sanitation	
India, Turkey /	45.30	0.39	committed	OOF	Grant	Mitigation	Energy	
Indochina countries /	50.00	0.43	provided	ODA	Grant	Mitigation	Forestry	
Indonesia /	58,334.25	507.26	provided, committed	Other (ODA, OOF)	Other (Concessional Loan, Grant)	Mitigation	Energy, Forestry, Water and sanitation, Other (Others)	
Indonesia /	5,484.00	47.68	provided, committed	ODA	Other (Concessional Loan, Grant)	Adaptation	Other (Others)	
Indonesia /	8.00	0.07	committed	ODA	Grant	Cross-cutting	Forestry	
Indonesia, Viet Nam /	45.00	0.39	provided	ODA	Grant	Mitigation	Other (Others)	
Jordan /	47.00	0.41	committed	ODA	Grant	Cross-cutting	Water and sanitation	
Jordan /	1,911.00	16.62	committed	ODA	Grant	Adaptation	Water and sanitation	
Kazakhstan /	15.00	0.13	provided	ODA	Grant	Mitigation	Other (Others)	
Kenya /	1,262.00	10.98	provided, committed	ODA	Grant	Adaptation	Water and sanitation, Agriculture, Other (Others)	
Kenya /	44.70	0.39	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy, Forestry	
Kosovo /	674.00	5.86	provided, committed	ODA	Grant	Mitigation	Water and sanitation	
Kyrgyz /	220.00	1.91	provided	ODA	Grant	Mitigation	Other (Others)	
Lao People's Democratic Republic /	4.00	0.03	committed	ODA	Grant	Cross-cutting	Forestry	
Lao People's Democratic Republic /	46.00	0.40	provided	ODA	Grant	Mitigation	Other (Others)	
Latin America /	20,700.00	180.00	committed	OOF	Non-Concessional Loan	Mitigation	Energy	
Latin America, Middle Eastern Europe and Central Asia /	290.00	2.52	provided	ODA	Grant	Mitigation	Cross-cutting	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Lesotho /	297.00	2.58	committed	ODA	Grant	Mitigation	Energy	
Lesotho /	209.30	1.82	committed	ODA	Grant	Adaptation	Other (Others)	
Macedonia /	181.00	1.58	provided	ODA	Grant	Mitigation	Forestry, Other (Others)	
Malawi /	415.00	3.61	provided, committed	ODA	Grant	Adaptation	Agriculture, Water and sanitation	
Malaysia /	214.40	1.86	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy, Water and sanitation, Other (Others)	
Malaysia /	87.00	0.76	provided	ODA	Grant	Adaptation	Other (Others)	
Maldives /	88.10	0.77	committed	OOF	Grant	Mitigation	Energy	
Mexico /	7,014.90	61.00	provided, committed	Other (ODA, OOF)	Other (Grant, Non-Concessional Loan)	Mitigation	Energy	
Moldova /	417.00	3.63	committed	ODA	Grant	Mitigation	Energy	
Mongolia /	199.00	1.72	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy	
Morocco /	702.00	6.11	provided, committed	ODA	Grant	Adaptation	Agriculture, Other (Others)	
Mozambique /	174.00	1.52	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy	
Myanmar /	18.00	0.16	committed	ODA	Grant	Adaptation	Other (Others)	
Nepal /	10.00	0.09	committed	ODA	Grant	Adaptation	Other (Others)	
Niger /	815.00	7.09	committed	ODA	Grant	Adaptation	Other (Others)	
Nigeria /	1,990.00	17.30	committed	ODA	Grant	Mitigation	Energy	
Nigeria /	1,257.00	10.94	provided, committed	ODA	Grant	Adaptation	Agriculture, Water and sanitation, Other (Others)	
Pacific Region /	296.00	2.57	provided	ODA	Grant	Mitigation	Water and sanitation	
Pakistan /	8,782.00	76.37	committed	ODA	Grant	Adaptation	Other (Others)	
Pakistan /	16.00	0.14	provided	ODA	Grant	Cross-cutting	Water and sanitation	
Palestine /	2,650.00	23.04	committed	ODA	Grant	Cross-cutting	Energy, Agriculture	
Papua New Guinea /	104.00	0.90	provided	ODA	Grant	Cross-cutting	Forestry	
Paraguay /	207.00	1.80	provided	ODA	Grant	Adaptation	Water and sanitation	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Peru /	29.00	0.26	committed	ODA	Grant	Mitigation	Forestry	
Philippines /	9,244.00	80.38	committed	ODA	Concessional Loan	Cross-cutting	Forestry	
Philippines /	814.88	7.09	committed	ODA	Grant	Adaptation	Other (Others)	
Philippines /	30.86	0.27	committed	ODA	Grant	Mitigation	Forestry	
Philippines, Peru /	73.17	0.64	committed	ODA	Grant	Adaptation	Other (Others)	
Rwanda /	2,723.00	23.68	provided, committed	ODA	Grant	Mitigation	Energy	
Rwanda /	8.00	0.07	provided	ODA	Grant	Adaptation	Agriculture	
Senegal /	79.00	0.69	provided	ODA	Grant	Mitigation	Water and sanitation	
Serbia /	10.00	0.09	provided	ODA	Grant	Mitigation	Energy	
Seychelles /	189.00	1.64	provided	ODA	Grant	Adaptation	Other (Others)	
Sierra Leone /	115.00	1.00	committed	ODA	Grant	Adaptation	Other (Others)	
Solomon Islands /	504.00	4.38	committed	ODA	Grant	Adaptation	Other (Others)	
Somalia /	2,090.00	18.17	committed	ODA	Grant	Adaptation	Other (Others)	
South Africa /	161.90	1.41	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy	
South Asia /	2,300.00	20.00	committed	OOF	Non-Concessional Loan	Mitigation	Energy	
South Sudan /	99.00	0.86	provided	ODA	Grant	Mitigation	Water and sanitation	
Sri Lanka /	218.80	1.91	provided	ODA	Grant	Mitigation	Energy, Water and sanitation, Other (Others)	
Sudan /	2,051.00	17.83	committed	ODA	Grant	Adaptation	Water and sanitation, Other (Others)	
Sultanate of Oman /	41.00	0.36	provided	ODA	Grant	Cross-cutting	Forestry	
Tanzania /	5,500.00	47.83	committed	ODA	Grant	Mitigation	Energy	
Tanzania /	241.00	2.09	provided	ODA	Grant	Adaptation	Water and sanitation	
Thailand /	2,546.90	22.15	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy, Water and sanitation, Other (Others)	
Thailand /	1,678.00	14.59	provided	ODA	Grant	Adaptation	Other (Others)	
Thailand, Viet Nam /	40.70	0.35	committed	OOF	Grant	Mitigation	Energy	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Togo /	12.78	0.11	committed	ODA	Grant	Mitigation	Forestry	
Turkey /	4,242.00	36.89	provided, committed	ODA	Other (Concessional Loan, Grant)	Cross-cutting	Forestry	
Turkey /	32.00	0.27	provided	ODA	Grant	Mitigation	Energy, Water and sanitation	
Viet Nam /	17,227.00	149.80	committed	ODA	Concessional Loan	Cross-cutting	Cross-cutting, Other (Others)	
Viet Nam /	699.82	6.08	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy, Forestry, Cross-cutting, Other (Others)	
Viet Nam /	215.00	1.87	provided	ODA	Grant	Adaptation	Agriculture, Other (Others)	
Viet Nam, Indonesia, South Africa /	44.60	0.39	committed	OOF	Grant	Mitigation	Energy	
Zambia /	210.00	1.83	provided	ODA	Grant	Adaptation	Water and sanitation	
Zimbabwe /	230.00	2.00	committed	ODA	Grant	Adaptation	Other (Others)	

Abbreviations: ODA = official development assistance, OOF = other official flows; USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should report, to the extent possible, on details contained in this table.

[c] Parties should explain, in their biennial reports, the methodologies used to specify the funds as provided, committed and/or pledged. Parties will provide the information for as many status categories as appropriate

[d] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under “Other”.

[e] Parties should report, as appropriate, on project details and the implementing agency.

[f] Parties should explain in their biennial reports how they define funds as being climate-specific.

[g] Please specify.

[h] Cross-cutting type of support refers to funding for activities which are cross-cutting across mitigation and adaptation.

Custom Footnotes

The unit of JPY is "million Japanese Yen", and the unit of USD is "million US dollars".

The exchange rate is 115JPY/USD.

Table 6.6 Provision of public financial support: contribution through bilateral, regional and other channels in 2012

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Total contributions through bilateral, regional and other channels	432,999.82	3,765.14						
Afghanistan /	37.00	0.32	provided	ODA	Grant	Adaptation	Agriculture	
Africa /	220.00	1.91	provided	ODA	Grant	Mitigation	Cross-cutting	
Angola /	29.00	0.25	provided	ODA	Grant	Adaptation	Agriculture	
Asia /	500.00	4.35	provided	ODA	Grant	Mitigation	Cross-cutting	
Asia, Africa /	122.00	1.06	provided, committed	ODA	Grant	Mitigation	Forestry	
Asia, Latin America /	176.00	1.53	committed	OOF	Grant	Mitigation	Forestry	
Asia, South America /	9.00	0.08	provided	ODA	Grant	Adaptation	Forestry	
Bangladesh /	83.00	0.71	provided	ODA	Grant	Mitigation	Energy	
Bangladesh /	31.00	0.27	provided	ODA	Grant	Adaptation	Water and sanitation	
Benin /	31.00	0.27	committed	ODA	Grant	Mitigation	Forestry	
Benin /	2.00	0.02	committed	ODA	Grant	Cross-cutting	Forestry	
Bhutan /	24.00	0.21	provided	ODA	Grant	Mitigation	Energy	
Bolivia /	11.00	0.10	provided	ODA	Grant	Adaptation	Agriculture	
Bosnia and Herzegovina /	115.00	1.00	committed	OOF	Grant	Mitigation	Energy	
Botswana /	16.00	0.14	provided	ODA	Grant	Cross-cutting	Forestry	
Botswana /	53.00	0.46	provided	ODA	Grant	Mitigation	Energy	
Brazil /	69,046.00	600.40	provided, committed	Other (ODA, OOF)	Other (Non-Concessional Loan, Grant)	Mitigation	Energy	
Brazil /	14.00	0.12	provided	ODA	Grant	Adaptation	Other (Others)	
Burkina Faso /	47.00	0.41	committed	ODA	Grant	Adaptation	Water and sanitation	
Cambodia /	421.00	3.66	provided, committed	ODA	Grant	Mitigation	Energy, Water and sanitation, Forestry	
Cameroon, Central African Republic, Democratic Republic of the Congo /	278.00	2.42	committed	ODA	Grant	Cross-cutting	Forestry	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Cameroon, Central African Republic, Democratic Republic of the Congo, Republic of Congo /	18.00	0.16	committed	ODA	Grant	Cross-cutting	Forestry	
Cape Verde /	6,186.00	53.79	committed	ODA	Concessional Loan	Mitigation	Energy	
China /	47.00	0.41	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy, Other (Others)	
China /	3.00	0.03	provided	ODA	Grant	Cross-cutting	Forestry	
Colombia /	92.00	0.80	provided	ODA	Grant	Mitigation	Energy, Water and sanitation	
Côte d'Ivoire /	20.00	0.17	committed	OOF	Grant	Adaptation	Other (Others)	
Democratic Republic of the Congo /	53.00	0.46	provided	ODA	Grant	Cross-cutting	Forestry	
Developing Countries /	531.40	4.62	committed	ODA	Grant	Mitigation	Energy, Forestry, Agriculture, Other (Others)	
Developing Countries /	16.00	0.14	committed	ODA	Grant	Cross-cutting	Forestry	
Developing Countries /	25.00	0.22	committed	ODA	Grant	Adaptation	Agriculture	
Djibouti /	354.50	3.08	provided, committed	ODA	Grant	Adaptation	Agriculture, Water and sanitation, Other (Others)	
Djibouti,Ethiopia /	130.80	1.14	committed	OOF	Grant	Mitigation	Energy	
Dominican Republic /	205.57	1.79	committed	ODA	Grant	Cross-cutting	Other (Others)	
Ecuador /	48.00	0.42	provided	ODA	Grant	Adaptation	Other (Others)	
Egypt /	135.00	1.17	provided	ODA	Grant	Adaptation	Agriculture	
Ethiopia /	1,690.10	14.70	provided, committed	ODA	Grant	Adaptation	Water and sanitation, Agriculture, Other (Others)	
Fiji /	29.00	0.25	provided	ODA	Grant	Adaptation	Water and sanitation	
Gabon /	52.00	0.45	provided	ODA	Grant	Cross-cutting	Forestry	
Ghana /	46.00	0.40	provided	ODA	Grant	Adaptation	Agriculture	
Ghana /	20.00	0.17	committed	ODA	Grant	Mitigation	Forestry	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Guatemala /	36.00	0.31	committed	ODA	Grant	Cross-cutting	Forestry	
Haiti /	138.00	1.20	committed	ODA	Grant	Adaptation	Water and sanitation, Other (Others)	
Honduras /	25.00	0.22	provided	ODA	Grant	Mitigation	Energy	
Honduras /	9.00	0.08	provided	ODA	Grant	Cross-cutting	Cross-cutting	
India /	6,371.00	55.40	committed	ODA	Concessional Loan	Cross-cutting	Forestry	
India /	212,739.70	1,849.90	provided, committed	Other (ODA, OOF)	Other (Concessional Loan, Grant)	Mitigation	Energy	
India /	11.00	0.10	provided	ODA	Grant	Adaptation	Agriculture, Water and sanitation	
Indochina countries /	45.00	0.39	provided	ODA	Grant	Mitigation	Forestry	
Indonesia /	1,187.86	10.32	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy, Forestry, Other (Others)	
Indonesia /	47.00	0.40	provided, committed	ODA	Grant	Cross-cutting	Forestry, Water and sanitation, Cross-cutting	
Indonesia, Malaysia /	15.00	0.13	committed	OOF	Grant	Mitigation	Other (Others)	
Iraq /	22.00	0.19	provided	ODA	Grant	Mitigation	Water and sanitation	
Iraq /	82.00	0.72	provided	ODA	Grant	Adaptation	Agriculture	
Kazakhstan /	49.87	0.43	committed	OOF	Grant	Mitigation	Energy	
Kenya /	1,905.00	16.56	provided, committed	Other (ODA, OOF)	Grant	Adaptation	Energy, Agriculture, Water and sanitation, Other (Others)	
Kenya /	282.00	2.45	provided	ODA	Grant	Mitigation	Water and sanitation	
Lao People's Democratic Republic /	12.00	0.10	committed	ODA	Grant	Cross-cutting	Forestry	
Lao People's Democratic Republic /	128.00	1.12	provided	ODA	Grant	Mitigation	Energy	
Lao People's Democratic Republic /	19.00	0.17	provided	ODA	Grant	Adaptation	Water and sanitation	
Latin America /	290.00	2.52	provided	ODA	Grant	Mitigation	Cross-cutting	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Madagascar /	375.70	3.27	provided, committed	ODA	Grant	Adaptation	Agriculture, Cross-cutting, Other (Others)	
Malawi /	763.00	6.64	committed	ODA	Grant	Adaptation	Agriculture, Water and sanitation	
Malaysia /	20.00	0.17	committed	ODA	Grant	Cross-cutting	Forestry	
Malaysia /	35.00	0.30	committed	OOF	Grant	Mitigation	Energy	
Maldives /	35.00	0.30	committed	OOF	Grant	Mitigation	Energy	
Mauritius /	275.00	2.39	provided	ODA	Grant	Adaptation	Other (Others)	
Mexico /	56.00	0.49	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy	
Moldova /	75.00	0.65	provided	ODA	Grant	Mitigation	Energy	
Mongolia /	95.00	0.83	provided	ODA	Grant	Cross-cutting	Water and sanitation	
Mongolia /	154.00	1.34	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy	
Morocco /	10,790.00	93.83	committed	ODA	Concessional Loan	Mitigation	Water and sanitation	
Mozambique /	218.50	1.90	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy	
Mozambique /	8.00	0.07	provided	ODA	Grant	Adaptation	Agriculture	
Myanmar /	1,184.00	10.30	provided, committed	ODA	Grant	Adaptation	Other (Others)	
Myanmar /	597.00	5.19	provided, committed	ODA	Grant	Cross-cutting	Forestry, Other (Others)	
Myanmar /	63.65	0.55	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy, Water and sanitation	
Namibia /	114.00	0.99	provided	ODA	Grant	Adaptation	Agriculture	
Nepal /	20.00	0.17	committed	ODA	Grant	Adaptation	Agriculture	
Nepal /	15.00	0.13	provided	ODA	Grant	Mitigation	Energy	
Nigaragua /	299.48	2.60	committed	ODA	Grant	Adaptation	Other (Others)	
Niger /	889.00	7.73	provided, committed	ODA	Grant	Adaptation	Water and sanitation, Other (Others)	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Nigeria /	1,163.00	10.11	committed	ODA	Grant	Adaptation	Water and sanitation	
Nigeria /	980.00	8.52	committed	ODA	Grant	Mitigation	Energy	
North America, Central and South America /	17.00	0.15	provided	ODA	Grant	Mitigation	Energy	
North America, Central and South America /	3.00	0.03	provided	ODA	Grant	Adaptation	Other (Others)	
North and Latin America /	19.00	0.17	provided	ODA	Grant	Mitigation	Energy	
Pakistan /	1,223.50	10.64	committed	ODA	Grant	Adaptation	Water and sanitation, Other (Others)	
Palestine /	94.00	0.82	committed	ODA	Grant	Adaptation	Water and sanitation	
Palestine /	9.00	0.07	provided	ODA	Grant	Mitigation	Energy, Water and sanitation	
Peru /	8,770.00	76.26	committed	ODA	Concessional Loan	Mitigation	Other (Others)	
Peru /	127.00	1.10	provided	ODA	Grant	Adaptation	Water and sanitation	
Philippines /	11,328.00	98.50	provided, committed	ODA	Other (Concessional Loan, Grant)	Adaptation	Agriculture, Water and sanitation, Other (Others)	
Philippines /	175.09	1.53	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy	
Senegal /	66.00	0.57	provided	ODA	Grant	Cross-cutting	Other (Others)	
Sierra Leone /	23.00	0.20	provided	ODA	Grant	Adaptation	Water and sanitation	
Small Island and maritime nations /	40.80	0.35	committed	OOF	Grant	Mitigation	Energy	
Solomon Islands /	16.00	0.14	provided	ODA	Grant	Adaptation	Water and sanitation	
Somalia /	20.00	0.17	committed	OOF	Grant	Adaptation	Other (Others)	
South Africa /	26.00	0.23	committed	OOF	Grant	Mitigation	Energy	
South America /	20.00	0.17	committed	OOF	Grant	Adaptation	Other (Others)	
South Sudan /	212.00	1.84	provided	ODA	Grant	Adaptation	Agriculture	
Sri Lanka /	9,841.00	85.58	provided, committed	ODA	Other (Concessional Loan, Grant)	Mitigation	Energy	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Sri Lanka /	25.00	0.22	provided	ODA	Grant	Adaptation	Agriculture	
Tajikistan /	3.00	0.03	provided	ODA	Grant	Adaptation	Water and sanitation	
Tanzania /	255.00	2.22	provided, committed	Other (ODA, OOF)	Grant	Adaptation	Agriculture, Water and sanitation, Other (Others)	
Thailand /	228.00	1.98	provided	ODA	Grant	Adaptation	Agriculture, Other (Others)	
Thailand /	364.10	3.16	provided, committed	Other (ODA, OOF)	Grant	Mitigation	Energy	
Thailand /	4.00	0.03	provided	ODA	Grant	Cross-cutting	Cross-cutting	
Thailand, Viet Nam /	93.90	0.82	committed	OOF	Grant	Mitigation	Energy	
Thailand, Vietnam, Malaysia /	71.80	0.62	committed	OOF	Grant	Mitigation	Energy	
Timor-Leste /	11.00	0.10	provided	ODA	Grant	Adaptation	Water and sanitation	
Togo /	899.00	7.82	committed	ODA	Grant	Adaptation	Water and sanitation	
Tunisia /	1.00	0.01	provided	ODA	Grant	Cross-cutting	Water and sanitation	
Tuvalu /	51.00	0.44	provided	ODA	Grant	Adaptation	Other (Others)	
Uganda /	943.00	8.20	committed	ODA	Grant	Adaptation	Water and sanitation, Other (Others)	
Viet Nam /	7,776.00	67.61	provided, committed	ODA	Other (Concessional Loan, Grant)	Cross-cutting	Forestry	
Viet Nam /	20,745.00	180.38	provided, committed	Other (ODA, OOF)	Other (Concessional Loan, Grant)	Adaptation	Water and sanitation, Other (Others)	
Viet Nam /	46,497.00	404.31	provided, committed	Other (ODA, OOF)	Concessional Loan	Mitigation	Energy, Forestry, Cross-cutting, Water and sanitation	
Viet Nam and Indonesia /	49.00	0.43	provided	ODA	Grant	Mitigation	Energy	
Viet Nam, Myanmar, Cambodia /	38.00	0.33	committed	OOF	Grant	Mitigation	Energy	

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	Japanese yen - JPY	*USD*						
Zambia /	28.00	0.24	provided	ODA	Grant	Adaptation	Agriculture	
Zimbabwe /	95.00	0.83	provided	ODA	Grant	Cross-cutting	Water and sanitation	
Zimbabwe /	184.50	1.60	provided, committed	ODA	Grant	Adaptation	Agriculture, Water and sanitation	

Abbreviations: ODA = official development assistance, OOF = other official flows; USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should report, to the extent possible, on details contained in this table.

[c] Parties should explain, in their biennial reports, the methodologies used to specify the funds as provided, committed and/or pledged. Parties will provide the information for as many status

[d] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under “Other”.

[e] Parties should report, as appropriate, on project details and the implementing agency.

[f] Parties should explain in their biennial reports how they define funds as being climate-specific.

[g] Please specify.

[h] Cross-cutting type of support refers to funding for activities which are cross-cutting across mitigation and adaptation.

Custom Footnotes

The unit of JPY is "million Japanese Yen", and the unit of USD is "million US dollars".

The exchange rate is 115JPY/USD.

6.1.3.4 Private Finance

In order to further promote climate change action, Japan has also been working on establishing a mechanism to leverage private investment by use of public finance. Co-financing by JBIC with private sector and trade insurance are the examples of utilizing private finance. Private Finance also plays an important role to tackle climate change as its total amount is over 3 billion dollars as of December 2012, although it is not counted as Japan's Fast-Start Finance in this document.

- Other Official Flow, including co-funding with private sector

・Global Action for Reconciling Economic Growth and Environmental Preservation by JBIC (GREEN)(Mitigation)

In April 2010, JBIC launched a new operation named 'GREEN' (Global action for Reconciling Economic growth and Environmental preservation) of which primary purpose is to support projects with favorable impact on the preservation of the global environment. Under the 'GREEN' operation, JBIC utilizes its untied facility (loans and guarantees) and equity participation while mobilizing private funds.

<Features>

In every project under the 'GREEN' operation, JBIC conducts its own accounting measures named 'J-MRV Guidelines' for reduction impact of GHG emission. It is based on the idea that such accounting makes borrowers strongly aware of their contribution to the preservation of the global environment through the relevant projects.

<Examples>

JBIC has provided finance needed for the environment-related loans (improving energy efficiency project or renewable energy project) to financial institutions, such as Deniz Bank in Turkey, Corporacion Andina de Fomento in Latin America, BNDES in Brazil and ICICI Bank in India. Through this operation, the funding of JBIC enabled private finance institutions to co-finance, which led to the mobilization of more fund.

6.2 Technology Development and Transfer

Japan will contribute to solve the climate change problem all over the globe through the development of technologies of environment and energy fields (Innovation), and taking a leadership on international diffusion of the technologies (Application) based on the proactive diplomatic initiatives for countering global warming which is called "Actions for Cool Earth Japan" which was announced in November 2013.

6.2.1 Innovation

The government promotes diffusion of technological innovation and ensure

- Expanding Domestic Investment

On the premise of achieving primary balance surpluses in national and local government finances by FY2020, both private and public sectors will domestically invest combined $110billion for technological innovation over five years. In particular, from a long-term perspective, the government will take the initiative in developing technologies in areas where risks are high, but anticipated impact is large.

- Formulating Technology Roadmap

"Low Carbon Technology Plan" was revised to include a technology roadmap indicating targeted technology levels based on the latest scientific knowledge. Japan will steadily implement this plan and globally cooperate to develop and diffuse the technologies to cover approximately 80 percent of the reductions needed to halve global emissions by 2050.

- International Cooperation on Research and Development

The government will accelerate global development of innovative technologies by promoting international cooperation with major countries with a focus on basic research. To tackle global warming issues through accelerated innovation, Japan will annually host "Innovation for Cool Earth Forum", a kind of energy-and-environment-version of Davos Forum, with the participation of leaders of industry, government, and academia.

6.2.2 Emissions Reduction in Oversea Countries by Diffusing Technologies

Japan will promote the global "application" of existing low-carbon technologies. Accelerating the diffusion of such technologies and verifying the reduction effect by the technologies will realize the further emission reduction of greenhouse gasses and new economic growth simultaneously.

6.2.2.1 Joint Crediting Mechanism (JCM)

Japan is promoting the establishment and implementation of the "Joint Crediting Mechanism (JCM)" in which Japan facilitates the diffusion of advanced low carbon technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions, and contributes to sustainable development of developing countries. Following an appropriate evaluation of the contributions to GHG emission reductions or removals in developing countries in a quantitative manner, Japan will use them to achieve its emission reduction target.

Since Japan and Mongolia signed bilateral documents in January 2013 for the first time to start this mechanism, the number of partner countries has increased to 9 as of December 2013. The government aims to increase the number to 16 in 3 years and, to achieve the target, is accelerating the discussions with developing countries. At the same time, Japan is promoting the formulation of JCM projects through various supporting schemes, and further accelerating the transfer of low-carbon technologies.

6.2.2.2 Development of the Basic Framework to Diffuse Technologies

- Support for International Standardization and Institutional Arrangement

The government has contributed to the international standardization of measuring CO_2 emissions through steel processing and effects of energy saving of air-conditioners with inverters. The government will also propose assessing measures of energy efficiencies of LED lightings etc. thus will contribute to the international standardization onwards. In addition, the government will provide supports on institutional arrangements for enhancing abilities of appropriate measuring and developing standards of energy savings in developing countries.

- Support for Formulating Low-Carbon Strategies and Enhancing Adaptive Ability in Developing Countries with Technologies and Know-How of Japan

- Utilization of Satellites

The government aims to launch a new state-of-the-art GHG observing satellite (successor to GOSAT) in FY2017. Focusing on Asia, the satellite will monitor nation-by-nation or megacity-by-megacity GHG emission levels, verify the effectiveness of countermeasures and propose emission reduction measures.

- Assessments

Technological needs will be identified and the direction of technology creation and diffusion will be effectively verified based on verification of the effectiveness of the introduced low-carbon technologies and technology assessment (assessment of utility and environmental impact of technologies).

6.2.2.3 Other Supports for Developing Countries

In developing countries in particular, addressing deforestation and forest degradation due to illegal logging, expanding agricultural land and other factors are urgent issues. Leveraging its knowledge and expertise, Japan will actively support Reducing Emissions from Deforestation and Forest Degradation (REDD+) including sustainable management of forests in developing countries, which will contribute to forest conservation in those countries.

In addition, at the United Nations Conference on Sustainable Development (Rio+20) in June 2012, Japan announced that over the following three-year period it would provide US $3 billion in support to developing countries for renewable energy and other initiatives in the climate change field. And Japan also announced it would boost the training and development of human resources for the green economy transition by organizing 10,000 experts over the same three-year period.

Furthermore, in order to achieve compatibility between environmental protection and economic growth in developing countries, Japan will promote cooperation through a co-benefits approach that will contribute to both environmental pollution reduction and greenhouse gas emissions reduction, which is a global concern.

By supporting activities by the Asia Pacific Adaptation Network (APAN) and other networks, Japan will share information, knowledge and experience within the Asia-Pacific region with the aim of strengthening its adaptive capacity toward climate change.

Information on Japan's project on the provision of assistance for the development and transfer of technology is as shown in Table 6.7.

Table 6.7 Provision of technology development and transfer support

Measures and activities related to technology transfer	Recipient country and/or region	Targeted area	Sector	Purpose	Total funding	Years in operation	Description	Technology transferred	Indicate factors which led to project's success	Source of the funding for technology transfer	Activities undertaken by	Status	Impact on greenhouse gas emissions/sinks	Additional information
Demonstration Project of technology and System for International Energy Consumption Efficiency	Global	Mitigation	Energy	Contribute to the solutions of problems in terms of the mitigation of tight energy supply and demand in the world, energy security in Japan and measures to global warming by the dissemination of Japanese superior technology	18920（included 980 for clean coal technology projects）	1993	Customize Japanese superior technologies such as energy saving, renewable energy and smart community technology flexibly in accordance with natural condition, regulatory and system, and industrial structure of targeted country, and visualize the advantages and effectiveness of them.	Energy saving, Renewable Energy, Smart Community technology, clean coal technology	—	Private and Public	Private and Public	Implemented	Approx. 34.82 Mt-CO2/year	
Project for development of the Meteorological Radar System in the Philippines	Philippines	Adaptation	Prevention and restoration of disaster	Develop the Meteorological Radar System and peripheral equipments, and support the monitoring of typhoon	3350	2009	Put in the place meteorological monitoring equipments and three weather radar facilities of Virac, Aparri and Guiuan, and support the typhoon monitoring with Japanese technologies.	Meteorological Radar System and meteorological monitoring equipment		Public	Private and Public	Planed	—	
Desalination plan of groundwater in Southern Region of Tunisia	Tunisia	Adaptation	Water and Sanitation	Improve access to drinking water in Medenine Governorate in Southern Region of Tunisia	1000	2010	Because of increase of water consumption and expansion of water supply area, drinking water cannot be supplied adequately in southern region of Tunisia. In addition, it is concerned that the securement of drinking water will be more difficult because decreasing in precipitation and worsening of groundwater salination in coastal areas are expected to become advanced due to climate change. Therefore, Japan supports the development of groundwater desalination system by a reverse osmosis membrane to improve access to drinking water in Medenine Governorate in southern region of Tunisian	Groundwater desalination system by a reverse osmosis membrane		Private	Private and Public	Implemented	—	
Project for Total Emission Control of Nitrogen Oxide in Atmosphere in China	China	Mitigation	Industry	Improve methods to control increasing NOx emissions in China which shows rapid economic growth	63	2013	Implement the preparation for installation of NOx emission control technology to facilities and prepare a technical guidelines. In addition, accept the trainees and verify the method to grasp NOx control effect through the simulation technique for air pollutants dispersion model.	Japanese technologies to control emission of NOx which is indirect GHGs		Public	Private and Public	Planed	—	
Project for impact assessment of Climate Change in Brantas and Musi River and integrating into the Water Resources Management Plans	Indonesia	Adaptation	Water and Sanitation	Perform the impact assessing of Climate Change in Brantas and Musi River and integrate it into the Water Resources Management Plans	134	2013	Prepare climate change prediction data and re-assess the safety and flood control level based on the result of the data, and develop Mitigation and Adaptation strategies for climate change. In addition, prepare an guideline applicable to another region.	Reassessment of the safety of water control and utilization based on the preparation and results of climate change prediction data using Japanese technology, and develop a mitigation and adaptation strategies for climate change in the target river basin		Public	Private and Public	Planed	—	

Measures and activities related to technology transfer	Recipient country and/or region	Targeted area	Sector	Purpose	Total funding	Years in operation	Description	Technology transferred	Indicate factors which led to project's success	Source of the funding for technology transfer	Activities undertaken by	Status	Impact on greenhouse gas emissions/sinks	Additional information
CTI Private Financing Advisory Network(CTI PFAN) Program (AFCEF3)	Asia/Pacific	Mitigation	Energy	Improve the possibility of financing mainly by the private sector, providing advice and technical assistance for the project developer in developing countries or economies in transition, and improving project proposals to the level which international finance requests.	14	2012	Hold seminars for enhancing fund-raising capacities of the developers of clean-energy projects in developing countries and forums for introducing them to the investors for providing opportunities for matching between developers and investors.	Renewable energy technologies (Biomass, Biogas, Hydropower, Solar power)		Private and Public	Private	Implemented	2.91 Mt-CO2/year	
CTI Private Financing Advisory Network(CTI PFAN) Program (AFCEF1,2)	Africa	Mitigation	Energy	Improve the possibility of financing mainly by the private sector, providing advice and technical assistance for the project developer in developing countries or economies in transition, and improving project proposals to the level which international finance requests.	29	2010	Hold seminars for enhancing fund-raising capacities of the developers of clean-energy projects in developing countries and forums for introducing them to the investors for providing opportunities for matching between developers and investors.	Renewable energy technologies (Biomass, Biogas, Hydropower, Solar power)	Provide individualized teaching to project developers, and hold the seminars for introducing them to the investors and matching between developers and investors	Private and Public	Private	Implemented	Approx, 0.94 Mt-CO2/year	GHG emission reduction is not achieved by only Japanese contribution because this GHG emission reduction was result from the project established under CTI-PFAN which was a multilateral public-private partnership.
Greenhouse gas emission reduction support project	Asia/Pacific	Mitigation	Energy	Reduce energy use and GHG emissions in industry sector of developing countries by promoting technology transfer and dissemination of Japanese superior energy-saving technologies and products for the industry sector of developing countries	92	2010	Send Japanese experts to model companies in India, Philippines and China, and provide energy-saving consulting and technical guidance. Also, conduct capacity building activities including holding of seminars for dissemination of technologies and individualized teaching for staff at local companies and relevant government staff in order to promote the spontaneous dissemination of the energy-saving technologies mainly developed by the model companies.	Energy-saving technology	Provide the energy-saving consulting and the technical guidance to rolling mills in India, food factories and commercial buildings in Philippines and chemical fertilizer factories in China. Hold the seminars and workshops for disseminating improvement of energy-saving activities	Private and Public	Private	Planed	Approx. 0.535 Mt-CO2/year	
Global environment international cooperation project	Asia/Pacific	Mitigation	Energy	Promote transfer and dissemination of Japanese superior climate change protection technology and products to developing countries and emerging economies by providing support individually to small and medium-sized enterprises in Japan that would like to sell their climate change protection technology to developing countries and emerging economies.	8	2012	Provide support individually including introduction of local companies with needs, coordinate support of local activities and provision of consulting service in local area for the Japanese companies interested in transfer of their technologies to companies and local governments in Thailand and Philippines.	Renewable energy technologies (Electric generation by biogas, Biogasification)	Provide service by local consultants as one of support	Private and Public	Private	Planed	Approx. 6 kt-CO2/year	

Measures and activities related to technology transfer	Recipient country and/or region	Targeted area	Sector	Purpose	Total funding	Years in operation	Description	Technology transferred	Indicate factors which led to project's success	Source of the funding for technology transfer	Activities undertaken by	Status	Impact on greenhouse gas emissions/sinks	Additional information
Global Superior Energy Performance Partnership : GSEP	Global	Mitigation	Energy, Industry	Ensure energy security and promote global warming measures through development, dissemination and transfer of energy-saving and environment-friendly technology, and technological cooperation of associated technology under the public-private partnership	59	2010	Under GSEP sectoral working groups chaired by Japan (Power WG, Steel WG, Cement WG), inherit activities of Cement TF, Power generation and Transmission TF, and Steel TF under Asia-Pacific Partnership on Clean Development and Climate (APP), and promote the activities relevant to the development, dissemination and transfer of the most advanced technologies for high-efficiency and low-emission by sector under the cooperation between the public and private sectors.	Technologies for operation and maintenance contributory to the maintenance and enhancement of thermal efficiency of coal power generation plants	Share the technologies and know-how for the improvement and maintenance of thermal efficiency of coal power plants through equipment diagnosis and information exchange about operation and maintenance of coal power plant.	Private and Public	Private and Public	Implemented		
Project for promoting new system of measures against illegal logging of tropical forest	Peru, Indonesia, Togo	Mitigation	Forestry	Promote efficient and effective measures against illegal logging of tropical forests	72	2012	*Enhance the traceability capacity of small and medium-sized enterprises which ensure sustainable and legitimate timber production and processing. *Restore degraded forests by provision of local nursery trees and forestation. *Put in place map information systems such as the development of forest information and GIS.	Improvement of forest functions for traceability of wood and restoration of degraded forests, and development of the map information systems.	Hold several training workshops on the operation of the relevant technologies for the counterparts	Public	Public	Implemented		
Project for promoting measures against illegal logging to prevent deforestation and rain forest degradation	Philippines, Guatemala, etc.	Mitigation	Forestry	Promote efficient and effective measures against illegal logging of tropical forests	229	2010, 2011	*Develop the certification systems for the legality and sustainability of forest resources by the enhancement of information such as CoC certification, the certification of legality and area of production. *Develop the continuous forest information systems in using GIS, develop the packages of technical data necessary for decision-making, and conduct the dissemination and promotion strategies relevant to SIFGUA.	Operation system of Forest Stock Monitoring System （FSMS) and productivity information system	Hold several training workshops on the operation of the relevant technologies for the counterparts	Public	Public	Implemented		
Project for promoting prevention of deforestation and forest degradation in developing countries	Asia/Pacific	Mitigation	Forestry	Develop a system to grasp the deforestation and forest degradation quantitatively to take adequate measures for reducing deforestation and forest degradation by developing countries themselves.	150	2009	Training of personnel with expertise on monitoring forest deforestation and degradation by utilizing satellite images, understanding factors, and future prediction	Monitoring technologies for deforestation and forest degradation	Hold the workshops on the results of monitoring technologies on deforestation and forest degradation for the relevant persons in developing countries	Public	Private	Implemented		

Measures and activities related to technology transfer	Recipient country and/or region	Targeted area	Sector	Purpose	Total funding	Years in operation	Description	Technology transferred	Indicate factors which led to project's success	Source of the funding for technology transfer	Activities undertaken by	Status	Impact on greenhouse gas emissions/sinks	Additional information
Project for promoting sustainable forest management in developing countries	Africa	Mitigation	Forestry	Promote overseas forest conservation activities by various actors such as enterprises and NGOs.	288	2009, 2010	・Develop and disseminate methodologies for selecting candidate sites for forestation and recovery of green land considering the water balance in half-dry areas. ・Develop and disseminate technical guidelines for the forest development and management which can contribute to the poverty reduction in developing countries and revegetation such as the land after mines.	Methodologies for the forest development and management in half-dry area, and technologies for the forest development and management, and revegetation in the land after development	Hold the trainings and workshops on the results including methodologies developed for the relevant persons in developing countries	Public	Private	Implemented		
Program for supporting process of United Nations forests forum	Asia/Pacific	Mitigation	Forestry	Support the reporting of progress of sustainable forest management by developing countries to United Nation Forest Forum (UNFF)	120	2011	Identify and develop methodologies for data collection and reporting which contribute to the reporting to UNFF, and develop human resources for the enhancement of reporting capacities in each country so that developing countries can deal with the activities which are to report their progress of the activities for the sustainable forest management by using standard and index for the sustainable forest management.	Identification and development of methodologies for reporting and data collection which can contribute to the preparation of national reports reported to UNFF	Hold the local workshops on the transfer of relevant technologies, and transfer the technologies to relevant countries	Public	Public	Implemented		

6.3 Capacity-building

To overcome the problems of climate change, not only industrialised countries but all countries including developing countries should participate in mitigation actions to curb emissions of GHG. Many developing countries, however, do not have enough human resource and technical capacity to effectively conduct climate change policies as well as the lack of institutional arrangements.

Therefore, Japan actively conducts projects to enhance their capacity with taking advantage of our low-carbon technologies, know-how, and experiences of developing low-carbon society in Japan to leverage the progress of global climate change actions.

The detailed information of projects/programmes to promote capacity building in developing countries is as follows.

Table 6.8 Provision of capacity-building support

Programme or project title	Recipient country / region	Targeted area	Description of programme or project
Project to support the large-scale formation of Joint Crediting Mechanism programs to realize Low Carbon Societies in Asia	Asia/Pacific and SIDS	Mitigation	・Formulate large-scaled projects with utilizing JCM (Joint Crediting Mechanism) and hold workshops for the policy makers of host countries to promote low carbonization of cities and regions in Asia. ・Prepare the NAMAs Guidebook for developing countries and MRV handbook for implementing JCM. ・Invite interested persons of countries and cities to Japan and hold seminar to promote partnerships between cities to promote the construction of low carbon society, and share information on Japanese advanced environmental technologies between interested persons.
Asia-Pacific joint research /observation work of the Global Environment	Asia/Pacific	Multiple Areas	Supports the Asia-Pacific Network for Global Change Research (APN) which is an intergovernmental network in the Asia-Pacific region to foster global change research, increase developing country participation in that research, and strengthen interactions between the science community and policy-makers.
Asia-Pacific Regional Assessment of the Climate Change Impacts and Promotion of Adaptation	Asia/Pacific	Adaptation	Supports UNEP lead the Asia-Pacific Adaptation Network (APAN), under the Global Adaptation Network (GAN), to enhance capacity of policy-makers and practitioners in the Asia-Pacific region by sharing knowledge on climate change adaptation.
International Research Network for Low Carbon Societies	Asia/Pacific	Mitigation	Supports the International Research Network for Low Carbon Societies in Asia to develop capacity of researchers and others for building low carbon societies.
Asia-Pacific Seminar on Climate Change	Asia/Pacific	Multiple Areas	Every year since 1991, the Ministry of the Environment, Japan has been convening the Asia-Pacific Seminar on Climate Change which has served as an important vehicle for countries in the region to exchange views and information on their respective efforts to mitigate and adapt to climate change in a practical manner, thereby contributing to capacity and confidence building among them.
Acid Deposition Monitoring Network in East Asia	Asia/Pacific	Technological development/transfer	EANET started in 1998 as an intergovernmental initiative to create a common understanding on the state of acid deposition problems in East Asia, provide useful inputs for decision making at various levels with the aim of preventing or reducing the adverse impacts on the environment, and promote cooperation among countries. Thirteen countries in East Asia are participating in EANET at present.
Japan-South Africa water resources management workshop	South Africa	Adaptation	Hold workshops on Japanese activities related to water resource management through introducing adaptation to climate change, maintenance and management of infrastructure and activities for water quality improvement.

Programme or project title	Recipient country / region	Targeted area	Description of programme or project
Activities under "Memorandum of Cooperation Flood control and Adaptation of Climate change" executed between Ministry of Land, Infrastructure and Transportation (MLIT) Japan and Ministry of Agriculture and Rural Development (MARD) Vietnam	Vietnam	Adaptation	Hold workshops to provide case study of Japanese flood control measures based on the memorandum.
Japan Practical Guidelines on Strategic Climate Change Adaptation Planning －Flood Disasters－	Asia/Pacific	Adaptation	Develop a guideline including basic procedures for developing adaptation measures to damage of floods which become increasingly severe by climate change and publish it on the web for Asia and Pacific regions. This manual is based on experiences, strategies and technologies accumulated in Japan over the years.
Flood forecasting utilizing satellite data etc	Asia/Pacific, Middle East	Adaptation	Make available Integrated Flood Analysis System (IFAS) utilizing satellite developed by International Center for water Hazard and Risk Management (ICHARM) for free of charge via the internet, and execute seminars about the use of IFAS specifically designed to officials of the government in Indonesia, Philippines, Myanmar, Vietnam and Iran.
Various trainings on the flood control measures for countering the effects of climate change	Asia/Pacific Africa Middle East/North Africa Latin America and the Caribbean	Adaptation	Provide various trainings on the flood control measures for countering the effects of climate change to officials of the government in developing countries that are facing with flood damages in collaboration with the Japan International Cooperation Agency (JICA) and the National Graduate Institute for Policy Studies (GRIPS).
The 5th International Conference on Flood Management	Global	Adaptation	ICHARM, ICFM5 Secretariat organized the 5th International Conference on Flood Management from 27 to 29 September 2011. More than 450 participants participated on some sessions and verbal presentations on realistic methods for adaptation to climate change.
Research project for developing infrastructure for obtaining Joint Credit (Human resource development related to MRV)	India, Vietnam, Mongolia, South Africa	Mitigation	Provide the following training and expert sending for the purpose of disseminating Japanese low carbon technologies and products for countries which have agreed Joint Crediting Mechanism (JCM) and are possible to agree to develop system of JCM in accordance with the situation of international negotiation of Japanese government. - Accept trainee such as decision makers of business, engineer and policy makers from partner countries, and provide training including seminar on MRV and low carbon technology and products, study tour of facilities and introduction of technology. - Send experts to partner countries, and provide training including seminar on MRV and low carbon technology and products, and lecture on technology for decision makers of business, engineer and policy makers.
Project for rationalization of international energy use	Asia/Pacific, Middle East/North Africa, Africa, Latin America and the Caribbean	Mitigation	Mitigate the shortage of international energy demand by promoting the introduction of energy conservation measures and renewable energy in foreign countries through institutional building support by the project of accepting trainees and dispatching experts.
Project for promoting new systems of measures against illegal logging of tropical forest	Peru, Indonesia, Togo	Mitigation	・Enhance the traceability capacity of small and medium-sized enterprises, which ensures sustainable and legitimate timber production and processing. ・Providing and planting nursery trees of native tree species ・Systematizing information in forest sector and improving reliability through the development of human resources to perform the maintenance of the information on forest and GIS
Project for promoting measures against illegal logging to prevent deforestation and rain forest degradation	Philippines, Guatemala, etc.	Mitigation	・Institutional improvements and human resources development such as amplifying information of CoC certification, legality and proof of origin ・ Development of human resources in accordance with the continuous building forest information system using such as GIS and the development of technical data package necessary for decision-making

Programme or project title	Recipient country / region	Targeted area	Description of programme or project
Project for promoting prevention of deforestation and forest degradation in developing countries	Asia/Pacific	Mitigation	Training of personnel for expertise in monitoring deforestation and forest degradation by using satellite images, identifying drivers of deforestation and forest degradation, and estimation of future forest cover change
Project for promoting sustainable forest management in developing countries	Africa	Mitigation	Organize workshops and training for stakeholders in order to develop measures for forestation and forest management for promoting sustainable forest management in developing countries
Caribbean Disaster Management Project	Latin America and the Caribbean	Adaptation	Build capacity and strengthen institutional mechanisms to mitigate dangers in the Caribbean Disaster Emergency Response Agency (CDERA) participating states, particularly regarding flood hazards.
Developing countermeasures against landslide	Ethiopia	Adaptation	Enhance capacity for adaptation to heavy rain affected by climate change through developing disaster reduction capacity, implementing inspections and analyzing the landslide generation mechanism in the Abai Valley in Ethiopia.
Expert on disaster prevention	Guatemala	Adaptation	Enhance capacity for adaptation to climate change by developing disaster reduction policy making capacity in Guatemala.
Disaster management capacity enhancement project adaptable to climate change	Sri Lanka	Adaptation	Enhance capacity for adaptation to climate change through developing disaster reduction capacity by establishing a disaster reduction framework model that includes disaster observation and forecasting, disaster reduction activity and evacuation of residences.
Training for the countermeasures against littoral erosion	Senegal	Adaptation	Plan and establish effective countermeasures for shore erosion.
Capacity development for disaster management	Thailand	Adaptation	Enhance climate change adaptation capacity by developing DDPM's capacity for diffusing disaster reduction activities, community disaster reduction and school education on disaster reduction.
Strengthening Community Disaster Risk Management Project in the Pacific Region	Fiji	Adaptation	Enhance an appropriate framework for appropriate evacuation when flooding occurs outside targeted areas.
Disaster Risk Management	Philippines	Adaptation	Enhance disaster reduction capacity at NDRRMC−OCD in the Philippines.
Project for Building Disaster Resilient Societies in Vietnam (Phase 2)	Vietnam	Adaptation	Develop capacity for adaptation to climate change, especially water-related disasters, by implementing structural and non-structural measures at the central and local levels.
Project on Capacity Development for Disaster Risk Management in Central America "Bosai", Phase 2	North, Central and South America	Adaptation	Establish a sustainable framework for diffusing community disaster reduction in accordance with the PCGIR, which was determined as a regional activity for natural disaster risk reduction and prevention of natural disaster risks.
Groundwater Development and Management Capacity Development Project in Tanzania	Tanzania	Adaptation	Enhance capacity for ground water development in government cooperation or by the private sector of wells and dams in order to implement one of the components of the national water development program, the "water supply and sanitation" program.
Advisor on water resources policy	Indonesia	Adaptation	Develop capacity for studying measures in response to variation of precipitation patterns, promoting integrated water resource management in Indonesia.
Project for water management improvement	Uzbekistan	Adaptation	Enhance capacity to address precipitation pattern change affected by climate change through developing WUA water management methods in the region under the jurisdiction of BISM.

Programme or project title	Recipient country / region	Targeted area	Description of programme or project
Project for management of non-revenue water	Kenya	Adaptation	Enhance capacity to address precipitation pattern change affected by climate change through promoting the effective use of water resources by implementing a reduction in the proportion of non-revenue water in Kenya.
Training for water resources and environmental management	Singapore	Adaptation	Enhance capacity to address precipitation pattern change affected by climate change through promoting effective water utilization via non-traditional water resource and environment control knowledge and technology in water-poor areas.
Project for enhancing the function of the national water resources institute	Nigeria	Adaptation	Enhance capacity to address precipitation pattern change affected by climate change through developing capacity of local water supply and health staff by improving water supply services.
Project on Effective Utilization of Reservoirs and Auto-Promotion of Local Communities in the Sahel	Niger	Adaptation	Promote sustainable village development and alleviate the vulnerability of farm production to decreasing precipitation through organized capacity development for diffusion staff for the effective utilization of reservoirs in Tahoua Region and Maradi Region.
Training for water supply system	Bangladesh	Adaptation	Enhance capacity to address precipitation pattern change affected by climate change by promoting a clean water supply system in Khulna city.
Improving sustainable water and sanitation system	Burkina Faso	Adaptation	Enhance capacity to address precipitation pattern change affected by climate change by promoting development, verification and preparation for a water and sanitation system appropriate for the African Sahel region.
Advisor on water sector	Mexico	Adaptation	Enhance capacity to address precipitation pattern change affected by climate change by promoting effective utilization of water and developing capacity for water quality conservation in CONAGUA.
Enhancement of Water Resources Management in Haouz Plain	Morocco	Adaptation	Enhance capacity to address precipitation pattern change affected by climate change by developing administrative capacity for water resource management in ABHT.
Capacity Development Project on Nationally Appropriate Mitigation Actions (NAMAs)	Serbia	Mitigation	Develop capacity for planning nationally appropriate mitigation actions.
Project for Capacity Development for the National Focal Point on Climate Change to Enhance the Implementation of Climate Change Policies in Indonesia	Indonesia	Mitigation	Develop the DNPI's institutional capacity to coordinate and evaluate climate change policy as a focal point on climate change.
Capacity Development and Institutional Strengthening for GHG Mitigation	Thailand	Mitigation	Develop capacity and strengthen institutional power for GHG mitigation.
Project for Capacity Building for National Greenhouse Gas Inventory	Vietnam	Mitigation	Develop capacity to compile periodic national GHG inventories which have time-series consistent, accurate and a clear estimation method for GHG emissions and removals.
Project for Development of Low Carbon Society Scenarios for Asian Regions	Malaysia	Mitigation	Develop and apply a structural method for a low carbon society scenario and dispatch the results in the Asian region.
Capacity Development for NAMA/MRV	Africa, Asia	Mitigation	Develop capacity to make NAMAs and understand international trends, concrete policies, and effective measures and measurement methods of GHG gas reduction.
Strengthening capacity of electric power pool in Eastern and Southern Africa	Africa	Mitigation	Strengthen capacity of electric power pool by establishing a solution policy for electricity shortages and improving energy efficiency in Eastern and Southern Africa.
Promotion of cleaner production	Argentina	Mitigation	Promote diffusion of cleaner production technology, mainly energy saving technology, particularly held in small- and medium-sized companies.
Training for mass rapid transit	Indonesia	Mitigation	Improve civic facilities and the urban environment by reducing traffic pollution by reinforcing mass rapid transit.
The training for promotion of energy efficiency and conservation	Serbia	Mitigation	Make an action plan in order to establish an energy management institution in Serbia through utilizing information collected by Japanese energy management institutions.
Workshop on Promotion of Energy Efficiency for Black Sea Economic Cooperation (BSEC) Countries	Turkey	Mitigation	Promote energy saving policy through a workshop on the Promotion of Energy Efficiency for the Black Sea Economic Cooperation (BSEC) countries.
Power Sector Adviser	Bangladesh	Mitigation	Support reform of the electric power sector and improve efficiency in electric facilities.
Training program on smart grid/smart community in Brazil	Brazil	Mitigation	Strengthen recognition and initiative for smart grid/smart community introduction and promote smart grid/smart community enterprises through Japanese technology in Brazil.

Programme or project title	Recipient country / region	Targeted area	Description of programme or project
Expert on demand-side management and energy conservation	Maldives	Mitigation	Establish institutions and develop capacity for promoting Demand Side Management (DSM) and energy saving.
Expert for Urban Transportation System Improvement in Ulaanbaatar city, Mongolia	Mongolia	Mitigation	Promote deployment and control capacity of irrigation facilities, promote water management capacity and strengthen water usage alliance for Ministry of Food, Agriculture and Light Industry in Mongolia.
Project for RECO's Capacity Building for Efficient Power System Development	Rwanda	Mitigation	Develop efficiency and stability of the electric power system.
Project for Strengthening National Forest Resources Monitoring System for Promoting Sustainable Forest Management and REDD+ in the Democratic Republic of the Congo	Democratic Republic of the Congo	Mitigation	Promote REDD+ by implementing natural forest monitoring appropriately based on the operating plan of the national forest resource inventory system.
Capacity Development on Forest Resource Monitoring for Addressing Climate Change in Papua New Guinea	Papua New Guinea	Mitigation	Conserve and manage sustainable forestland in PNG as an important climate mitigation and adaptation measure.
Training on mitigating climate change through social forestry	Kenya	Mitigation	Implement countermeasures against climate change through social forestry in order to develop capacity in training on mitigating climate change.
Research on reforestation for reducing GHGs	Tajikistan	Mitigation	Propose forest preservation and reforestation in pilot area in order to reduce GHGs, preserve forest and conduct reforestation.
Afforestation Planning and Implementation Capacity Strengthening Project	Vietnam	Mitigation	Develop afforestation planning capacity of people related to the forest industry to mitigate GHGs through CO2 absorption and soil conservation.
Human resource development on forestry	China	Mitigation	Promote forest preservation through training for the forest industry to promote reform in the industry in western China.
Development of a System of National Forest Resources Inventory contributing to national REDD activities	Gabon	Mitigation	1. Promote maintenance, management and solid policy for forest resources in accordance with the REDD framework. 2. Realize a periodic resource evaluation framework and promote forest resource management. 3. Support REDD related policy. 4. Promote management by people who benefit from forest resources. 5. Strengthen the exchange of forest policy information among countries in the Congo Basin.
Advisor: Sustainable Forest Management in the Congo Basin	Cameroon	Mitigation	Promote sustainable forest management in the COMIFAC (Central African Forest Commission) countries.
Project for Facilitating the Implementation of REDD+ Strategy and Policy	Cambodia	Mitigation	Promote sustainable forest management as climate change mitigation based on the experience of REDD+ strategy and policy.

Chapter 7

Research and Systematic Observation

7.1 Comprehensive Government Policies and Fundraising for Research and Systematic Observation

In 1990, the Government of Japan established a budgeting system for the Global Environment Research Fund (currently the Environment Research and Technology Development Fund). This fund was for research, observation and technological development concerning global environmental issues, for the comprehensive promotion of various types of research and studies on global environmental conservation, and for inviting interdisciplinary and international proposals for global environmental research from a broad range of industry, academia and government sources. In April 2001, the Global Environment Research Account for National Institutes was created to promote studies on global warming from both medium- and long-term perspectives.

In April 2012, the Government of Japan adopted the Fourth Basic Environment Plan in accordance with the Basic Environment Law. This plan is aimed at realizing a low-carbon society, sound material-cycle society, and society in harmony with nature, while ensuring fundamental security and safety. One of the important policies in this plan is the Climate Change Policy, with specific measures such as reducing CO_2 emissions from fuel combustion and other GHG emissions, and promoting carbon sink forests and utilizing biomass.

In March 2001, the Government of Japan adopted the Second Science and Technology Basic Plan (from 2001 to 2005) in accordance with the Science and Technology Basic Law, and the academic field of Environmental Sciences was selected as one of four priority fields for allocating research and development resources. Accordingly, a sectoral promotion strategy for Environmental Sciences was decided in September 2001 by the Council for Science and Technology Policy (CSTP), chaired by the Prime Minister. The Council was established in 2001 as a central resource for comprehensive science and technology policy, strengthening coordination among related ministries and agencies in this sector. Under this promotion strategy, it was decided that the government as a whole will make it a top priority to “carry out observation and projection related to global warming; assess the effects of environmental changes, such as temperature increase and sea level rise, on nature, the economy, and society; and develop technologies and methods to avoid or minimize any detrimental effects” in its global warming-related research.

Along with the above strategy, Japan has been comprehensively promoting observation and projection studies on global changes including global warming. In March 2002, Japan began operating a high performance supercomputer system, the Earth Simulator, used for studying global warming projections and

changes in the Earth's interior. The Earth Simulator's functions were updated in March 2009 for higher-precision projection studies.

Furthermore, in March 2006, the Government of Japan adopted the Third Science and Technology Basic Plan (from 2006 to 2010) and the academic field of Environmental Sciences was again cited as one of the four priority fields for allocating research and development resources. The Basic Plan also set out specific policy objectives that the science and technology sector should pursue, and cited "overcoming of global warming and energy problems" as one such objective.

In August 2011, the Fourth Science and Technology Basic Plan (from 2011 to 2015) was endorsed by the Cabinet; it places importance on the promotion of Green Innovation targeting the environment and energy.

It is important for Japan to contribute to resolving global issues such as global warming and energy scarcity by steadily developing and diffusing innovative technologies in order to achieve the 50% reduction target of global greenhouse gas emissions by 2050, as well as to contribute to overcoming environmental and energy issues hindering the economic growth of developing countries. Therefore, the CSTP revised the Low Carbon Technology Plan in September 2013 and presented basic policies in order to put steady development and diffusion of innovative technologies into practice, such as: (1) identification of innovative technologies to be developed both over the short-to-medium and medium-to-long term; (2) strengthening of policies for promoting technology development; and (3) measures required for the global expansion and diffusion of innovative technologies.

The results of global warming projection and process studies under the KAKUSHIN Program (Innovative Program of Climate Change Projection for the 21st Century) have greatly contributed to the Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC). The KAKUSHIN Program used both the Earth Simulator and results from other global warming-related natural science studies, funded by the Special Coordination Fund for Promoting Science and Technology, Grants-in-Aid for Scientific Research (Kakenhi), and ordinary budget funds. In FY2012, Japan launched the SOUSEI Program (Program for Risk Information on Climate Change) as a new five-year program to succeed the KAKUSHIN Program and to continue research activities using the Earth Simulator.

In the area of systematic observation, Japan has been promoting the establishment of an observation network that combines observation on the ground with observation by satellites, aircraft, and ships, and international and national observation activities are under way, as described below.

Internationally, the 10-Year Implementation Plan of the Global Earth Observation System of Systems (GEOSS) was formulated at the Third Earth Observation Summit held in February 2005 in Brussels, in accordance with an agreement reached at the June 2003 Group of Eight (G8) Summit in Evian, France. Japan has been proactively contributing to GEOSS development by serving as a member of the Executive Committee of the Group on Earth Observations (GEO), an international framework to promote GEOSS,

while participating in international GEOSS initiatives addressing global environmental issues, such as water resource management, agricultural monitoring, and forest monitoring.

Domestically, in response to the deepening international discussions toward the establishment of GEOSS, the CSTP drew up the Earth Observation Promotion Strategy in December 2004. Based on this Strategy, the Earth Observation Promotion Committee was established under the Council for Science and Technology of the Ministry of Education, Culture, Sports Science and Technology (MEXT) in February 2005 in order to annually elaborate upon the Earth Observation Implementation Policy. Currently the relevant ministries and agencies, as well as other concerned organizations, are working together toward the realization of comprehensive, needs-driven Earth observation, based on the Implementation Policy, which is to be revised each fiscal year.

Furthermore, in the Kyoto Protocol Target Achievement Plan formulated by the government in April 2005 and altogether revised in August 2008, which is based on the Law Concerning the Promotion of Measures to Cope with Global Warming, there is a section on the "promotion of research on climate change and strengthening of observation and monitoring systems." The plan states that it is a basic policy of the Government of Japan to strengthen comprehensive observation and monitoring systems.

7.2 Research

7.2.1 Basic Principles

- Under the Global Warming Research Initiative included in the sectoral promotion strategy of Environmental Sciences in the Second Science and Technology Basic Plan decided by the CSTP in September 2001, individual research projects which had been implemented by various ministries were integrated into the research programs noted below. Consequently, the related research and development has been collaboratively promoted among industry, academia, and government.

  a Comprehensive monitoring program for global warming
  b Research program for projecting global warming and climate change
  c Research program for assessing impacts and risks of global warming
  d Program for developing technologies to fix and sequester greenhouse gases
  e Technological development program for controlling greenhouse gas emissions caused by human activities, such as energy generation
  f Policy research program for controlling global warming

- The Third Science and Technology Basic Plan (from 2006 to 2010) adopted by the Cabinet in March 2006 again cited the academic field of Environmental Sciences as one of the four priority fields for allocating research and development resources. The Basic Plan also set out specific policy objectives that the science and technology sector should pursue, and cited "overcoming of global warming and energy problems" as one such objective.

- Japan participates in and cooperates with the World Climate Research Programme (WCRP), the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme of Global Environmental Change (IHDP), and other international global environmental research programs, conducts research and studies based upon the appropriate international division of tasks, and otherwise promotes joint research and other initiatives with overseas research organizations.

- Through the Asia-Pacific Network for Global Change Research (APN), Japan enhances activities related to global change research in the Asia-Pacific region, by cooperating with researchers throughout the region.

- In an effort to contribute to the development of government policy on climate change and global warming, Japan actively promotes research on global environmental problems from a human and social perspective, academic research integrating the natural and social sciences, and research on socioeconomic systems. Japan also cooperates with Global Environmental Strategies (IGES), which was established in March 1998 as an international research institute for the study of political and practical strategies to help realize sustainable development on a global scale, particularly with regard to the Asia-Pacific region.

- As agreed at the G8 L'Aquila Summit, the Government of Japan will continue to contribute to the development of GEOSS, promote the establishment of an integrated observation network employing satellite, oceanic and land observation systems centering on the Asia-Pacific region, monitor and evaluate the impact of climate change in the Asia-Pacific region, and provide information to national governments.

7.2.2 Priority Fields

Regarding research and studies on climate change and global warming, the Government of Japan, while taking into consideration the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, is comprehensively promoting research and studies on the observation and projection of global warming and its impact, the fixation, sequestration and reduction of greenhouse gases, global warming control policies and other countermeasures, and adaptation measures for environmental changes associated with global warming. In particular, since the issue of climate change projection uncertainties was identified by the IPCC's Fourth Assessment Report (AR4), Japan has addressed the reduction of these uncertainties mainly through the KAKUSHIN Program and by the Environment Research and Technology Development Fund. The latest results from this endeavor contributed to the Working Group I contribution to the IPCC's Fifth Assessment Report, and some of the projection results are being provided to developing countries for their regional adaptation studies. In FY2012, Japan launched the SOUSEI Program as a new five-year program to succeed the KAKUSHIN Program and to continue research activities using the Earth Simulator. Furthermore, as bilateral cooperation, Japan-EU workshops and Japan-US workshops on global

change projection studies are held biennially, in order to exchange information and compare projection results.

In the Asia-Pacific region, the following areas are prioritized based on strategic plan of the APN: (1) climate; (2) ecosystems, biodiversity, and land use; (3) changes in the atmospheric, terrestrial, and marine domains; (4) resource utilization and the pathways for sustainable development; and (5) cross-sectoral issues and collaboration between science and policy.

7.2.3 Main Research Fields

7.2.3.1 Research on Climate Processes and the Climate System, Including Paleoclimate Research

Research and studies have been carried out on the following subjects: research on the spatio-temporal variability and climate change impact of ozone and black carbon in Asia; analysis of seawater temperature in the Asian monsoon region based on coral dendroclimatology; and research on highly uncertain physical processes in climate models, such as the indirect effect of aerosols including the effect on cloud radiation forcing. In the SOUSEI Program, process studies focusing on the terrestrial ecosystem and mixed layers in the atmosphere or in the ocean are under way, with research results reflected in the development of climate models.

7.2.3.2 Climate Change Projection Modeling and Projection Studies

Climate change projection studies in the areas of projection model sophistication, quantification of uncertainties, and impact assessment in natural disasters have been conducted under the SOUSEI Program using the Earth Simulator. These studies fall under the following five themes: (1) prediction and diagnosis of imminent global climate change; (2) climate change projection contributing to stabilization target setting; (3) development of basic technology for risk information on climate change; (4) precise impact assessments on climate change; and (5) promotion for climate change research and linkage coordination.

Research being carried out through the Environment Research and Technology Development Fund includes the project Studies on Future Climate Projection in the Asian Region Utilizing the CMIP5 Multi-Model Ensemble Data.

7.2.3.3 Studies on Climate Change Impact

Research is being carried out in the project Experimental Study of Multiple Impacts of Global Warming and Ocean Acidification on Marine Species.

7.2.3.4 Socioeconomic Analysis, Including Analysis of both Climate Change Impact and Anticipated Reactions

Research is being carried out on the themes including the following: research project on establishing methodologies to evaluate medium- to long-term environmental policy options toward an Asian low-carbon society; and integrated research on the development of global climate risk management strategies.

7.2.3.5 Research and Development on Reduction and Adaptive Technology

Research is being carried out on the following themes: technological development for local governments to be able to reflect the results of global climate change projections in their climate change adaptation policies; and technologies of integrating and analyzing various data such as Earth observation data, global climate change projection data, etc., so as to provide scientific knowledge for planning climate change adaptation policies.

Currently, a total of 16 organizations from seven countries including Japan are participating in the International Research Network for Low Carbon Societies (LCS-RNet), whose establishment was approved at the G8 Environment Ministers' Meeting held in Syracuse, Italy, in April 2009. Research institutes of participating countries share information on research concerning low-carbon societies, promote research cooperation, and contribute to international policy-making processes on climate change, including the G8, by communicating research outcomes and recommendations. Furthermore, Japan and LCS-RNet proposed the establishment of a network called the Low Carbon Asia Research Network (LoCARNet) at the ASEAN+3 EMM held in October 2011 in Cambodia. The launch of LoCARNet was declared at a side event of the East Asia Low Carbon Growth Partnership Dialogue held in April 2012 in Japan. LoCARNet promotes research to support the development of policies for low-carbon growth by enabling dialogue between scientists and policy-makers. With Japan's lead, the APN launched the Low Carbon Initiatives Framework in 2012 in cooperation with LoCARNet in order to enhance joint research on mitigation, as well as a special framework focusing on the area of adaptation.

7.3 Systematic Observation

7.3.1 Basic Principles

- Observation and monitoring of climate change should be implemented in accordance with the Science and Technology Basic Plan (decided by the Government of Japan in March 2001) and the Earth Observation Promotion Strategy (proposed by the CSTP in December 2004). Bearing in mind Japan's contribution to the development of GEOSS based on the 10-Year Implementation Plan, organizations that carry out such observations and monitoring should adopt methods consistent with international observation and monitoring projects. In addition, the results of their activities should be available to ensure that the data is utilized effectively.

- Contributing to the development of GEOSS, the Government of Japan participates in and cooperates with international observation and monitoring programs conducted under the Global Environmental Monitoring System (GEMS), the Global Atmosphere Watch (GAW) Program, the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS), and the Joint World Meteorological Organization (WMO)/UNESCO Intergovernmental Oceanographic Commission (IOC) Technical Commission for Oceanography and Marine Meteorology (JCOMM). Japan also conducts wide-area observation and monitoring based on the appropriate sharing of international tasks. In addition, the government is also working to facilitate utilization of observation and monitoring data through joint research and knowledge networks such as the APN.

- It is important to effectively promote Earth observation by satellites with coordination on a worldwide scale in accordance with Japan's Plan for Satellite Development for Global Observation and Means for Advancing Data Usage, compiled in June 2005 by the Space Activities Commission. Accordingly, the Government of Japan is actively participating in the activities of the Committee on Earth Observation Satellites (CEOS) and other international forums and is promoting the development, launch, and operation of satellites in conformity with these activities. Furthermore, through GEOSS, the Government of Japan promotes integrated global observations combining satellite, aircraft, ship, and ground-based observation in cooperation with international organizations and research projects.

7.3.2 Priority Fields

The Government of Japan places special priority on promoting observations and monitoring necessary to identify the causes, status, and impacts of global warming and climate changes.
Observations and monitoring related to climate changes and global warming cover a wide area (and can include the entire globe), so Japan has actively been promoting the development of effective methods such as the utilization of various satellite sensors, as well as operating geostationary meteorological satellites.

7.3.3 Main Systematic Observations

7.3.3.1 Atmospheric Climate Observing Systems Including Atmospheric Constituent Measurement Systems

Japan is continuously strengthening its observation and monitoring systems and other measures to scrutinize the temporal and spatial distribution of greenhouse gases such as CO_2, CH_4, N_2O, CFCs, and tropospheric ozone. Homogeneous and high quality climate observations have been implemented over 150 meteorological stations in Japan for more than several decades. CLIMAT reports (the reporting format of monthly values from a land station set by the WMO) from some of these stations are exchanged internationally on a monthly basis. In a joint effort with Germany, Japan has been monitoring the reception rates and data quality of CLIMAT reports from all over the world under the framework of the WMO. Japan has also been providing quasi-real time climate change-related information based on climate data collected and analyzed through the above activities, both within and outside Japan. Data from geostationary meteorological satellites, such as cloud amounts, are used to monitor long-term changes in global radiation, and associated climate change. The Precipitation Radar (PR) aboard the Tropical Rainfall Measuring Mission (TRMM) satellite provides data for rainfall distribution in tropical and subtropical zones. In order to contribute to the further promotion of measures against global warming, including grasping the region-by-region status of greenhouse gas absorption and emissions, Japan launched the Greenhouse Gases Observing Satellite (GOSAT) in January 2009 and started publishing its observation data. Since 2012 Japan has been developing the successor satellite GOSAT-2, which features improved accuracy and density of observation. Moreover, in May 2012, Japan launched the Global Climate Observation Mission – Water (GCOM-W), which continuously observes water-related parameters such as water vapor and soil moisture, and has started publishing its observation data. Furthermore, Japan has been promoting the following activities: development of Dual-Frequency Precipitation Radar (DPR) for the Global Precipitation Measurement (GPM) project in order to contribute internationally in the field of global observation; development of the Global Climate Observation Mission – Climate (GCOM-C), which makes continuous global observations of climate changes using multi-band optical radiometers; development of GOSAT-2, which will mount sensors for observations of greenhouse gasses with higher accuracy than GOSAT; development of a comprehensive system to trace, analyze and forecast changes in the Sun as well as in the Earth’s upper atmosphere; international joint research for the development of comprehensive observation systems for the middle atmosphere; and joint research into global environmental measurement technologies in Asia.

Table 7.1 Participation in the Global Atmospheric Observing System

	GSN	GUAN	GAW	BSRN	Other
Number of stations	14	7	7	6	
Number of operating stations	14	7	7	6	
Number of stations operating to GCOS standards	14	7	7	6	
Number of stations expected to be operational in 2010	14	7	7	6	
Number of stations providing data to the International Data Center	14	7	7	6	

*As of January 1, 2014, including the Showa Station in the Antarctic.

Table 7.2 Terrestrial Atmospheric Observing Systems for Climate (Land Surface Meteorological Observations)

System	Climate parameters	Total stations	Appropriate for characterizing national/ regional climates?			Time series stations [digitized]			Adequate quality control procedures?			Meta data available, total stations [digitized (%)]	Continuity Stations expected to be operational in 2015
			Fully	Partly	No	30-50 years	50-100 years	More than 100 years	Fully	Partly	No		
Stations useful for national climate monitoring purposes	Atmospheric pressure	157	○			8 [8]	83 [83]	66 [66]	○			157 [100]	157
	Clouds	61	○			1 [2]	14 [59]	46 [0]	○			61 [100]	61
	Weather	155	○			7 [155]	82 [0]	66 [0]	○			155 [100]	155
	Humidity	157	○			8 [8]	82 [82]	67 [67]	○			157 [100]	157
	Precipitation	155	○			7 [7]	82 [82]	66 [66]	○			155 [100]	155
	Global solar radiation	49	○			11 [11]	38 [38]	0 [0]	○			49 [100]	49
	Sunshine duration	157	○			8 [8]	83 [83]	65 [65]	○			157 [100]	157
	Temperature	157	○			7 [7]	84 [84]	66 [66]	○			157 [100]	157
	Visibility	155	○			7 [155]	82 [0]	66 [0]	○			155 [100]	155
	Wind	156	○			8 [8]	82 [147]	65 [1]	○			156 [100]	156
Stations reporting internationally		53											
CLIMAT reporting Stations		53											

*As of January 1, 2014, including the Showa Station in the Antarctic.

Table 7.3 Available Homogenous Data Sets for Land Surface Meteorological Observations

Data set name	Climate parameters	Stations and region covered	Time period	Contact
Surface meteorological observation monthly and 10-day mean/total data file	Atmospheric pressure, clouds, weather, humidity, precipitation, global solar radiation, sunshine duration, temperature, wind	156 stations in Japan	1880s-2013	Japan Meteorological Agency
Surface meteorological observation daily mean/total data file	As above	As above	1880s-2013	Japan Meteorological Agency
Surface meteorological observation monthly mean/total data file	As above	As above	1880s-2013	Japan Meteorological Agency

*As of January 1, 2014.

Table 7.4 Atmospheric Observing Systems (Upper Air Meteorological Observations)

System	Total stations	Appropriate for characterizing national/regional climates?			Times Series Stations [digitized]				Adequate quality control procedures?			Meta data available, total stations [digitized (%)]	Continuity Stations expected to be operational in 2015
		Fully	Partly	No	5-10 years	10-30 years	30-50 years	More than 50 years	Fully	Partly	No		
Radiosonde stations	17	○			0	0	8 [8]	9 [9]	○			17 [100]	17
Stations reporting internationally	17												
CLIMAT TEMP reporting stations	17												
Wind profiler stations	33			0	0	0	0	○				33 [100]	33

*As of January 1, 2014, including the Showa Station in the Antarctic.

Table 7.5 Available Homogenous Data Sets for Upper Air Meteorological Observations

Data set name	Climate parameters	Stations and area covered	Time series	Contact
Upper air meteorological observation daily mean/total data file	Humidity, temperature, wind, altitude	16 stations in Japan Data at standard atmospheric pressure levels	1988-2013	Japan Meteorological Agency
Upper air meteorological observation monthly mean/total data file	As above	As above	1951-2013	Japan Meteorological Agency

*As of January 1, 2014.

Table 7.6 Atmospheric Constituent Observing Systems for Climate

System	Total stations	Appropriate for characterizing national climate?			Times series stations [digitized]				Adequate quality control procedures?			Meta data available, total stations [digitized (%)]	Continuity Stations expected to be operational in 2015
		Fully	Partly	No	10-20 years	20-30 years	30-50 years	More than 50 years	Fully	Partly	No		
CO_2	26	○			22 [22]	4 [4]	0	0	○			26 [100]	26
Vertical CO_2 distribution	41	○			41 [41]	0	0	0	○			41 [100]	41
Surface ozone	15	○			13 [13]	2 [2]	0	0	○			9 [100]	15
Total ozone	6	○			0	1 [1]	2 [2]	2 [2]	○			6 [100]	6
Vertical ozone distribution	4	○			0	0	2 [2]	2 [2]	○			4 [100]	4
Other greenhouse gases	25	○			23 [23]	2 [2]	0	0	○			25 [100]	25
Aerosols	9	○			9 [9]	0	0	0	○			9 [100]	9
Vertical aerosols distribution	17	○			3 [3]	0	0	0	○			17 [100]	17

*As of January 1, 2014.

Total of the Meteorological Agency's observation stations (including the Showa Station in the Antarctic) and the National Institute for Environmental Studies' observation stations.

Table 7.7 Atmospheric Observing Systems for Climate (BSRN)

System	Total stations	Appropriate for characterizing national climate?			Times series stations [digitized]				Adequate quality control procedures?			Meta data available, total stations [digitized (%)]	Continuity Stations expected to be operational in 2015
		Fully	Partly	No	10-20 years	20-30 years	30-50 years	More than 50 years	Fully	Partly	No		
Surface radiation	6	○					2 [2]	4 [4]	○			6 [100]	6

*As of January 1, 2014.
Total of the Meteorological Agency's observation stations (including the Showa Station in the Antarctic).

7.3.3.2 Ocean Observing System for Climate

Japan has been promoting the development of the GOOS, and is also contributing actively to its regional pilot project, the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS).

Furthermore, Japan has been making efforts to enhance observation and monitoring systems, and other measurements, to determine time-and-space-related distributions of CO_2 in the ocean, while continuous observation has been implemented at nationwide observation points to monitor changes in sea levels. Oceanographic observations have also been carried out to monitor oceanic changes associated with climate changes in the western North Pacific. With the aim of elevating the sophistication of climate change projection models, Japan has been improving the marine observation system by deploying Triton buoys in the tropical Western Pacific since 1998, and by deploying ARGO floats since 2000 under the Advanced Ocean Observing System (ARGO Project). In addition, under international cooperation such as the WMO, Japan has been promoting oceanographic and marine meteorological observations by ordinary ships, deployment of drifting buoys, and automatic shipboard upper-air observations. Moreover, Japan has been promoting the following activities: publishing the water-related observation data of GCOM-W, such as water vapor, soil moisture, and so on; development of GCOM-C, which will make continuous global observations, including the ocean, using multi-band optical radiometers; provision of data on the rainfall distribution in tropical and subtropical zones using the PR aboard the TRMM satellite; development of a DPR to be mounted on the main satellite for the GPM project; and research into remote sensing technologies.

7.3.3.3 Terrestrial Observing Systems for Climate

Japan has been carrying out the following: monitoring of greenhouse gas flux in northern forests; observation of CO_2 and CH_4 by the GOSAT; development of the Advanced Land Observing Satellite-2 (ALOS-2) with a higher accuracy radar sensor than ALOS; provision of data on the rainfall distribution in tropical and subtropical zones using the PR aboard the TRMM satellite; development of a DPR to be mounted on the main satellite for the GPM project; publishing the water-related observation data of GCOM-W such as water vapor, soil moisture, and so on; development of the GCOM-C, which will make continuous global observations of climate changes and will use multi-band optical radiometers;

development of the GOSAT-2 satellite, which will mount sensors for observations of greenhouse gasses with higher accuracy and a wider observation range than GOSAT, and with the object of observing regional level changes in CO_2 and methane flux in forests and megacities; and research into remote exploration technologies for carrying out terrestrial environmental observations of vegetation amounts (biomass), land use, changes in land coverage, ground moisture, and snow and ice. Furthermore, by comprehensive observation of short-lived climate pollutants (e.g., black carbon), GOSAT-2 will contribute to accumulating scientific knowledge about their movement. Under the framework for the worldwide network of energy, water vapor, and greenhouse gas flux observations (FLUXNET), long-term monitoring has begun at 30 sites in various ecosystems in Japan by many domestic institutions. Promotion of an Asian regional network (AsiaFlux), development of a database, and capacity building have been conducted as well.

7.3.3.4 Support for Developing Countries to Establish and Maintain Observation Systems, Relevant Data, and Monitoring Systems

Japan has been conducting joint research on global environmental observation and promoting technical transfers in order to build observation networks in Asia in areas lacking such facilities. Japan has also been promoting the establishment of strategic environmental monitoring systems using satellites in the Asia-Pacific region, pilot projects concerning the utilization of satellite data through the Asia-Pacific Earth Observation Pilot Project, and capacity development.

Chapter 8

Education, Training, and Public Awareness

8.1 Approaches to Policies and Measures

CO_2 emissions have been consistently increasing in recent years in the residential sector, which is closely related to public life. To mitigate global warming, everyone must shift from the "mass consumption and disposal lifestyle" to one that people engage in resource and energy conservation and recycling. At the same time, the use of non-fossil fuel energy, including renewable energy, should be considered.

To these ends, the Government of Japan provides opportunities to learn about global warming, as well as the energy issues closely involved at home education, school education and social education. Japan promotes improved awareness through advertising in the mass media, distributing pamphlets, and holding symposiums. Japan is also committed to increasing support for environmental NGOs, which promise to play a leading role as advisors in public efforts to address global warming.

The Government of Japan will actively provide and share, in as visible a manner as possible, knowledge about the increasingly serious global warming issue, the specific actions for which enormous efforts are needed in order to curb GHG emissions, and information about what each individual must do. The Government of Japan will also carry out public relations and dissemination activities on these topics in order to improve the awareness of households and businesses and rouse them to take action.

8.2 Promotion of Environmental Education and Study

8.2.1 Outline

In June 2011, the Low for promotion of Environmental Conservation Activities though Environmental Education, etc. was established and subsequently came into full force in October 2012 after a Cabinet Decision on its basic policy (at a Cabinet meeting held in June 2012).

At Japan's proposal, the United Nations Decade of Education for Sustainable Development (UNDESD) (2005-2014) was launched. The Government of Japan established an Interministerial Meeting within the Cabinet and formulated Japan's Implementation Scheme for the UNDESD in March 2006, and revised it in June 2011.

In order to have efforts to prevent global warming take root in people's daily lives, the Government of Japan proactively provides venues and opportunities in households, schools, communities, and businesses to learn about the importance of protecting the global environment, links between the global warming

problem and people's everyday lives, energy problems closely associated with global warming, and concrete examples of practicable efforts to mitigate global warming.

In particular, the Government of Japan will promote the implementation of hands-on environmental education and energy conservation activities in school facilities that play a central regional role. This will be done through measures such as renovations, including the introduction of heat insulation materials and the utilization of locally harvested timber that would contribute to global warming countermeasures, the introduction of new energy devices, and the use of the Internet to promote support for global warming countermeasures in households. In combination with these measures, the Government of Japan will continue to advance the development of teaching materials and programs that would encourage understanding and actions by the public in collaboration with concerned entities such as NPOs.

In addition, the Government of Japan will promote various hands-on activities in forests and green park areas in order to deepen understanding of their role in preventing global warming, and show the necessity of forest development, the cyclical use of timber resources, and the value of urban greening, among other topics.

8.2.2 Specific Measures

- Promotion of Environmental Education Provided by Schools

  By revising the Courses of Study for elementary and junior high schools in March 2008 and for high schools in March 2009, Japan upgraded the contents of environmental education, focusing on closely related subjects such as social studies, science, and technical and homemaking courses. The new Courses of Study for elementary schools was launched in April 2011 and for junior high schools in April 2012. For high schools, the mathematics and science courses were launched for students who entered schools in FY2012, and the other subjects for students who entered in FY2013. As a specific measure to promote environmental education, the Government of Japan is also conducting research and studies on this new type of environmental education, implemented environmental leadership training projects for teachers and citizens involved in environmental activity, etc., and certified GLOBE (Global Learning and Observations to Benefit the Environment) model schools and environmentally friendly school facilities (eco-schools).

  Japan has been using recycled paper in textbooks as an opportunity to deepen students' understanding of recycling.

- Environmental Education and Studies at Home, School, Workplace, A Local Community, and Any Places

  In order to help building up cooperation among community centers and other relevant organizations in respective regions so as to better address environmental issues and thus increase learning activities, the Government of Japan is undertaking projects to provide prioritized support to

particularly excellent regional efforts and to disseminate information on such efforts nationwide to promote similar efforts.

The government is also promoting environmental education at youth educational facilities, providing them with opportunities for hands-on environmental education in rich natural environments, and with activities for experiences in nature.

Based on the Law for Promotion of Environmental Conservation Activities through Environmental Education, etc., environmental education at home, school, workplace, a local community and any places promotes activities based on the point of view of Education for Sustainable Development (ESD) and provides information and opportunities including global warming issues.

- Promotion of ESD Activities

  The efforts of the UNDESD, which the Government of Japan advocated at the Johannesburg Summit in 2002, have been promoted all over the world since 2005. In 2014, the last year of the Decade of the UNESCO World Conference on ESD will be held in Japan. Therefore, the Government of Japan has been promoting various activities in order to prevent global warming as well as advancing efforts related to ESD.

- Junior Park Ranger Project

  Since 1999 the government has been running the Junior Park Ranger project, which provides opportunities for elementary and junior high school students to get hands-on experience in various environmental conservation activities by communing with nature in national parks and other sites. The project has been promoting children's interaction with nature and deepening their understanding of environmental conservation. In FY2012, the project was conducted at a total of 13 national parks and other sites.

- Environmental Education in Urban Parks

  The government has been promoting urban parks as centers for public environmental activities and for the training of leaders. In order to improve awareness and encourage urban greening, the Green Consultation Center has been established. In addition, the government is promoting activities for the conservation, creation, and management of green park areas with the participation and cooperation of local citizens.

- Support for Forest Environmental Education Activities

  The Government of Japan is providing support for various forest experience activities aimed at children and forest environmental education activities by local residents. The government is also supporting the forest environmental education activities, for example, by constructing a network for environmental education about the use of timber.

The government has also established “Forests for Students” as places in National Forests for experience-based activities led by schools. Experience-based activities held by the Forestry Agency and the provision of information and technical instruction are also being implemented.

- Promotion of the UNDESD
  The Ministry of Education, Culture, Sports, Science and Technology has been promoting ESD, and working on various efforts based on the philosophy of ESD, while defining UNESCO Schools as a base for promoting ESD. The number of UNESCO Schools in Japan reached 647 as of October 2013. In November 2014, the last year of the UNDESD, the UNESCO World Conference on ESD will be held in Nagoya city, Aichi prefecture, and in Okayama city. At the conference, future strategies will be discussed while reviewing and following up the UNDESD.

8.3 Activities for Promoting the Prevention of Global Warming

8.3.1 Outline

In order to mitigate global warming, it is necessary for each member of the public to modify their own lifestyle, and this requires public awareness and action.

The Government of Japan will encourage voluntary actions by each individual citizen by strongly appealing to public awareness. This will be done through the appropriate provision of information using diverse methods. In doing so, the government will work to foster a sound sense of crisis, using the latest scientific knowledge, and to provide information and educate the public concerning what specific actions or purchases will contribute to the limitation of greenhouse gas emissions or the promotion of sink measures.

8.3.2 Specific Measures

- Development of National Campaigns (COOL BIZ, WARM BIZ)
  In order to promote understanding across all sectors of society, including the nation and business sector, and to allow them to absolutely understand specific global warming prevention actions, the government will disseminate knowledge and develop national campaigns while collaborating with local governments, business circles, NPOs, labor circles, and researchers.

  Specifically, with respect to countermeasures concerning the reduction of greenhouse gas emissions, there have been coordinated campaigns using the Internet, television, newspapers, and radio, which have enlightened people to take various global warming prevention actions including setting heaters and air conditioners to appropriate temperatures.
  As one example of these efforts, the Government of Japan is promoting the COOL BIZ and WARM BIZ, which encourage people in offices to wear clothes that enable them to set the air conditioner to 28C° in the summer and set the heating to 20C° in the winter, and to live comfortably at these room temperatures.

- Measures through the Japan Center for Climate Change Actions and Prefectural Centers for Climate Change Actions

  In accordance with the Law Concerning the Promotion of the Measures to Cope with Global Warming, enacted in April 1999 and revised in June 2008, the Japan Center for Climate Change Actions and Prefectural Centers for Climate Change Actions have been engaged in activities to help raise public awareness and publicize global warming countermeasures.

  The Japan Environment Association was designated as the Japan Center for Climate Change Actions in July 1999, and its name was changed to the Japan Network for Climate Change Actions in October 2010. As of September 2013, a total of 55 regional centers for climate change actions have been designated across Japan, serving as promoters of global warming countermeasures in their respective regions.

- Activities of the Global Warming Prevention Activities Advisors

  In accordance with the Law Concerning the Promotion of the Measures to Cope with Global Warming, activities which are aiming at controlling the emission of greenhouse gases related to daily life by providing advice and seeking to improve public awareness have been carried out by global warming prevention activities advisors designated by prefectural governors and so on.

- Promotion of Green Purchasing

  The Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Law on Promoting Green Purchasing) established in 2000 stipulates the Basic Policy on Promoting Green Purchasing in order to comprehensively and systematically promote the procurement of environmentally friendly goods and services. The national and local governments are stipulating their goods and services procurement policies in line with this Basic Policy and implementing priority procurement of environmentally friendly goods and services. The law also requires local governments, businesses, and the public to endeavor to select environmentally friendly goods and services. In order to contribute to this selection process, the government is providing information through the Internet and is involved in public education activities such as green purchase information sessions.

- Measures Focusing on Environment Month

  Both the national and local governments engage in various efforts to raise public awareness regarding environmental conservation. These activities are mainly conducted in June, which is Japan's Environment Month, and particularly on June 5, which is Japan's annual Environment Day. Specific activities include: the Eco-Life Fair, an environment-themed exhibition; various lectures, symposiums, and events; preparation and distribution of pamphlets and posters; the commendation of parties who provide outstanding environmental conservation services; and public relations campaigns using such media as television, radio, newspapers, and magazines.

- Measures Focusing on Global Warming Prevention Month

  December has been designated Japan's Global Warming Prevention Month and the national and local governments promote various activities to further this aim. Specifically, the following have been promoted: various events, such as holding symposiums that contribute to global warming prevention; the commendation of parties who provide environmental conservation services; and PR campaigns conducted in various media.

- Measures Focusing on Ozone Layer Conservation Promotion Month

  September has been designated Japan's Ozone Layer Conservation Promotion Month, which is associated with the International Day for the Preservation of the Ozone Layer on September 16. Various ozone layer conservation and global warming prevention related activities have been promoted, including those focused on reducing emissions of ozone layer depleting substances and the three groups of fluorinated gases, such as HCFs. Some types of activities include the distribution of brochures and posters, the holding of briefing meetings on the Fluorocarbons Recovery and Destruction Law to raise public awareness about the recovery of CFCs, and the commendation of companies and organizations that have contributed to ozone layer conservation and the mitigation of global warming.

- Measures Focusing on the 3R Promotion Month

  October has been designated Japan's 3R (reduce, reuse, and recycle) Promotion Month, when the national and local governments promote various activities to help raise public awareness about 3R activities. Specific examples of such activities and events for the month include the holding of the 3R Promotion National Convention, the Minister of the Environment's award-giving to Persons of Merit in Promoting 3R Activities and Winners of the 3R Poster Contest, as well as an Award Ceremony for Resource-Recycling Technologies and Systems designed to promote recycling businesses at the National Convention.

- Promotion of Visualization of Greenhouse Gas Emissions by Building the Carbon Footprint System

  In order to help promote businesses' efforts to efficiently reduce greenhouse gas emissions as well as to induce consumer behavior promoting emission reductions through choices of lower-emission products and services, the Government of Japan is promoting the creation and spread of the carbon footprint system. This system involves displaying greenhouse gas emissions generated throughout a product or service's life cycle, from the procurement of raw materials to its disposal and recycling, in terms of the amount of CO_2 emitted, in a simple and easy-to-understand manner.

- Awareness Campaign for Energy Conservation

  In order to promote cooperation on energy conservation measures in all sectors of society, the Council for Promoting Energy and Resource Conservation Related Measures decides on "summer (winter) energy conservation measures" every year, and strengthens its awareness campaigns in conjunction with various ministries and agencies during these seasons in which energy consumption tends to increase.

Furthermore, in order to promote energy saving in the industrial, residential and commercial, and transport sectors, public relations activities are being undertaken to inform the public of concrete energy-saving behaviors in an easy-to-understand manner through advertisements, events, the Web, brochures, etc.

- 3R Awareness Campaign

  In order to disseminate and promote 3R awareness, the Government of Japan operates the website "Re-style" to help improving public awareness through the Internet.

- Measures for Renewable Energy

  For public relations regarding the Feed-in Tariff introduced in July 2012, the Government of Japan hosts briefing sessions and symposiums, utilizes media such as the Internet and radio, runs advertisements, uploads information on Facebook and Twitter, as well as creates content and holds events regarding Japan's general renewable energy policy.

- Provision of Information Related to Nuclear Power

  Since the incident occurred at Fukushima Daiichi Nuclear Power Plant, the Government of Japan has been steadily carrying out public relations activities, for promoting public understanding as well as energy policy including nuclear energy policy.

- Awareness Campaign for Use of Wood Products

  The national and local governments are advancing the Wood Products Awareness Campaign, in which a range of awareness campaigns concerning use of wood products are carried out, particularly the Wood Products Awareness Promotion Month in October. Various events are held, pamphlets and posters are prepared and distributed, and public relations activities are carried out through a variety of media.

- Awareness Campaign for National Greenery and Urban Greening

  Examples of awareness campaigns concerning national greenery and urban greening include the development of public participation greening campaigns such as national greening campaigns during Greenery Month, Urban Greening Month, etc., as well as promoting the establishment of private sector forests, greening activities funded through charity collections, and urban greening funds.

- Development of the National Movement for Fostering Beautiful Forests in Japan

  With broad public understanding and cooperation, the government is promoting to build a rich, green, recycling-oriented society that promotes appropriate forest development through use of timber, fostering lively activities of people and robust communities to support forests, and a wide range of participation by urban citizens and businesses in afforestation activities.

- Awareness Campaign for Transport Sector Environmental Issues

  Environmental measures for the transport sector are being promoted throughout Japan by implementing specific measures and improving awareness of global environmental issues through activities including the creation of pamphlets, etc., concerning global warming issues, energy conservation measures such as Eco-drive, and environmental issues for the transport sector such as air pollution problems. This information is distributed to local governments, related industrial circles, and the general public.

- Awareness Campaign for Fuel-Efficient Vehicles

  Fuel-efficient vehicles have been promoted by preparing and distributing the Automobile Fuel Efficiency List, showing fuel efficiency and carbon dioxide emissions from vehicles, and by providing the latest information through the Internet.

- Provision of Information on the Current Status and Future Projections of Global Warming

  Japan has been encouraging the general public to become more aware of the latest information on climate change with publications describing its monitoring results, and future projections, such as "Climate Change Monitoring Report", "Global Warming Projections", "Report on, Extreme Weather" and "Climate Change in Japan and Its Impacts".

  In March 2013, the government published "Global Warming Projections Vol. 8," which shows more detailed global warming projections over Japan compared to previous volumes by using advanced global and regional climate models.

  Furthermore, the Japanese translation of the Summary for Policymakers (SPM) of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) has also been prepared and published.

8.4 Support for Environmental NGOs

8.4.1 Outline

The vital activities and healthy development of environmental NGOs and similar private groups are indispensable for the success of mitigating global warming. Such groups can also play important roles as leaders or advisors in efforts to get the general public involved. However, many groups do not have the sufficient financial resources needed to operate adequately and have depended on assistance from the national and local governments. Japan is committed to strengthening financial support for environmental NGOs and other private groups while preserving the original intent of their activities.

8.4.2 Specific Measures

- Model Projects for Creating Local Recycling Zones

The Ministry of the Environment is soliciting applications for advanced projects that private sector entities and businesses undertake through collaboration with local governments toward establishing a sound material-cycle society and that can serve as models of "projects for creating local recycling zones" for other areas. By implementing these as demonstration projects, the Ministry is striving to discover and support local efforts toward forming a recycling-oriented society.

- Japan Fund for the Global Environment

  The Japan Fund for the Global Environment was transferred from the jurisdiction of Japan Environment Corporation to that of the Environmental Restoration and Conservation Agency of Japan in April 2004. Every year the Fund provides about 200 subsidies and other support for global warming prevention, recycling, and nature conservation-related activities undertaken by environmental NGOs both within Japan and abroad.

- Funds for the Conservation of the Local Environment by Local Governments

  Local governments also support environmental conservation activities by NGOs and similar groups through their respective funds for the conservation of the local environment.

- Activities of the Global Environment Outreach Centre, etc.

  Based on the Law for Promotion of Environmental Conservation Activities through Environmental Education, etc., business operators, NPOs, and others are given information including seminars and exhibitions and provided places to communicate in order to promote environmental preservation activities, etc., so that nations, private organizations, and the national and local governments will be able to cooperate with each other on an equal footing.

- Support for Forestry Collaboration in the Private Sector

  The Forestry Agency has been promoting sustainable forest management in developing countries. The following are being implemented through this project.

  1) Support for formulating green projects implemented by NGOs.
  2) Strengthening of cooperation with NGOs.
  3) Training of engineers engaging in forestry collaboration.

- Provision of Opportunities for Forest Establishment Activities

  The government is providing leader training and safety and technical training to groups involved in forest establishment and is providing support for activities such as Activity Forests and other fields within national forests.