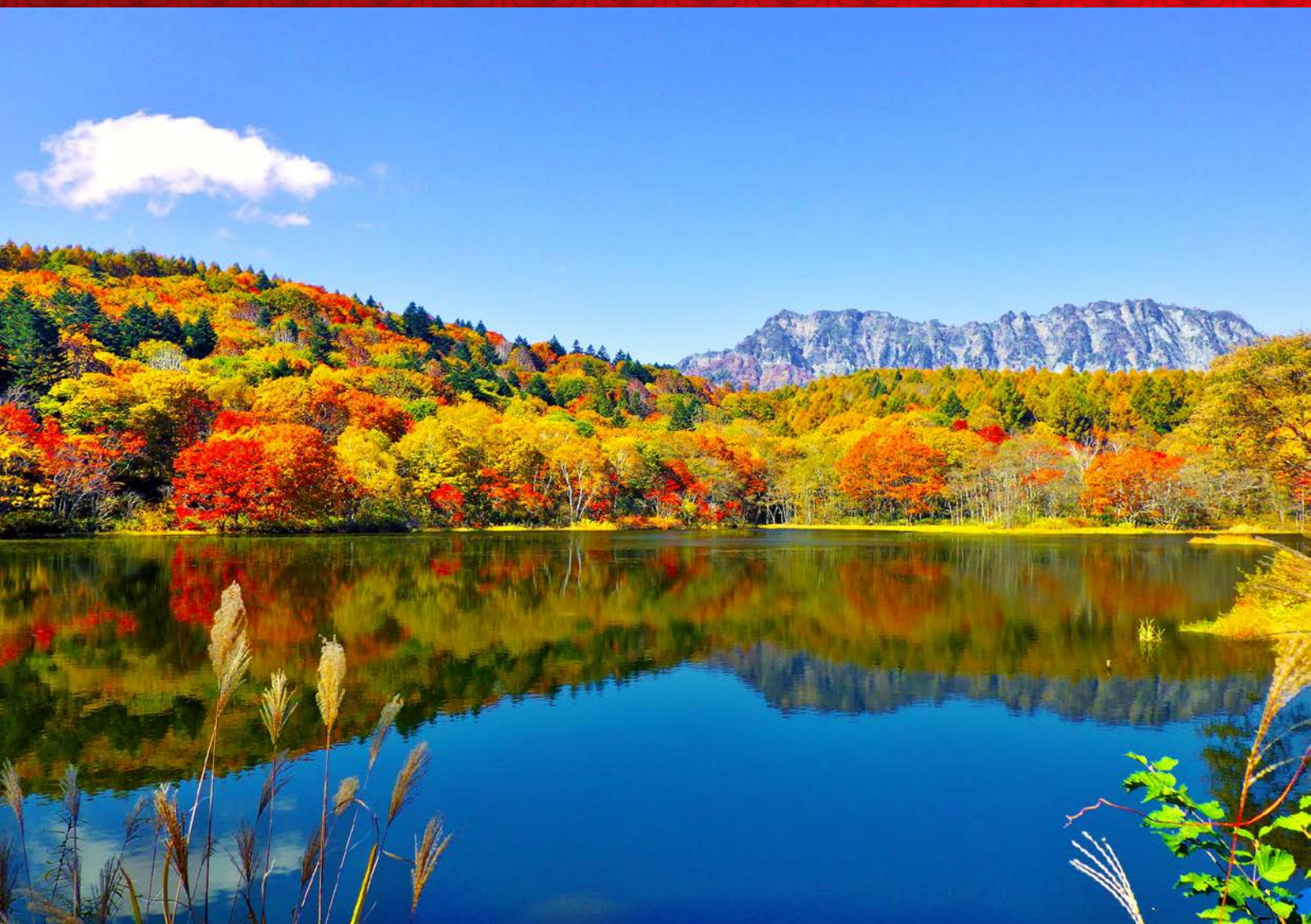
The Government of Japan

Japan's Fourth Biennial Report

under the United Nations Framework Convention on Climate Change

December 2019



Introduction

Prior to the United Nations Framework Convention on Climate Change (UNFCCC) adopted in 1992, Japan formulated the Action Program to Arrest Global Warming in 1990 and has been implementing measures to address climate change issues. Subsequently, the Kyoto Protocol was adopted at the third session of the Conference of the Parties (COP 3) in 1997, and Japan established the Global Warming Prevention Headquarters at the Cabinet, and comprehensive and systematic measures have been implemented under the Act on Promoting Global Warming Countermeasures and the Kyoto Protocol Target Achievement Plan. As a result of the implementation of those measures, the greenhouse gas (GHG) emission reduction target in the first commitment period of the Kyoto Protocol was achieved. Even after the first commitment period of the Kyoto Protocol, the GHG emission reduction target for fiscal year (FY) 2020 based on the Cancun Agreement adopted at COP 16 was announced at COP 19. In addition, Japan prepared the Intended Nationally Determined Contribution (INDC) stipulated in the COP 19 Decision, and Japan has decided on the Japan's INDC, including the mid-term targets for FY 2030 and submitted it to the UNFCCC secretariat. At the 32nd Global Warming Prevention Headquarters on December 22 2015, the Action Policy for Global Warming Countermeasures based on the Paris Agreement was adopted and Japan decided to make steady efforts to achieve the emission reduction target for FY 2030 and commit to a long-term and strategic contribution to the reduction of global emissions taking into account the 2 degrees goal that the Paris Agreement set out as a common global goal, and Japan aims to achieve a balance between anthropogenic GHG emissions by sources and removals by sinks in the second half of this century. Furthermore, Japan formulated the Plan for Global Warming Countermeasure based on the Act on Promoting Global Warming Countermeasures, the Government Action Plans in line with the plan, and has been taking the initiative and strengthening the public campaign. In light of this trend, Japan ratified the Paris Agreement in November 2016. In June 2019, the Japanese government formulated Japan's Long-term Strategy under the Paris Agreement for development of a lower GHG gas emission society and submitted it to the UNFCCC secretariat. In this context, Japan is implementing further measures to combat global warming.

COP 16 decided that developed country parties should submit Biennial Reports (BR) including information on the progress of emission reductions achieved and mitigation actions to achieve their quantified economy-wide emission reduction targets, projection of GHG emissions and removals and the provision of financial, technological and capacity building support (Decision 1/CP.16). The COP 17 decided that developed country parties shall submit the first Biennial Report (BR1) by January 1, 2014, and subsequent BRs every two years. And COP 17 also adopted the UNFCCC biennial reporting guidelines for developed country Parties (Decision 2/CP.17, Annex I) that stipulates the reporting matters to be reported in the BRs. At COP 18 and COP 21, the Common Tabular Format (CTF), which developed country parties shall use to report the information required in the BR was adopted (Decision 19/CP.18, Annex and 9/CP.21, Annex). In accordance with the provisions above, Japan hereby submits its fourth Biennial Report (BR4).

The structure of this report is consistent with the reporting elements specified in the BR reporting guidelines. Chapter 1 "Information on Greenhouse Gas Emissions and Trends" provides information on greenhouse gas emissions and trends between FY 1990 and FY 2017, consistent with Japan's National Greenhouse Gas Inventory that Japan submits annually to the UNFCCC in accordance with Article 4 and 12 of the UNFCCC and Decision 2/CMP.8. Chapter 2 "Quantified Economy-Wide Emission Reduction Target" reports Japan's greenhouse gas emission reduction targets for FY 2020 and FY 2030. Chapter 3 "Progress in Achievement of Quantified Economy-Wide Emission Reduction Targets and Relevant Information" presents information on the progress made toward achieving the GHG emission reduction targets and mitigation actions for achieving the targets. Chapter 4 "Projections" presents projections of Japan's GHG emissions and removals in FY 2020 and FY 2030. Chapter 5 "Financial, Technological and Capacity-building Support" reports information on the financial, technological and capacity-building support to developing countries provided by Japan in order to support climate change measures in developing countries.

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Chapter 1

Information on Greenhouse Gas Emissions and Trends

1.1 Description of GHG Emissions and Removals

1.1.1 Overview of Greenhouse Gas Inventory

Background Information on Japan's Greenhouse Gas Inventory

Japan reported the greenhouse gas (GHG) inventories in April 2019, which contain information on emissions and removals of GHGs, including precursors (nitrogen oxides [NO_X], carbon monoxide [CO], non-methane volatile organic compounds [NMVOC]), and sulfur oxides [SO_X] in Japan from FY 1990 to FY 2017[1] on the basis of Article 4 and 12 of the United Nations Framework Convention on Climate Change (UNFCCC) and Decision 2/CMP.8.

Estimation methodologies for the GHG inventories are required to be in line with the *2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 IPCC Guidelines)*, which were made by the Intergovernmental Panel on Climate Change (IPCC), and Japan's estimation methodologies are basically in line with these guidelines. In order to enhance transparency, consistency, comparability, completeness, and accuracy of the inventory, Japan also applies the *2013 Supplement to the 2006 IPCC Guidelines: Wetlands (Wetlands Guidelines)* and the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (KP Supplement [2013])*.

Japan's national inventory was reported in accordance with the *UNFCCC Reporting Guidelines on Annual Greenhouse Gas Inventories* (Decision 24/CP.19 Annex I, hereinafter referred to as the *UNFCCC Inventory Reporting Guidelines*) decided by the Conference of the Parties.

Brief General Description of Methodologies

The methodology used in the estimation of GHG emissions or removals is in accordance with the *2006 IPCC Guidelines*. The country-specific methodologies are also used for some source/sink categories in order to more accurately reflect the actual emission status in Japan.

The results of the actual measurements or estimates based on research conducted in Japan are used to determine the EFs (country-specific emission factors). The default values given in the *2006 IPCC Guidelines* are used for estimation of emissions, which are assumed to be quite low and are not investigated well.

Sectors

Japan's national GHG inventory is composed of GHG emissions and removals (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3) and precursors (NO_x, CO, NMVOC and SO_x). These emissions are estimated by five sectors (Energy; Industrial Processes and Product Use (IPPU); Agriculture; Land Use, Land-Use Change and Forestry [LULUCF]; and Waste).

(1) Energy

Emissions from the energy sector consist of two main categories: fuel combustion (1.A) and fugitive emissions (1.B) from fuels. Fuel combustion (1.A) includes emissions released into the atmosphere when fossil fuels (e.g., coal, oil products, and natural gas) are combusted. Fugitive

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

emissions are intentional or unintentional releases of gases from fossil fuels by anthropogenic activities. In particular, the emissions from fuel combustion (1.A) are a significant emission source accounting for nearly 90% of total GHG emissions (excluding LULUCF). It is composed of five subcategories, Energy industries (1.A.1), including emissions from mainly public electricity and heat production; Manufacturing industries and construction (1.A.2), including emissions from the manufacturing and construction industries; Transport (1.A.3), including emissions from the transport of passengers and freight; Other sectors (1.A.4), including commercial/institutional, residential, agriculture/forestry/fishing; and Other (1.A.5).

In Japan, fossil fuels are used to produce energy for a wide variety of purposes (e.g., production, transportation, and consumption of energy products) and CO_2, CH_4, N_2O, NOx, CO, and NMVOC are emitted in the process.

(2) Industrial Processes and Product Use (IPPU)

The Industrial Processes and Product Use (IPPU) sector deals with GHG emissions resulting from chemical and physical transformations in the 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), non-energy products from fuels and solvent use, and HFCs, PFCs, SF_6 and NF_3 emissions at the stage of production, use, and discharge are estimated. It also deals with N_2O emissions resulting from the use of anesthetics (e.g., laughing gas) and NMVOC emissions from solvent production and uses such as paint, metal cleansing, and dry cleaning, are estimated.

(3) Agriculture

The agriculture sector deals with GHG emissions resulting from agricultural activities. In particular, 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, CO_2 from application of limestone, and urea into the soil etc. are estimated.

(4) Land Use, Land-Use Change and Forestry (LULUCF)

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—forestland, cropland, grassland, wetlands, settlements, and other land—and subdivides each of them into two subcategories by distinguishing them on the basis of whether or not land conversion has occurred in accordance with the *2006 IPCC Guidelines*; a default value of 20 years was used when distinguishing land conversion. GHG emissions and removals in this sector consist of carbon stock changes in five carbon pools (aboveground biomass, belowground biomass, dead wood, litter, and soil), carbon stock changes in harvested wood products (HWP) on forestland, direct N_2O emissions from N fertilization in forestland, CH_4 and N_2O emissions from drainage of organic soils, N_2O emissions from nitrogen mineralization resulting from change of land use or management of mineral soils, indirect N_2O emissions from managed soils, and non-CO_2 emissions from biomass burning.

(5) Waste

In the waste sector, GHG emissions from the treatment and disposal of waste are estimated for solid waste disposal, biological treatment of solid waste, incineration and open burning of waste, wastewater treatment and discharge, and others[2] in accordance with treatment processes. The "waste" to be covered in this sector is waste as defined in the *2006 IPCC Guidelines*. Waste sector estimates GHG emissions from not only incineration and disposal of municipal and industrial waste, which are defined by the Waste Disposal and Public Cleansing Law, but also energy or material use of recycled materials.

1.1.2 Trends in GHG Emissions and Removals

Total GHG emissions in FY 2017[3] (excluding LULUCF, including indirect CO_2[4], definition omitted below) were 1,292 million tonnes (in CO_2 equivalent) ($MtCO_2$ eq.). They increased by 1.3% compared to FY 1990, decreased by 6.5% compared to FY 2005, and decreased by 8.4% compared to FY 2013. The main driving factor for the decrease in GHG emissions compared to FY 2005 which is the base year of the emission reduction target for the year 2020 is decreasing energy-related CO_2 by the decrease in energy consumption due to energy savings while the HFCs emissions increased as a result of substitution from ozone depleting substance (ODS) in the refrigeration and air conditioning sector.

Net removals[5] (including CO_2, CH_4 and N_2O emissions) from the LULUCF sector in FY 2017 were 57.5 $MtCO_2$ eq.), which accounted for 4.4% of total GHG emissions. They decreased by 8.0% compared to FY 1990, by 37.1% compared to FY 2005, and by 13.2% compared to FY 2013. The long-term declining trend in removals from 2003 is largely due to the maturity of Japanese forests.

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[2] Data for some emission source categories in the waste sector are complemented by estimation, when statistical data or related data are not available. The methodologies for this estimation are not described in this chapter. For details, refer to the *Report of the Waste Panel on Greenhouse Gas Emission Estimate (2006)* and the website of the Ministry of the Environment, *Review of Greenhouse Gases Emissions Estimation Methods* (http://www.env.go.jp/earth/ondanka/santeiho/kento/index.html).

[3] The sum of CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3 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 *Fourth Assessment Report* (2007) issued by the IPCC.

[4] Carbon monoxide (CO), methane (CH_4) and non-methane volatile organic compounds (NMVOC) are oxidized in the atmosphere in the long term and converted to CO_2. Indirect CO_2 means the value in CO_2 equivalent of these emissions. However, emissions of derived from combustion origin and biomass origin of CO, CH_4, and NMVOC are excluded to avoid double counting and/or by the concept of carbon neutral.

[5] Note: Since the national GHG 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 under the Kyoto Protocol.

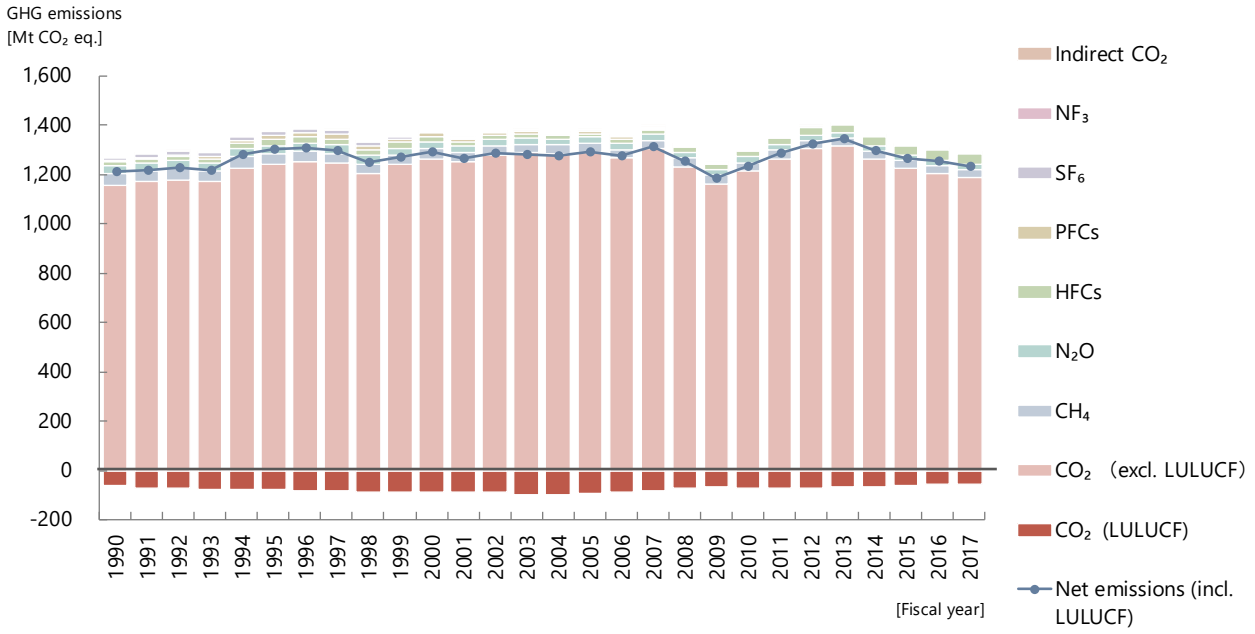


Figure 1-1 Trends in GHG emissions and removals in Japan

1.1.3 Trends in GHG Emissions and Removals by Gas

In FY 2017, CO_2 emissions were 1,188 Mt (excluding LULUCF, excluding indirect CO_2), accounting for 92.0% of total GHG emissions. CH_4 emissions (excluding LULUCF) were 30.1 $MtCO_2$ eq. (2.3%), N_2O emissions (excluding LULUCF) were 20.5 $MtCO_2$ eq. (1.6%), Indirect CO_2 emissions were 2.1 $MtCO_2$ eq. (0.2%), and total emissions of HFCs, PFCs, SF_6 and NF_3 in CY 2017 were 51 $MtCO_2$ eq. (3.9%).

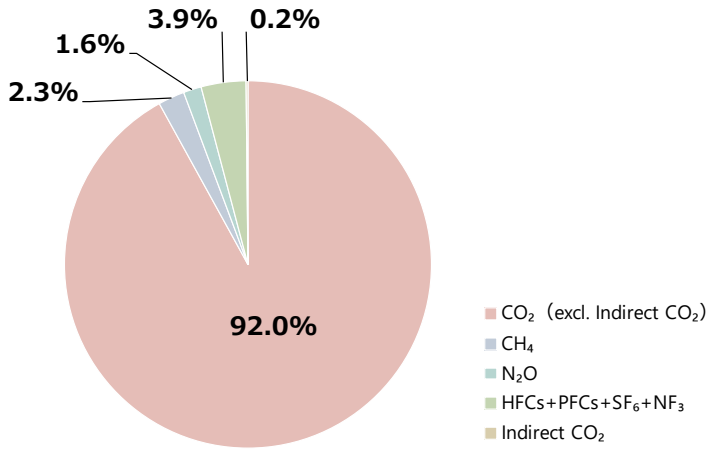


Figure 1-2 Proportion of GHGs emissions (excluding LULUCF)

Table 1-1 Trends in GHGs emissions (excluding LULUCF)

GHGs	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
CO_2	1,158.5	1,240.0	1,265.0	1,290.3	1,214.4	1,315.1	1,224.5	1,188.1	**-7.9%**
CH_4	44.3	41.9	38.0	35.7	34.5	32.3	30.8	30.1	**-15.7%**
N_2O	31.8	33.2	29.9	25.0	22.3	21.6	20.8	20.5	**-18.3%**
HFCs	15.9	25.2	22.9	12.8	23.3	32.1	39.3	44.9	**+251.1%**
PFCs	6.5	17.6	11.9	8.6	4.2	3.3	3.3	3.5	**-59.3%**
SF_6	12.9	16.4	7.0	5.1	2.4	2.1	2.2	2.1	**-57.7%**
NF_3	0.0	0.2	0.3	1.5	1.5	1.6	0.6	0.4	**-69.4%**
Indirect CO_2	5.5	4.7	4.2	3.2	2.4	2.2	2.2	2.1	**-33.6%**
Total	1,275.5	1,379.2	1,379.1	1,382.1	1,305.1	1,410.3	1,323.6	1,291.7	**-6.5%**

CO_2

(1) Trends in CO_2 Emissions

CO_2 emissions in FY 2017 were 1,188 Mt, accounting for 92.0% of total GHG emissions. They increased by 2.6% compared to FY 1990, decreased by 7.9% compared to FY 2005, and decreased by 9.7% compared to FY 2017.

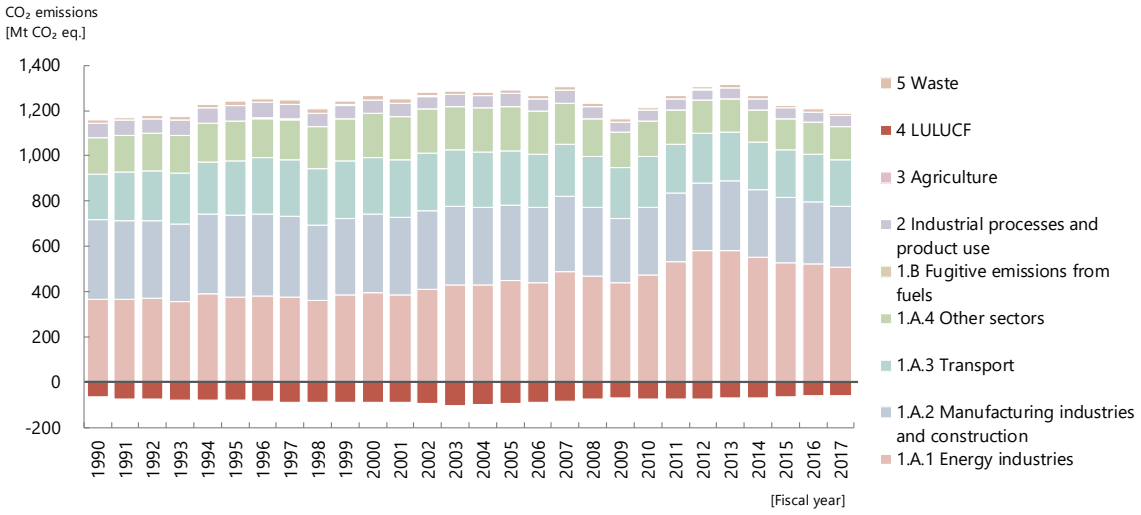


Figure 1-3 Trends in CO_2 emissions

The breakdown of CO_2 emissions in FY 2017 shows that fuel combustion (1.A) accounts for 95.0%, and is followed by industrial processes and product use (4.0%) and waste (1.0%). As for the breakdown of CO_2 emissions within the fuel combustion category, energy industries (1.A.1) account for 42.7% and is followed by manufacturing industries and construction (1.A.2) at 23.0%, transport (1.A.3) at 17.3%, and other sectors[6] (1.A.4) at 12.1%. The main driving factor for the increase in CO_2 emissions since FY 1990 is the CO_2 emissions from electricity power generation in the energy industries (1.A.1). This is because the electricity generation increased

[6] It covers emissions from commercial/institutional, residential and agriculture/forestry/fishing.

because of to the increase in electricity demand and the shift of fuels from petroleum to coal that is affordable and procurable progressed after the oil crisis in the 1970s. Since then, thermal power generation has increased because of the suspension of nuclear power plants after the Great East Japan Earthquake in 2011, which resulted in a significant increase in emissions. However, emissions have continued to decrease since FY 2014 by saving energy, introducing high-efficiency devices and renewable energy, and restarting nuclear power plants.

By looking at the changes in emissions by sector, emissions from fuel combustion in the energy industries increased by 37.6% compared to FY 1990, increased by 12.8% compared to FY 2005, and decreased by 12.9% compared to FY 2013. The main driving factor for the increase compared to the emissions in FY 1990 is the increased solid fuel consumption for electricity power generation. Emissions from manufacturing industries and construction decreased by 22.0% compared to FY 1990, by 18.4% compared to FY 2005, and by 11.1% compared to FY 2013. Emissions from transport increased by 2.1% compared to FY 1990, decreased by 13.7% compared to FY 2005, and decreased by 4.6% compared to FY 2013. The main driving factor for the increase compared to the emissions in FY 1990 is the increase in emissions from passenger vehicles, compensating for the decrease in emissions from freight road transportation. Emissions from other sectors decreased by 10.2% compared to FY 1990, by 27.0% compared to FY 2005, and by 3.4% compared to FY 2013.

CO_2 removals in FY 2017 were 57.7 Mt, which were equivalent to 4.9% of total GHG emissions. They decreased by 8.0% compared to FY 1990, by 37.0% compared to FY 2005, and by 13.1% compared to FY 2013.

Table 1-2 Trends in CO_2 emissions and removals in each sector

Category	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
1 Energy	1,079.0	1,155.4	1,186.5	1,218.5	1,153.7	1,252.6	1,164.8	1,128.9	**-5.7%**
1.A Fuel combustion	1,078.8	1,154.9	1,186.0	1,218.0	1,153.3	1,252.2	1,164.3	1,128.4	**-7.4%**
1.A.1 Energy industries	368.5	378.9	395.5	449.7	473.8	582.0	526.9	507.1	**+12.8%**
1.A.2 Manufacturing industries and construction	349.7	357.6	346.6	334.2	300.4	306.6	290.4	272.7	**-18.4%**
1.A.3 Transport	201.0	242.0	252.7	237.8	222.0	215.1	208.9	205.2	**-13.7%**
1.A.4 Other sectors	159.6	176.4	191.2	196.4	157.1	148.5	138.2	143.4	**-27.0%**
1.B Fugitive emissions from fuels	0.2	0.5	0.5	0.5	0.5	0.4	0.4	0.5	**-6.1%**
2 Industrial processes and product use	65.7	67.5	60.3	56.8	47.5	49.2	47.1	47.3	**-16.8%**
3 Agriculture	0.6	0.4	0.4	0.4	0.4	0.6	0.6	0.6	**+34.3%**
4 LULUCF	-62.8	-77.6	-88.2	-91.6	-70.8	-66.4	-59.8	-57.7	**-37.0%**
5 Waste	13.1	16.7	17.6	14.6	12.8	12.7	12.1	11.4	**-21.6%**
Total (including LULUCF)	1,158.5	1,240.0	1,265.0	1,290.3	1,214.4	1,315.1	1,224.5	1,188.1	**-5.7%**

(2) CO_2 Emissions per Capita, CO_2 Emissions per Unit of GDP

CO_2 emissions per capita in FY 2017 were 9.38 tCO_2/capita. They increased by 0.1% compared to FY 1990, decreased by 7.1% compared to FY 2005, and decreased by 9.1% compared to FY 2013.

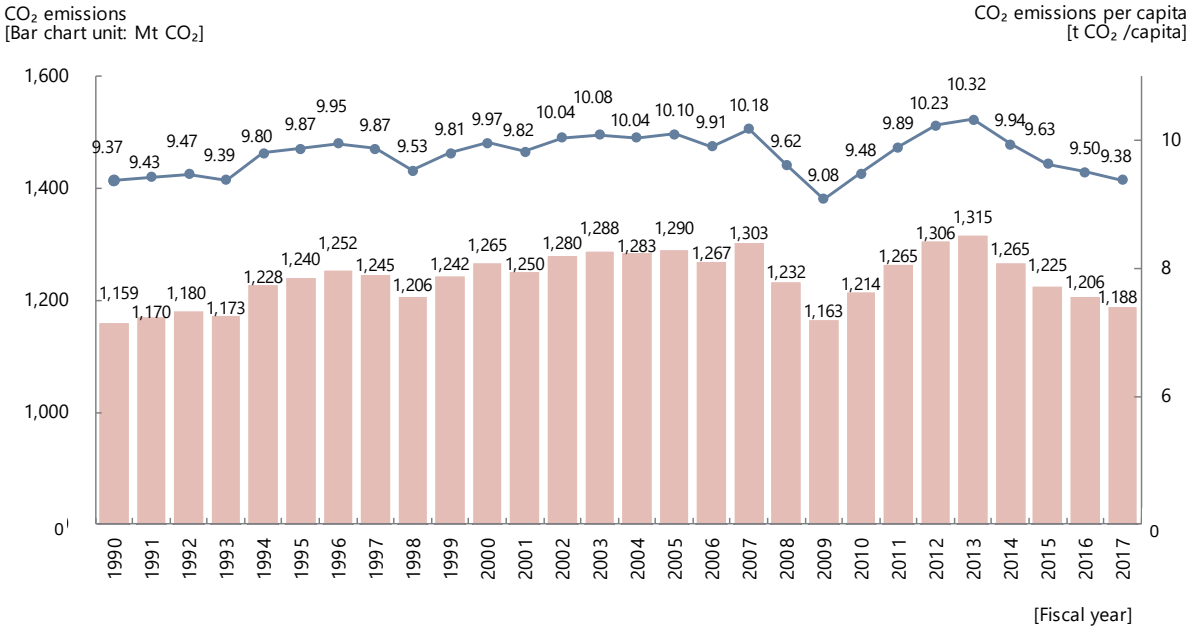


Figure 1-4 Trends in total CO_2 emissions and CO_2 emissions per capita

Source of population data: Ministry of Internal Affairs and Communications, Statistics Bureau, Population Census and Annual Report of Population Estimates

CO_2 emissions per unit of GDP (million yen) in FY 2017 were 2.23 tCO_2/million yen. They decreased by 20.6% compared to FY 1990, by 14.7% compared to FY 2005, and by 12.9% compared to FY 2013.

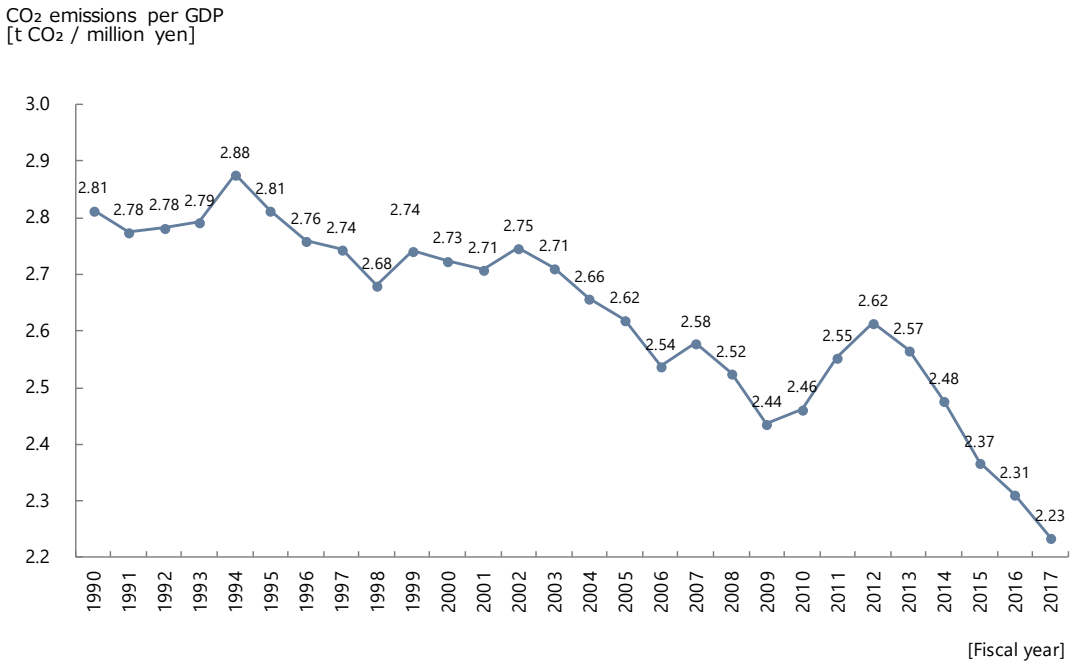


Figure 1-5 Trend in CO_2 emissions per unit of GDP

Source of GDP data: Cabinet Office, Government of Japan, Annual Report on National Accounts

CH_4

CH_4 emissions in FY 2017 were 30.2 $MtCO_2$ eq. (including LULUCF), accounting for 2.3% of total GHG emissions. They decreased by 32.1% compared to FY 1990, by 15.6% compared to FY 2005, and by 6.8% compared to FY 2013. Their decrease since FY 1990 is mainly a result of a 61.4% decrease in emissions from the waste sector (solid waste disposal).

The breakdown of the CH_4 emissions in FY 2017 showed that the largest source was the agriculture sector accounting for 77.3%, followed by the waste sector (16.1%). In the agriculture sector, rice cultivation (3.C) is the largest source accounting for 45% of total CH_4 emissions and followed by enteric fermentation (3.A) (24%). In the waste sector, solid waste disposal (5.A) is the largest source accounting for 10% of total CH_4 emissions.

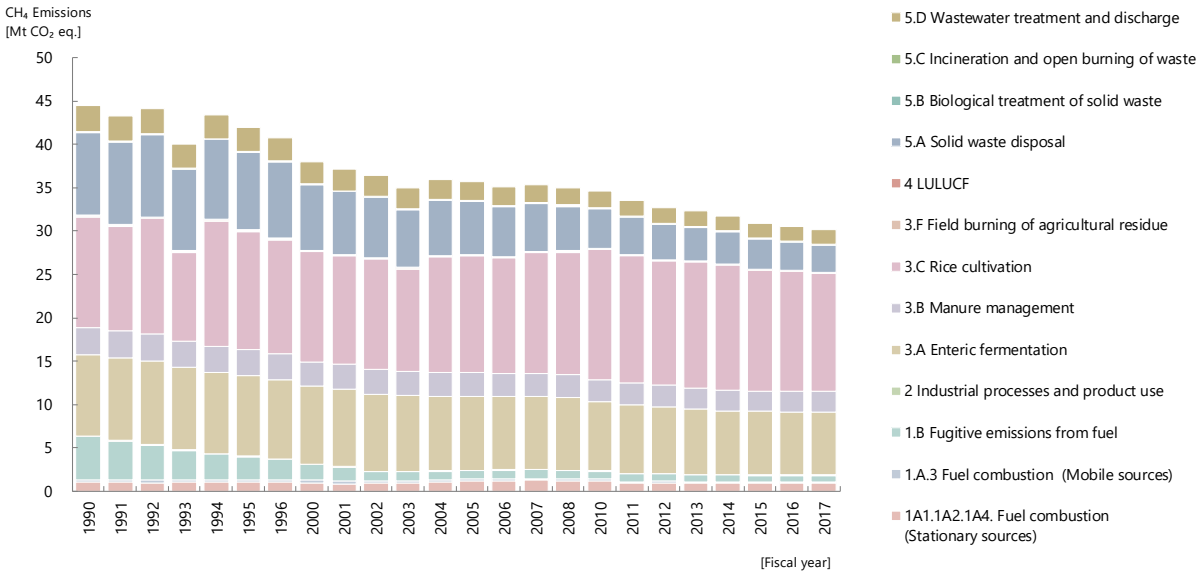


Figure 1-6 Trends in CH_4 emissions

Table 1-3 Trends in CH_4 emissions

Category	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
1 Energy	6.3	4.0	3.1	2.4	2.3	1.9	1.8	1.9	-23.0%
1.A Fuel combustion	1.3	1.4	1.3	1.4	1.4	1.1	1.1	1.1	-26.5%
1.A.1 Energy industries	0.5	0.4	0.3	0.2	0.3	0.2	0.2	0.2	-15.7%
1.A.2 Manufacturing industries and construction	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	+11.4%
1.A.3 Transport	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	-45.9%
1.A.4 Other sectors	0.2	0.3	0.3	0.5	0.5	0.2	0.2	0.2	-56.0%
1.B Fugitive emissions from fuels	5.0	2.6	1.8	1.0	0.9	0.8	0.8	0.8	-18.0%
2 Industrial processes and product use	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	-20.6%
3 Agriculture	25.4	26.0	24.6	24.8	25.6	24.6	23.7	23.3	-5.9%
4 LULUCF	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	+11.8%
5 Waste	12.6	11.8	10.2	8.4	6.5	5.7	5.3	4.9	-42.3%
Total (including LULUCF)	44.4	41.9	38.0	35.7	34.6	32.4	30.9	30.2	-15.6%

N_2O

N_2O emissions in FY 2017 were 20.6 $MtCO_2$ eq. (including LULUCF), accounting for 1.6% of total GHG emissions. They decreased by 35.5% compared to FY 1990, by 18.2% compared to FY 2005, and by 5.2% compared to FY 2013. Their decrease since FY 1990 is mainly a result of an 89.8% decrease in emissions from industrial processes and product use (e.g., adipic acid production in the chemical industry). There is a sharp decline in emissions from the industrial processes and product use from FY 1998 to 1999, as N_2O abatement equipment came on stream in the adipic acid

production plant in March 1999. However, the N_2O emissions increased in FY 2000 because of a decrease in the equipment's operation rate due to mechanical failure; the emissions decreased again in FY 2001 with the resumption of normal operation.

The breakdown of the N_2O emissions in FY 2017 showed that the largest source was the agriculture sector accounting for 45.3% of total N_2O emissions, followed by fuel combustion (stationary sources) (22.4%). In the agriculture sector, agricultural soils (3.D) is the largest source accounting for 26% of total N_2O emissions and followed by enteric fermentation (3.A) (19%). In the fuel combustion sector, energy industries (1.A.1) is the largest source accounting for 11% of total N_2O emissions.

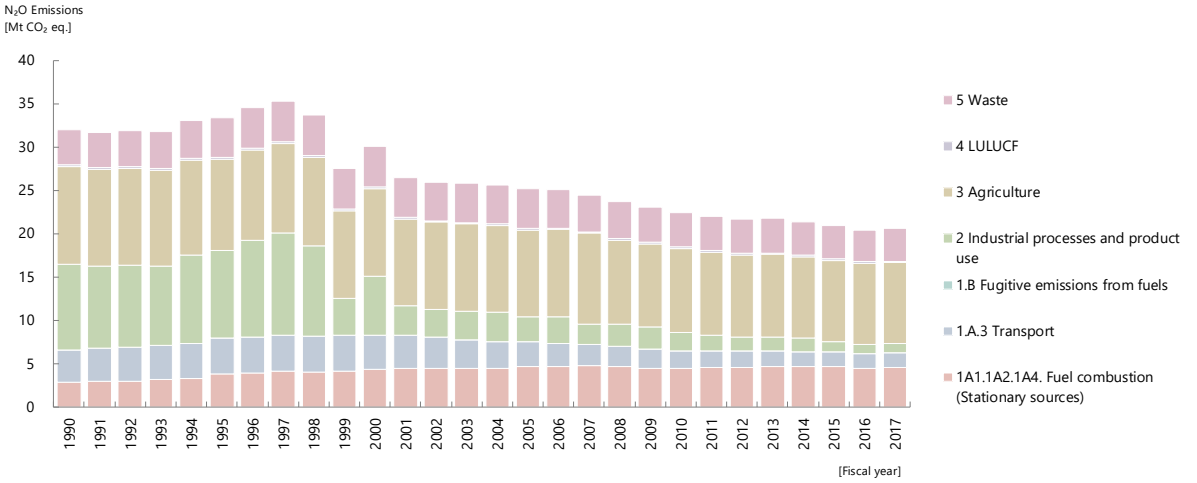


Figure 1-7 Trends in N_2O emissions

Table 1-4 Trends in N_2O emissions

Category	Eemissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
1 Energy	6.6	7.9	8.3	7.6	6.5	6.5	6.4	6.3	**-16.6%**
1.A Fuel combustion	6.6	7.9	8.3	7.6	6.5	6.5	6.4	6.3	**-16.6%**
1.A.1 Energy industries	0.9	1.4	1.6	2.1	2.1	2.4	2.3	2.3	**+10.2%**
1.A.2 Manufacturing industries and construction	1.3	1.7	1.9	1.9	1.7	1.8	1.7	1.7	**-11.6%**
1.A.3 Transport	3.7	4.1	4.0	2.8	2.0	1.8	1.7	1.7	**-40.3%**
1.A.4 Other sectors	0.7	0.8	0.9	0.8	0.7	0.6	0.6	0.6	**-15.9%**
1.B Fugitive emissions from fuels	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**-29.5%**
2 Industrial processes and product use	9.9	10.1	6.7	2.9	2.1	1.6	1.2	1.0	**-65.3%**
3 Agriculture	11.3	10.6	10.2	10.0	9.7	9.5	9.4	9.3	**-6.3%**
4 LULUCF	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	**-0.2%**
5 Waste	4.0	4.5	4.6	4.6	4.0	4.0	3.9	3.8	**-17.2%**
Total (including LULUCF)	32.0	33.4	30.1	25.2	22.5	21.8	21.0	20.6	**-18.2%**

HFCs

HFCs emissions in CY 2017[7] were 44.9 Mt CO_2 eq., accounting for 3.5% of total GHG emissions. They increased by 181.7% compared to CY 1990, by 251.1% compared to CY 2005 and by 39.8% compared to CY 2013. Their increase since CY 1990 is mainly a result of an increase in emissions from refrigeration and air conditioning (+41.1 MtCO_2 eq.) substituting for HCFC (an ozone

[7] Emissions of HFCs, PFCs, SF_6, and NF_3 are estimated on a calendar year (CY) basis.

depleting substance), despite a decrease in emissions of HFC-23 (-99.8%) produced as 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. (Act No.53, 1988)

The breakdown of the HFCs emissions in CY 2017 showed that the largest source was refrigerants of refrigeration and air conditioning equipment (2.F.1) accounting for 92% of total HFCs emissions.

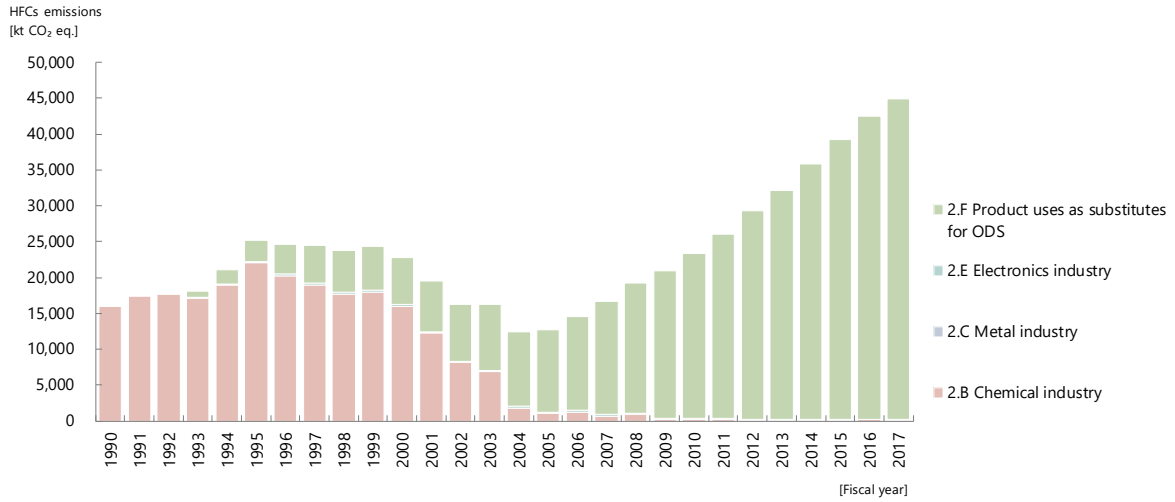


Figure 1-8 Trends in HFCs emissions

Table 1-5 Trends in HFCs emissions

Category	Emissions [kt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
2.B Chemical industry	15,930.2	22,019.0	15,984.2	1,035.5	181.3	147.4	112.6	133.4	**-87.1%**
2.C Metal industry	NO	NO	NO	NO	NO	1.3	0.9	1.4	**－**
2.E Electronics industry	0.7	270.9	284.6	227.0	167.9	111.6	115.0	125.0	**-44.9%**
2.F Product uses as substitutes for ODS	1.3	2,923.3	6,583.2	11,521.6	22,966.5	31,844.3	39,032.2	44,625.5	**+287.3%**
Total	15,932.3	25,213.2	22,852.0	12,784.0	23,315.8	32,104.7	39,260.6	44,885.4	**+251.1%**

PFCs

PFCs emissions in CY 2017 were 3.5 Mt CO_2 eq., accounting for 0.3% of total GHG emissions. They decreased by 46.3% compared to CY 1990, decreased by 59.3% compared to CY 2005 and increased by 7.1% compared to CY 2013. Their decrease since CY 1990 is mainly the result of a decrease in emissions from the solvents (-67.4%).

The breakdown of the PFCs emissions in CY 2017 showed that the largest source was semiconductor manufacture (2.E.1) accounting for 53% of total PFCs emissions, followed by solvents such as those for washing metals (2.F.5) (42%).

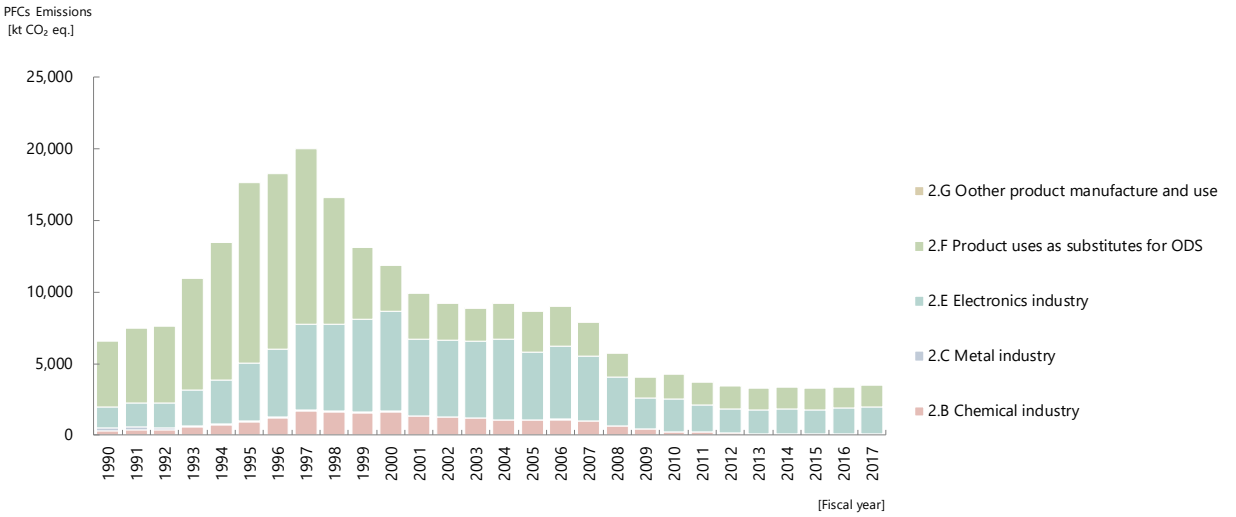


Figure 1-9 Trends in PFCs emissions

Table 1-6 Trends in PFCs emissions

Category	Emissions [kt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
2.B Chemical industry	330.9	914.4	1,661.3	1,040.6	248.4	110.8	114.6	77.7	**-92.5%**
2.C Metal industry	203.7	103.6	26.4	21.8	15.3	9.6	NO	NO	**－**
2.E Electronics industry	1,454.8	4,019.8	6,985.6	4,746.1	2,260.8	1,631.4	1,668.7	1,931.1	**-59.3%**
2.F Product uses as substitutes for ODS	4,549.9	12,572.2	3,199.8	2,814.6	1,720.7	1,517.9	1,517.0	1,483.9	**-47.3%**
2.G Oother product manufacture and use	NO	NO	NO	0.3	4.3	10.4	7.8	19.5	**+6660.2%**
Total	6,539.3	17,609.9	11,873.1	8,623.4	4,249.5	3,280.1	3,308.1	3,512.1	**-59.3%**

SF_6

SF_6 emissions in CY 2017 were 2.1 $MtCO_2$ eq., accounting for 0.2% of total GHG emissions. They decreased by 83.4% compared to CY 1990, decreased by 57.7% compared to CY 2005, and increased by 1.6% compared to CY 2013. Their decrease since CY 1990 is mainly a result of a decrease from electrical equipment, due to an enhancement of gas management system such as gas recovery largely in electric power companies. (-92.4%)

The breakdown of the SF_6 emissions in CY 2017 showed that the largest source was other product use (e.g., accelerator, etc.) (2.G.2) accounting for 41% of total SF_6 emissions, followed by electrical equipment (2.G.1) (29%).

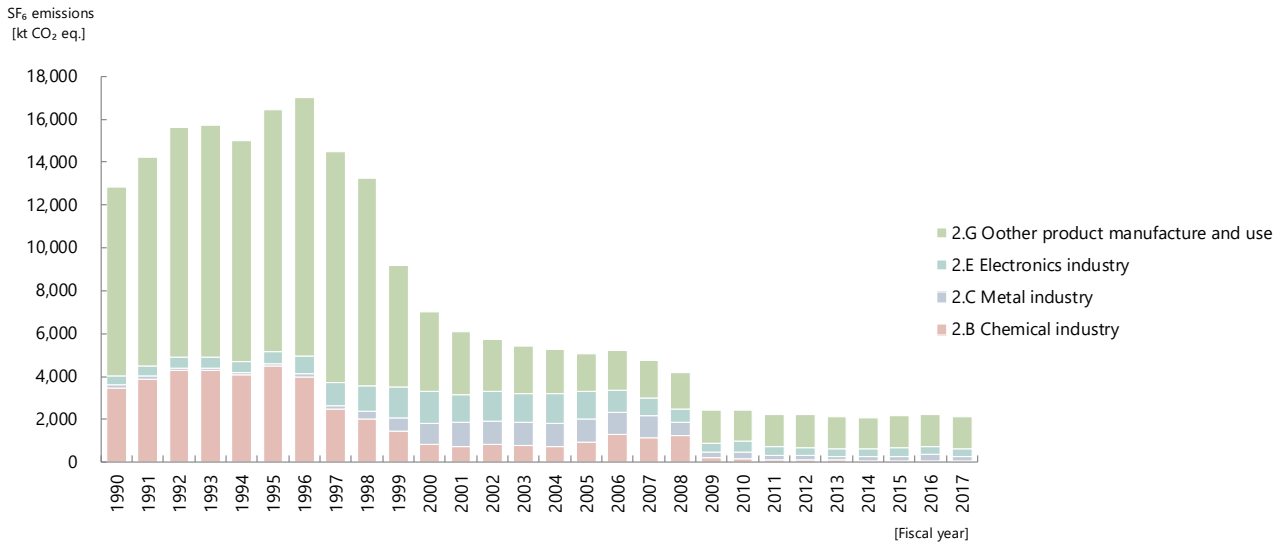


Figure 1-10 Trends in SF_6 emissions

Table 1-7 Trends in SF_6 emissions

Category	Emissions [kt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
2.B Chemical industry	3,470.8	4,491.6	820.8	930.2	189.2	92.8	52.4	40.7	**-95.6%**
2.C Metal industry	146.5	114.0	980.4	1,104.0	293.7	159.6	228.0	246.2	**-77.7%**
2.E Electronics industry	418.7	541.9	1,506.0	1,252.0	493.7	351.3	375.2	362.6	**-71.0%**
2.G Oother product manufacture and use	8,814.0	11,300.1	3,724.2	1,766.8	1,447.2	1,498.1	1,497.0	1,485.6	**-15.9%**
Total	12,850.1	16,447.5	7,031.4	5,053.0	2,423.9	2,101.8	2,152.7	2,135.1	**-57.7%**

NF_3

NF_3 emissions in CY 2017 were 0.4 $MtCO_2$ eq., accounting for 0.03% of total GHG emissions. They increased by 1,279.3% compared to CY 1990, decreased by 69.4% compared to CY 2005, and decreased by 72.2% compared to CY 2013. The increase since CY 1990 is mainly a result of an increase in fugitives from fluorochemical production (NF_3) (by 8,292.8%).

The breakdown of the NF_3 emissions in CY 2017 showed that the largest source was fluorochemical production (2.B.9) accounting for 52% of total NF_3 emissions, followed by semiconductor manufacture (2.E.1) (43%).

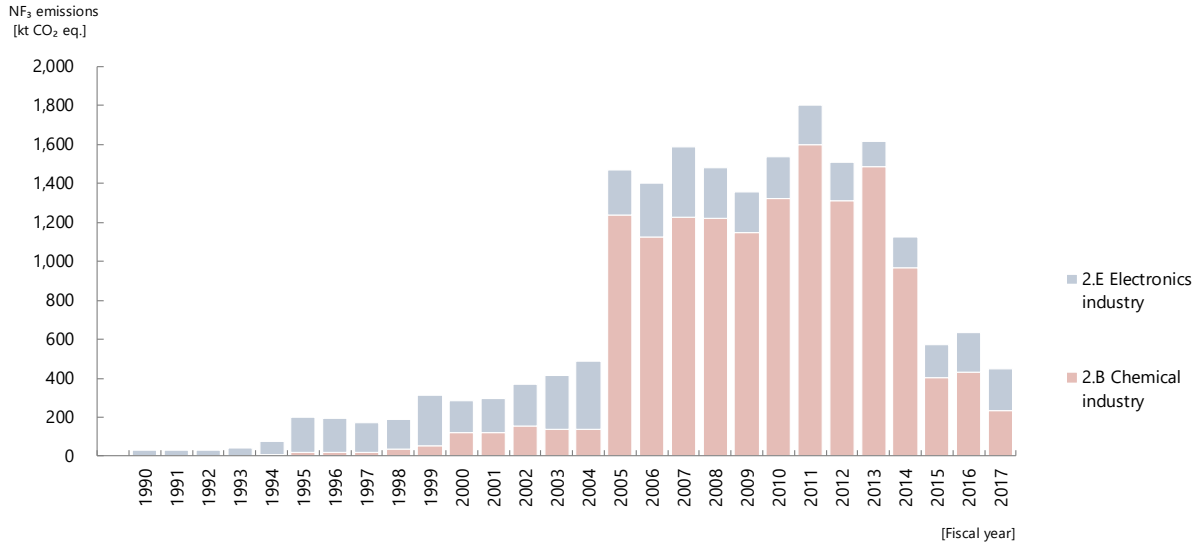


Figure 1-11 Trends in NF_3 emissions

Table 1-8 Trends in NF_3 emissions

Category	Emissions [kt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
2.B Chemical industry	2.8	17.2	120.4	1,240.1	1,322.7	1,486.1	404.2	234.1	**-81.1%**
2.E Electronics industry	29.8	183.9	165.4	231.6	217.1	131.2	166.8	215.7	**-6.9%**
Total	32.6	201.1	285.8	1,471.8	1,539.7	1,617.2	571.0	449.8	**-69.4%**

Indirect CO_2

Indirect CO_2[8] emissions in FY 2017 were 2.1 $MtCO_2$ eq., accounting for 0.2% of total GHG emissions. They decreased by 61.3% compared to FY 1990, by 33.6% compared to FY 2005, and by 5.5% compared to FY 2013. Their decrease since FY 1990 was due to the decrease in indirect CO_2 emissions derived from NMVOC from the use of paint through the wider use of low VOC paint and VOC removal by adsorption devices.

[8] Emissions derived from combustion-origin and biomass-origin CO, CH_4, and NMVOC are excluded to avoid double counting and/or by concept of carbon neutrality.

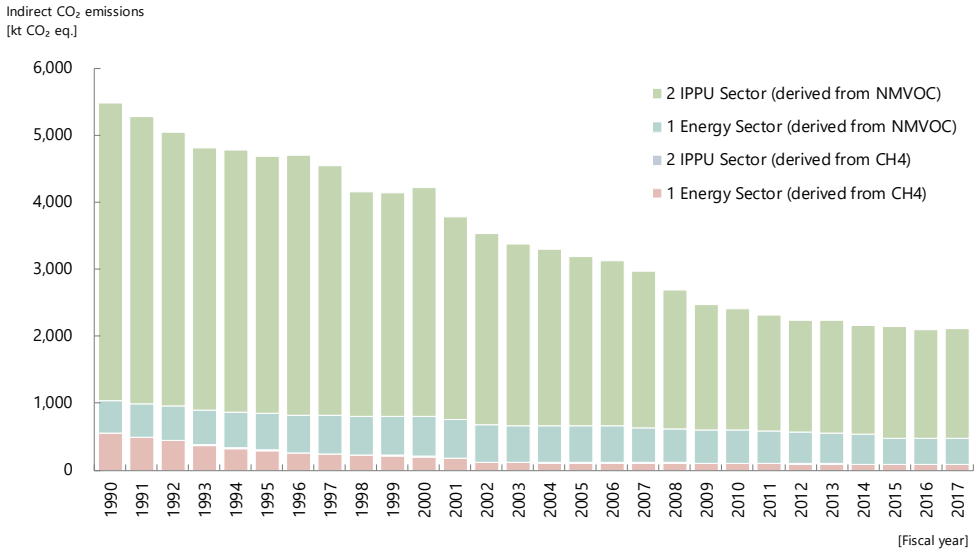


Figure 1-12 Trends in Indirect CO_2 emissions

Table 1-9 Trends in Indirect CO_2 emissions

Emission Source	Emissions [kt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
Derived from CH_4	553.7	297.6	207.9	113.3	103.3	94.9	91.9	92.8	**-18.1%**
1. Energy Sector	547.0	291.2	201.9	107.4	97.3	89.8	86.6	88.1	**-18.0%**
2. IPPU Sector	6.7	6.4	6.0	5.9	5.9	5.1	5.3	4.7	**-20.6%**
Derived from NMVOC	4,920.0	4,384.8	4,012.5	3,074.3	2,302.4	2,145.8	2,059.2	2,025.0	**-34.1%**
1. Energy Sector	480.5	545.0	589.8	548.0	497.2	462.7	390.1	379.5	**-30.7%**
2. IPPU Sector	4,439.6	3,839.8	3,422.7	2,526.3	1,805.2	1,683.1	1,669.1	1,645.6	**-34.9%**
Total	5,473.7	4,682.4	4,220.4	3,187.6	2,405.6	2,240.7	2,151.1	2,117.8	**-33.6%**

1.1.4 Trends in GHG Emissions and Removals by Sectors

The breakdown of GHG emissions and removals in FY 2017 by sectors[9] showed that energy (excluding indirect CO_2) accounted for 88.0% of total GHG emissions, followed by industrial processes and product use (7.7%), agriculture (2.6%), waste (1.6%), and indirect CO_2 emissions (0.2%).

Removals by LULUCF in FY 2017 were equivalent to 4.4% of total GHG emissions.

[9] As indicated in the *2006 IPCC Guidelines* and the CRF.

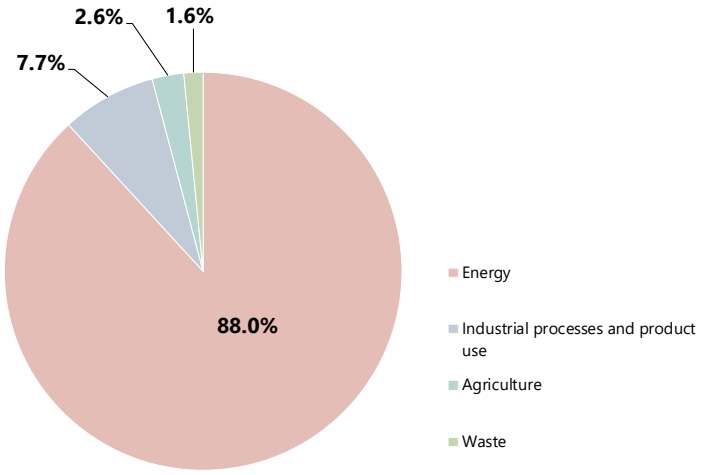


Figure 1-13 Share of GHG emissions by sector (FY 2017, excluding LULUCF)

Table 1-10 Trends in GHG emissions and removals by sector

GHGs	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
1 Energy	1,091.9	1,167.4	1,198.0	1,228.5	1,162.5	1,261.1	1,173.0	1,137.0	**-7.4%**
1.A Fuel combustion	1,086.8	1,164.2	1,195.6	1,227.0	1,161.2	1,259.8	1,171.8	1,135.8	**-7.4%**
1.A.1 Energy industries	369.9	380.7	397.4	452.0	476.2	584.6	529.5	509.6	**+12.8%**
1.A.2 Manufacturing industries and construction	351.3	359.6	348.9	336.5	302.6	308.8	292.6	274.8	**-18.4%**
1.A.3 Transport	205.0	246.4	257.0	240.8	224.2	217.1	210.7	207.0	**-13.7%**
1.A.4 Other sectors	160.6	177.5	192.4	197.7	158.2	149.3	139.0	144.3	**-27.0%**
1.B Fugitive emissions from fuels	5.2	3.2	2.3	1.5	1.4	1.3	1.2	1.3	**-13.9%**
2 Industrial processes and product use	111.1	137.2	109.2	87.7	81.1	90.0	93.6	99.3	**+13.3%**
3 Agriculture	37.3	36.9	35.2	35.2	35.7	34.6	33.6	33.2	**-5.6%**
4 LULUCF	-62.5	-77.3	-87.9	-91.3	-70.5	-66.2	-59.6	-57.5	**-37.1%**
5 Waste	29.7	33.1	32.5	27.6	23.3	22.4	21.3	20.1	**-27.2%**
Indirect CO_2	5.5	4.7	4.2	3.2	2.4	2.2	2.2	2.1	**-33.6%**
Gross Total (excluding LULUCF, including Indirect CO_2)	1,275.5	1,379.2	1,379.1	1,382.1	1,305.1	1,410.3	1,323.6	1,291.7	**-6.5%**

Energy

Emissions from the energy sector in FY 2017 were 1,137 MtCO_2 eq. They increased by 4.1% compared to FY 1990, decreased by 7.4% compared to FY 2005, and decreased by 9.8% compared to FY 2013.

The breakdown of the GHG emissions from the energy sector in FY 2017 showed that CO_2 emissions from fuel combustion (1.A) accounted for 99.2%. The CO_2 emission from energy industries (1.A.1) was the largest source accounting for 45% of total emissions from the energy sector and followed by CO_2 emission from manufacturing industries and construction (1.A.2) (24%).

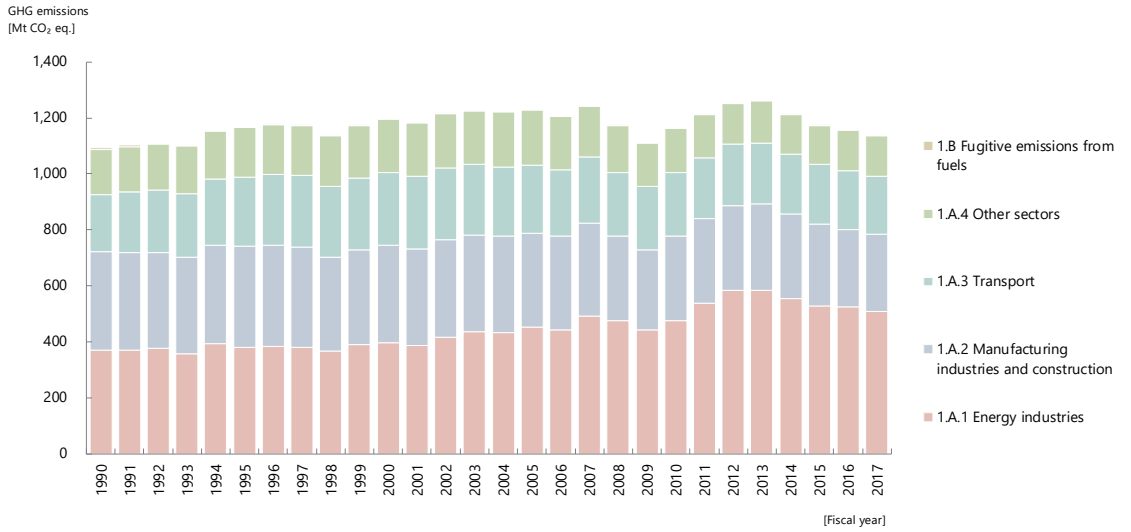


Figure 1-14 Trends in GHG emissions from the energy sector

Table 1-11 Trends in GHG emissions from the energy sector

GHGs	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
1.A Fuel Combustion	1,086.8	1,164.2	1,195.6	1,227.0	1,161.2	1,259.8	1,171.8	1,135.8	**-7.4%**
1.A.1 Energy industries	369.9	380.7	397.4	452.0	443.8	584.6	529.5	509.6	**+12.7%**
1.A.2 Manufacturing industries and construction	351.3	359.6	348.9	336.5	286.1	308.8	292.6	274.8	**-18.3%**
1.A.3 Transport	205.0	246.4	257.0	240.8	223.9	217.1	210.7	207.0	**-14.0%**
1.A.4 Other sectors	160.6	177.5	192.4	197.7	157.5	149.3	139.0	144.3	**-27.0%**
1.B Fugitive emissions from fuels	5.2	3.2	2.3	1.5	1.4	1.3	1.2	1.3	**-13.9%**
1.C CO2 transport and storage	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	—
Total	1,091.9	1,167.4	1,198.0	1,228.5	1,162.5	1,261.1	1,173.0	1,137.0	**-7.4%**

Industrial Processes and Product Use

Emissions from the industrial processes and product use (IPPU) sector in FY 2017 were 99.3 $MtCO_2$ eq. They decreased by 10.6% compared to FY 1990, increased by 13.3% compared to FY 2005, and increased by 10.3% compared to FY 2013.

The breakdown of GHG emissions from IPPU sector in FY 2017 showed that the largest source was HFCs emission from product uses as ODS substitutes (2.F), accounting for 45% of total emissions from IPPU sector followed by the mineral industry (2.A), such as CO_2 emission from cement production (34%) and CO_2 emission from the metal industry (2.C) (6%).

Despite the increase in HFCs emissions from product uses as substitutes for ODS compared to FY 1990, emissions from the IPPU sector decreased in the same period. The main driving factors for the decrease in emissions since FY 1990 were the decrease in emissions of HFC-23 produced as 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 (chemical industry), the decrease in CO_2 emissions from cement production (mineral industry) as the clinker production declined, and the decrease in N_2O emissions from adipic acid production (chemical industry) as the N_2O abatement equipment came on stream.

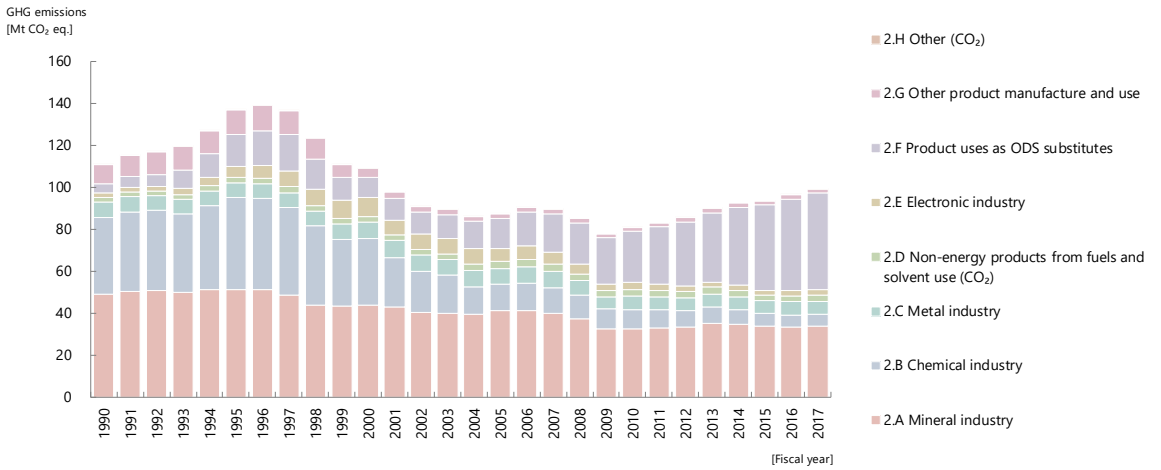


Figure 1-15 Trends in GHG emissions from the industrial processes sector

Table 1-12 Trends in GHG emissions from the industrial processes sector

GHGs	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
2.A Mineral industry	49.2	51.1	43.9	41.2	32.8	35.1	33.7	34.1	**-17.4%**
2.B Chemical industry	36.4	44.2	31.8	12.6	9.2	7.9	6.1	5.6	**-55.7%**
2.C Metal industry	7.6	7.1	7.8	7.6	6.4	6.4	6.2	6.0	**-21.6%**
2.D Non-energy products from fuels and solvent use (CO_2)	2.2	2.4	2.8	3.2	3.1	3.1	2.8	2.9	**-8.0%**
2.E Electronic industry	1.9	5.0	8.9	6.5	3.1	2.2	2.3	2.6	**-59.2%**
2.F Product uses as ODS substitutes	4.6	15.5	9.8	14.3	24.7	33.4	40.5	46.1	**+221.6%**
2.G Other product manufacture and use	9.1	11.7	4.1	2.1	1.7	1.9	1.9	1.9	**-10.0%**
2.H Other (CO_2)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	**-5.5%**
Total	111.1	137.2	109.2	87.7	81.1	90.0	93.6	99.3	**+13.3%**

Agriculture

Emissions from the agriculture sector in FY 2017 were 33.2 $MtCO_2$ eq. They decreased by 10.9% compared to FY 1990, by 5.6% compared to FY 2005, and by 4.1% compared to FY 2013.

The breakdown of the GHG emissions from the agriculture sector in FY 2017 showed that the largest source was the CH_4 emission from rice cultivation (3.C) accounting for 41% of total emissions from this sector. It was followed by CH_4 emission from the enteric fermentation (3.A) (22%), and by N_2O emission from the agricultural soils (3.D) (16%) such as N_2O emissions from the nitrogen-based fertilizer applications.

The main driving factor for the decrease in emissions since FY 1990 was the decrease in CH_4 emissions from enteric fermentation due to the decrease in the number of cattle, and the decrease in N_2O emissions from the agricultural soils because the amount of nitrogen fertilizers applied and organic fertilizers from livestock manure applied had decreased.

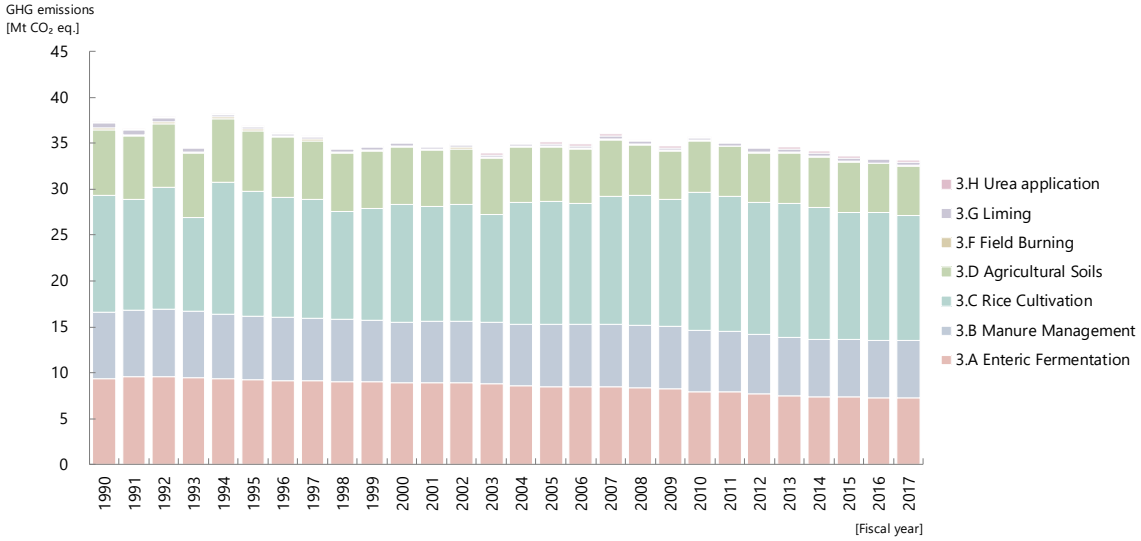


Figure 1-16 Trends in GHG emissions from the agriculture sector

Table 1-13 Trends in GHG emissions from the agriculture sector

GHGs	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
3.A Enteric Fermentation	9.4	9.3	8.9	8.5	8.0	7.5	7.3	7.3	**-14.5%**
3.B Manure Management	7.2	6.9	6.6	6.7	6.7	6.4	6.3	6.2	**-7.3%**
3.C Rice Cultivation	12.8	13.6	12.7	13.4	15.0	14.6	13.9	13.6	**+1.4%**
3.D Agricultural Soils	7.1	6.6	6.3	5.9	5.6	5.5	5.4	5.4	**-8.9%**
3.F Field Burning	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	**-21.8%**
3.G Liming	0.6	0.3	0.3	0.2	0.2	0.4	0.4	0.4	**+56.7%**
3.H Urea application	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	**+5.4%**
Total	37.3	36.9	35.2	35.2	35.7	34.6	33.6	33.2	**-5.6%**

Land Use, Land Use Change and Forestry (LULUCF)

Net removals (including CO_2, CH_4 and N_2O emissions) from the LULUCF sector in FY 2017 were 57.5 MtCO_2 eq. They decreased by 8.0% compared to FY 1990, by 37.1% compared to FY 2005 and by 13.2% compared to FY 2013.

The breakdown of the GHG emissions and removals from this sector in FY 2017 showed that the largest was CO_2 removals by Forest land (4.A), 60.9 Mt, accounting for 106% of net total emissions and removals of this sector.

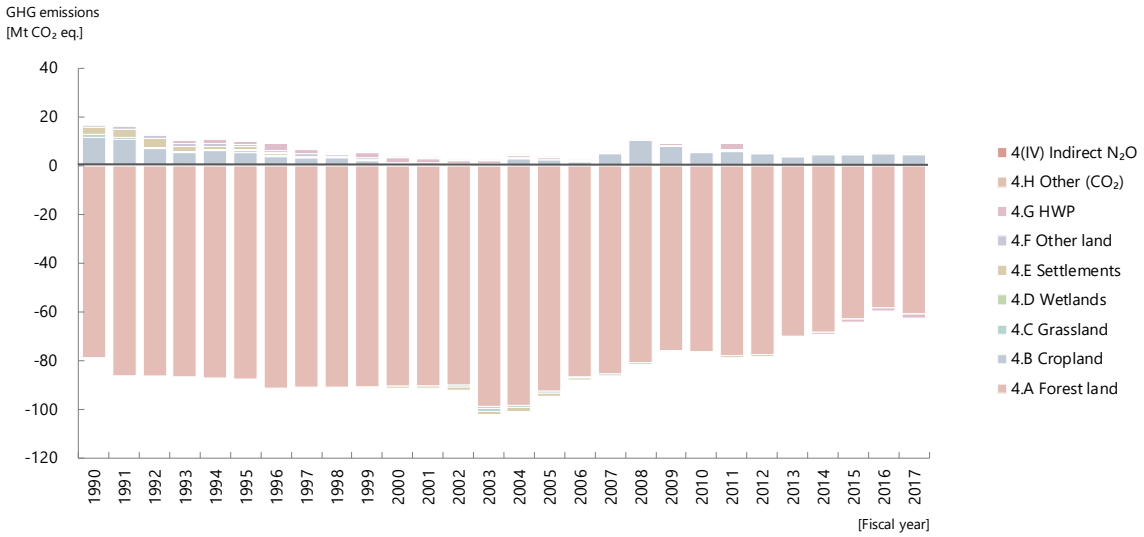


Figure 1-17 Trends in GHG emissions and removals from the LULUCF sector

Table 1-14 Trends in GHG emissions and removals from the LULUCF sector

GHGs	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
4.A Forest land	-78.9	-87.5	-90.5	-92.5	-76.3	-69.9	-63.0	-60.7	**-34.4%**
4.B Cropland	11.8	5.6	0.1	2.4	5.6	3.7	4.4	4.6	**+93.4%**
4.C Grassland	1.1	0.7	0.1	-1.0	0.1	-0.1	0.0	-0.1	**-87.3%**
4.D Wetlands	0.1	0.4	0.4	0.0	0.1	0.0	0.0	0.0	**+18.4%**
4.E Settlements	2.6	1.1	-0.6	-1.0	-0.3	-0.5	-0.1	-0.1	**-89.2%**
4.F Other land	1.2	1.0	0.7	0.2	0.2	0.2	0.2	0.2	**+17.2%**
4.G HWP	-0.4	1.5	1.8	0.6	0.1	0.3	-1.2	-1.4	**-321.5%**
4.H Other (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	–
4(IV) Indirect N_2O	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**-0.2%**
Total	-62.5	-77.3	-87.9	-91.3	-70.5	-66.2	-59.6	-57.5	**-37.1%**

Waste

Emissions from the waste sector in FY 2017 were 20.1 MtCO_2 eq. They decreased by 32.4% compared to FY 1990, by 27.2% compared to FY 2005 and by 10.1% compared to FY 2013.

Breakdown of the GHG emissions from this sector in FY 2017 showed that the largest source was CO_2 emission from waste incineration (5.C) associated with waste derived from fossil fuels such as waste plastic and waste oil, accounting for 54% of total emissions from this sector. It was followed by CH_4 emission from solid waste disposal (5.A) (15%) and N_2O emission from wastewater treatment and discharge (5.D) (10%).

The main driving factor for the decrease in emissions since FY 1990 was the decrease in CH_4 emissions from solid waste disposal on land as a result of decrease in the amount of disposal of biodegradable waste due to improvement in the volume reduction ratio by intermediate treatment under the Waste Management and Public Cleansing Act (Act No.137, 1970) and the Basic Law for Establishing the Recycling-based Society, and other recycling law (Act No.110, 2000).

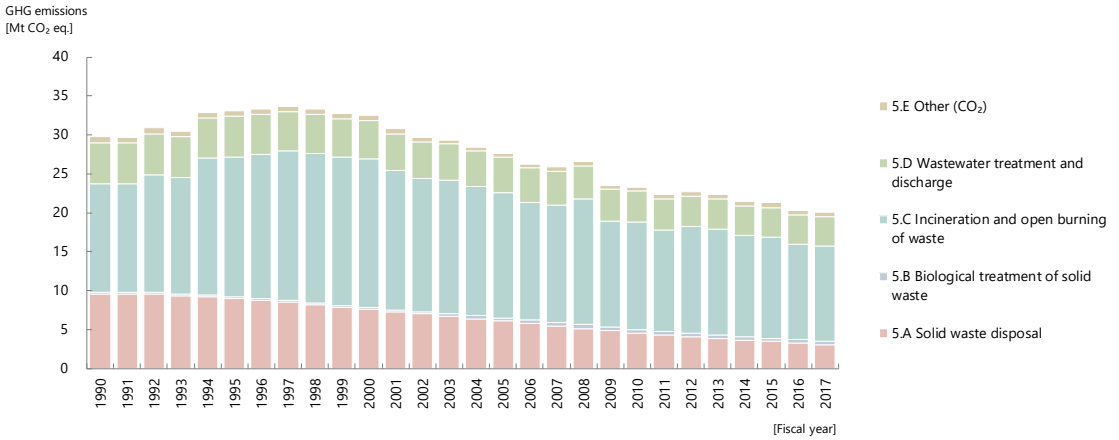


Figure 1-18 Trends in GHG emissions from the waste sector

Table 1-15 Trends in GHG emissions from the waste sector

GHGs	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
5.A Solid waste disposal	9.6	9.0	7.6	6.1	4.5	3.9	3.4	3.1	**-49.4%**
5.B Biological treatment of solid waste	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.4	**+7.9%**
5.C Incineration and open burning of waste	13.9	18.0	19.2	16.1	13.8	13.6	13.0	12.2	**-23.9%**
5.D Wastewater treatment and discharge	5.3	5.2	4.9	4.5	4.0	3.9	3.8	3.7	**-18.3%**
5.E Other (CO_2)	0.7	0.7	0.7	0.5	0.5	0.6	0.6	0.6	**+25.6%**
Total	29.7	33.1	32.5	27.6	23.3	22.4	21.3	20.1	**-27.2%**

1.1.5 Factor Analysis of Trend of Energy-related CO_2[10] Emissions

Since about 90% of Japan's greenhouse gas emissions are CO_2 from fuel combustion (energy-related CO_2), changes in energy-related CO_2 emissions have a major impact on total GHG emissions. Japan conducts a factor analysis of the trend of energy-related CO_2 regarding the contribution of each factor to changes in emissions and utilizes it for planning and implementation of mitigation policies and measures.

Specifically, CO_2 emissions could be divided into three factors, the factor of carbon intensity, the factor of energy intensity and the factor of activity. Emissions are shown as the product of several factors in each sector, and changes in emissions caused by changes in each factor are calculated in a quantitative manner (Figure 1-19). Energy-related CO_2 emissions by sector (excluding the energy transformation sector) used in this analysis are CO_2 emissions with electricity and heat allocated to each end-use sector in line with domestic mitigation measures, so it is not consistent with emissions by sector in the GHG Inventory and this BR submitted to the UNFCCC. CO_2 emissions with electricity and heat allocated to each end-use sector are shown in Table 1-16.

This section shows the summary of the results of the factor analysis of energy-related CO_2 for

[10] It is defined as CO_2 emissions from fossil fuel combustion, except for CO_2 emissions from the oxidation of lubricants CO_2 emissions, waste burnt for energy and CO_2 recovery by CCS in accordance with the domestic definition of energy-related CO_2.

the period from FY 2005 to FY 2017.

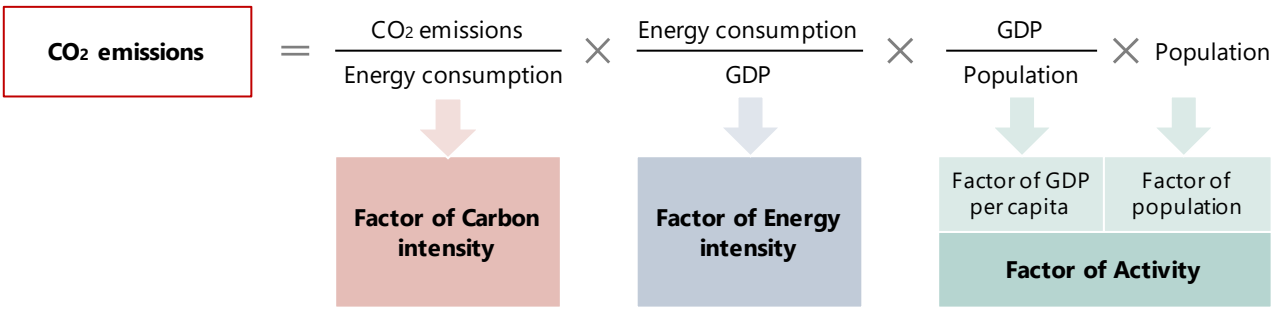


Figure 1-19 Equation for factor analysis of energy-related CO_2

Table 1-16 Energy-related CO_2 emissions with electricity and heat allocated by sector

	Energy-related CO_2 emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
Industries（factories, etc.）	503.5	490.1	477.6	467.5	430.3	464.8	432.2	412.9	**-11.7%**
Transport（cars, etc.）	207.3	248.4	258.3	244.2	228.8	224.2	217.4	213.2	**-12.7%**
Commercial and other（commerce, service, office, etc.）	130.0	161.8	189.8	220.4	200.1	236.3	218.2	207.5	**-5.9%**
Residential	130.7	150.3	155.6	170.5	178.9	207.8	186.9	185.6	**+8.9%**
Energy Transformation（power plants, etc.）	96.2	91.4	88.9	98.0	99.0	102.0	92.5	91.8	**-6.4%**
Total	1,067.6	1,142.0	1,170.3	1,200.5	1,137.0	1,235.2	1,147.2	1,110.9	**-7.5%**

Total Energy-related CO_2 Emissions

Energy-related CO_2 emissions in FY 2017 were 1,111 $MtCO_2$, which decreased by 7.5% compared to FY 2005 and by 10.1% compared to FY 2013.

The largest decrease factor from FY 2005 was the factor of energy intensity due to energy saving activities, followed by the factor of population by the variability of the population. On the other hand, the largest increase factor was the factor of carbon intensity due to the increase in the CO_2 emission factor by changing the energy mix, followed by the per unit of GDP factor from economic development. Particularly after FY 2011, the temporary suspension of all nuclear power plants in Japan due to the Fukushima Daiichi nuclear power plant accident caused by the Great East Japan Earthquake on March 11, 2011, led to an increase in fossil fuel-fired power generation and an increase in the factor of carbon intensity. However, energy intensity per unit of GDP improved due to the conversion of the industrial structure and energy and power saving activities.

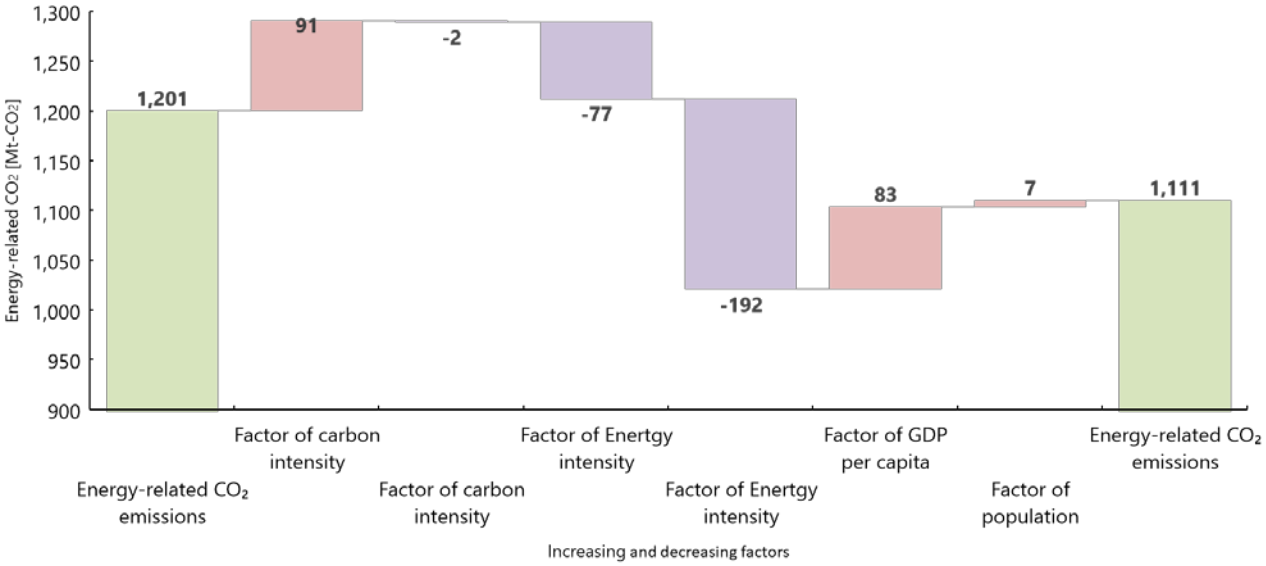


Figure 1-20 Changes in energy-related CO_2 emissions and factors since FY 2005

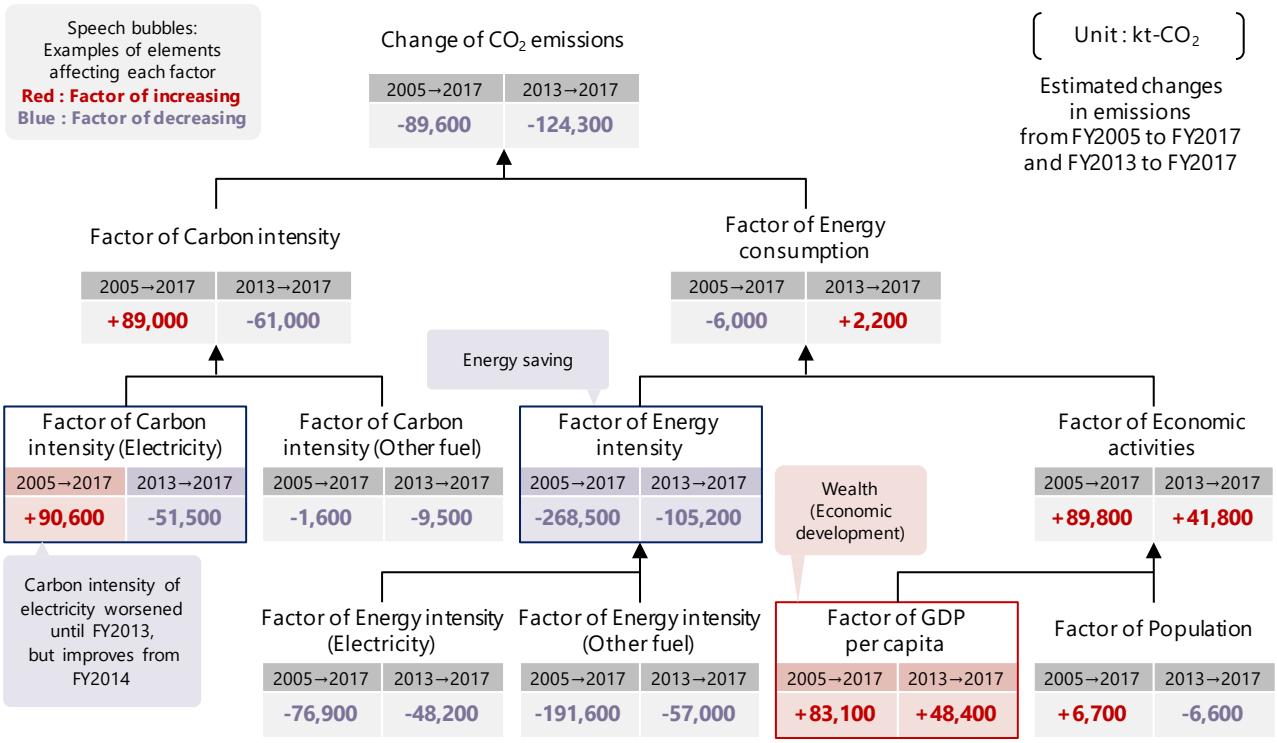


Figure 1-21 Factor of change of energy-related CO_2 emissions in FY 2017

Trends in an increase or decrease in factors of GHG emissions each year from the previous year are shown in Figure 1-22. Though the emissions in FY 2008 and FY 2009 decreased significantly due to the effects of the global economic crisis, the emissions in FY 2010 reversed significantly after recovery of the economy. In FY 2011 and FY 2012, the emissions increased significantly due to the increase in thermal power generation because of the shutdown of the nuclear power plant after the Great East Japan Earthquake. On the other hand, the emissions have been declining since FY 2014 due to the progress of energy saving after the Great East Japan Earthquake, increases in the introduction of renewable energy, and restart of nuclear power plants. In addition, electrification,

which has progressed over time, increased electricity consumption and reduced energy consumption other than electricity, affecting the factor of energy intensity.

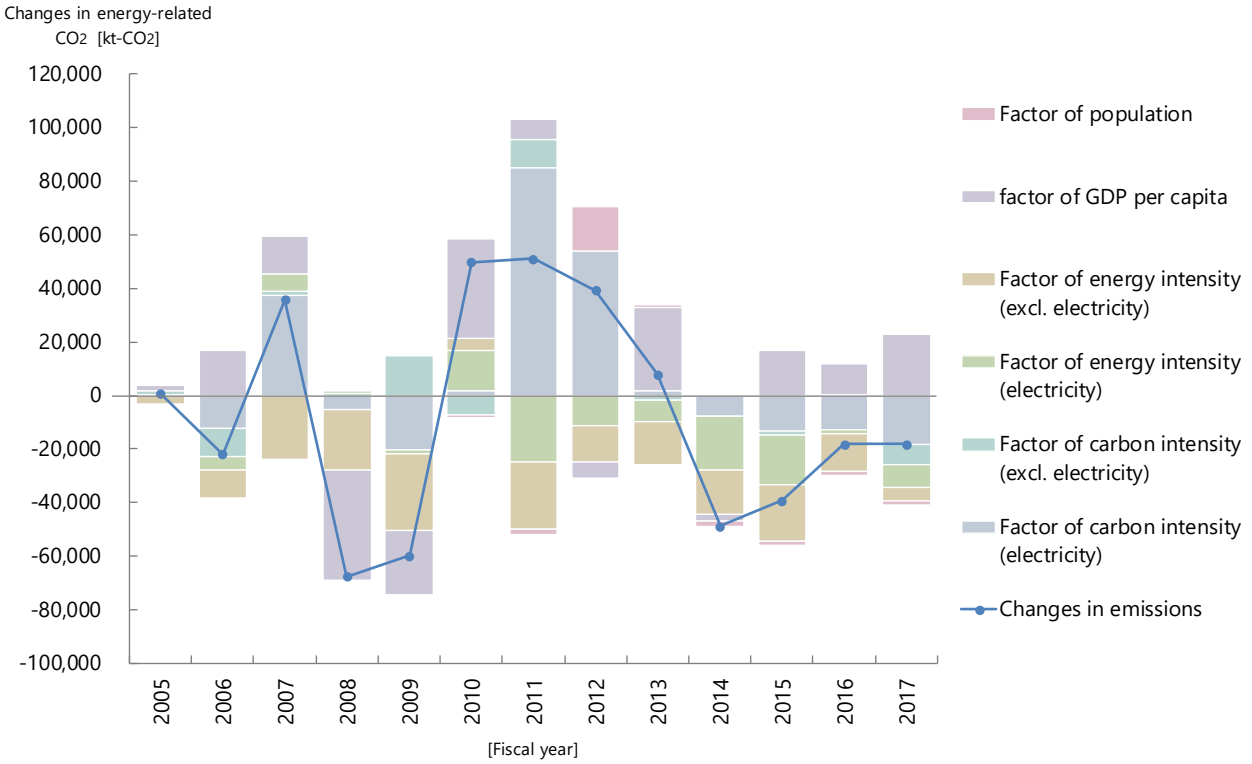


Figure 1-22 Trends of Factor of change of energy-related CO_2 emissions

Energy Transformation Sector (without electricity and heat allocated)[11]

CO_2 emissions (without electricity and heat allocated) in the energy transformation sector in FY 2017 were 492 Mt, which increased by 12.2% compared to FY 2005 and decreased by 14.1% compared to FY 2013.

The largest decrease factor from FY 2013 was the factor of energy mix that was due to the decrease in the share of fossil fuel power generation in total power generation caused by the increase in renewable energy and the restart of nuclear power plants, followed by the factor of power generation amount due to energy saving activities. The largest increase factor was the factor of fuel mix due to the change in fuel type consumed for power generation. There is no information disclosure in the amount of generated electricity before FY 2009, which is consistent with the scope of the survey after FY 2010, and the factor analysis in the energy transformation sector focuses on the comparison FY 2013 with FY 2017.

[11] the sum of commercial power generation and in-house power generation

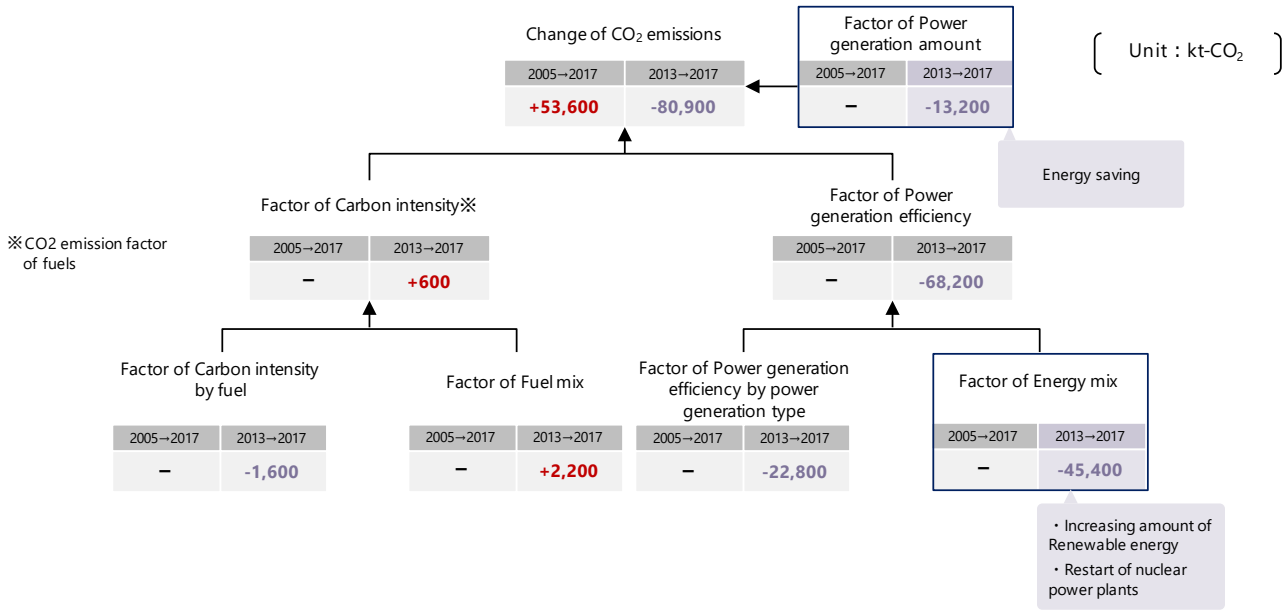


Figure 1-23 Factor of change of CO_2 emissions from Energy transformation sector (Power generation) in FY 2015

■ Industrial Sector

(1) Manufacturing Industry

CO_2 emissions in the manufacturing industries sector in FY 2015 were 386 Mt, which decreased by 11.5% compared to FY 2005 and by 12.2% compared to FY 2013.

The largest decrease factor from FY 2005 was the factor of added value, which was due to the recovery of added value (GDP) in the manufacturing industry and the increase of added value per products, followed by the factor of energy intensity due to the expansion of energy and power saving activities in factories. The largest increase factor was the factor of economic activity, which was due to the increase in GDP in the manufacturing industry, followed by the factor of carbon intensity (purchased electricity), which was due to the increase in the carbon intensity of electricity.

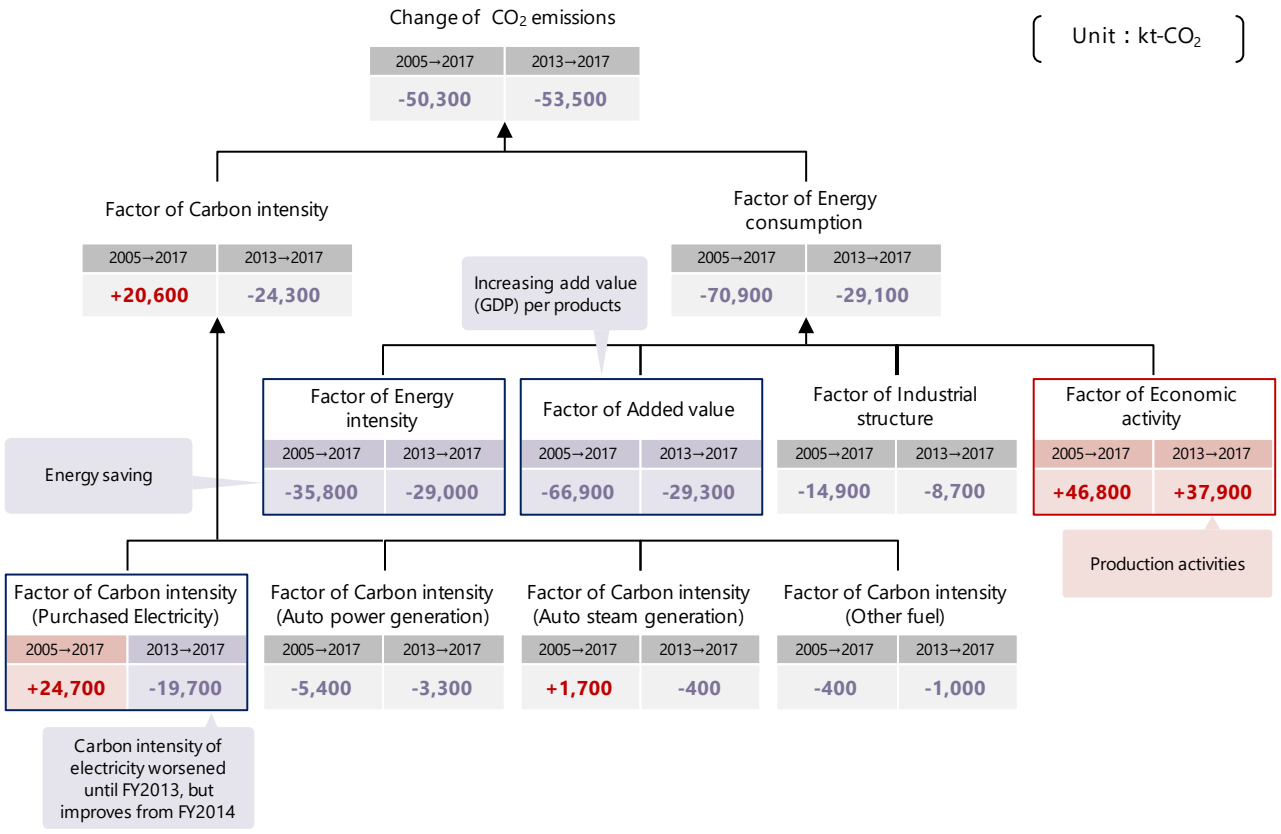


Figure 1-24 Factor of change of CO_2 emissions from Manufacturing sector in FY 2015

(2) Non-manufacturing Industry

CO_2 emissions in the non-manufacturing industries sector in FY 2017 were 27 Mt, which decreased by 13.5% compared to FY 2005 and increased by 5.9% compared to FY 2013.

The largest decrease factor from FY 2005 was the factor of industrial structure, which was due to changes in the industrial structure. On the other hand, the largest decrease factor was the factor of carbon intensity (electricity), which was due to the increase in the carbon intensity of electricity.

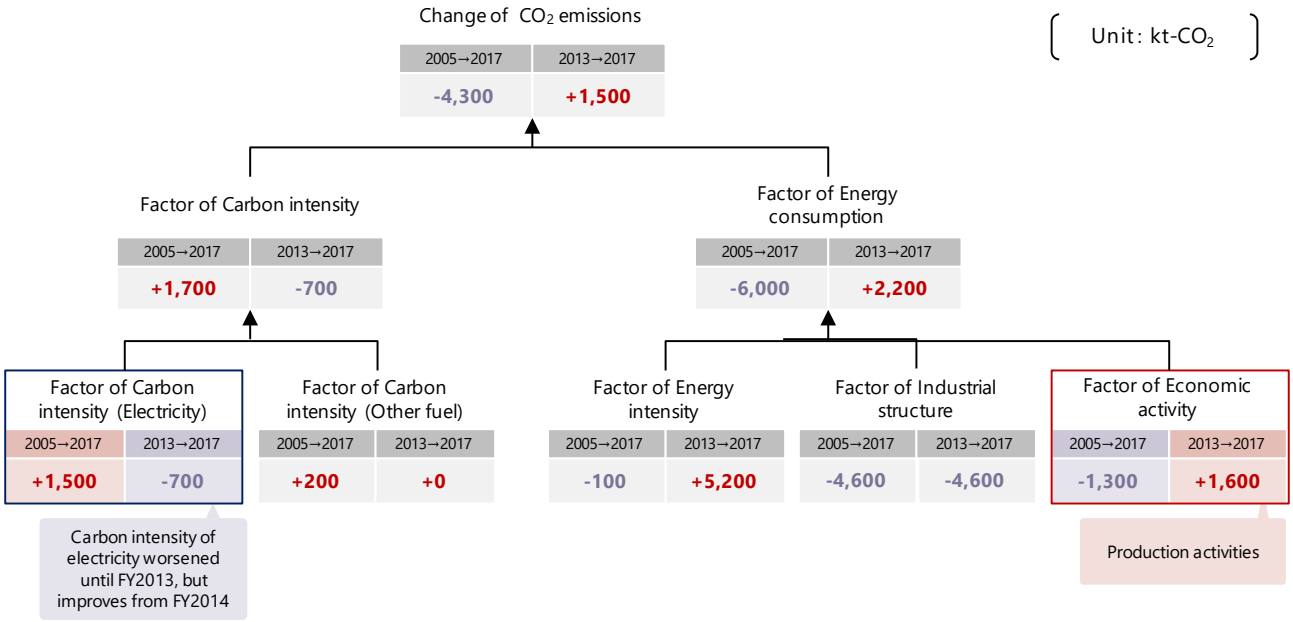


Figure 1-25 Factor of change of CO_2 emissions from Non-manufacturing sector in FY 2015

■ Transportation Sector

(1) Passenger

CO_2 emissions in the transportation sector (passenger) in FY 2017 were 127 Mt, which decreased by 12.2% compared to FY 2005 and by 6.0% compared to FY 2013.

The largest decrease factor from FY 2005 was the factor of energy intensity, which was due to the improved fuel efficiency of cars, followed by the factor of modal shifts, which was due to the decrease in the proportion of cars in traffic volume. On the other hand, the largest increase factor was the factor of carbon intensity, followed by the factor of traffic volume, which was due to the increase in traffic volume.

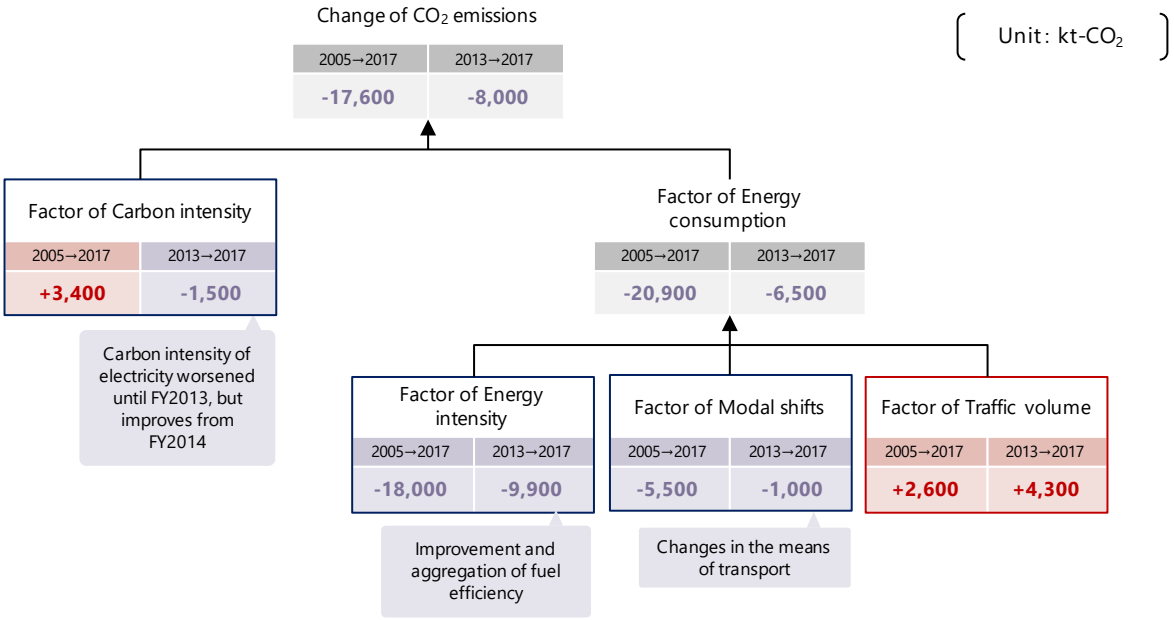


Figure 1-26 Factor of change of CO_2 emissions from Passenger sector (Transportation) in FY 2015

(2) Freight

CO_2 emissions in the transportation sector (freight) in FY 2017 were 86 Mt, which decreased by 13.4% compared to FY 2005 and by 3.4% compared to FY 2013.

The largest decrease factor from FY 2005 was the factor of traffic volume, which was due to the decrease in the traffic volume. On the other hand, the largest increase factor was the factor of modal shifts, which was due to the increase in the proportion of cargo trucks in the traffic volume.

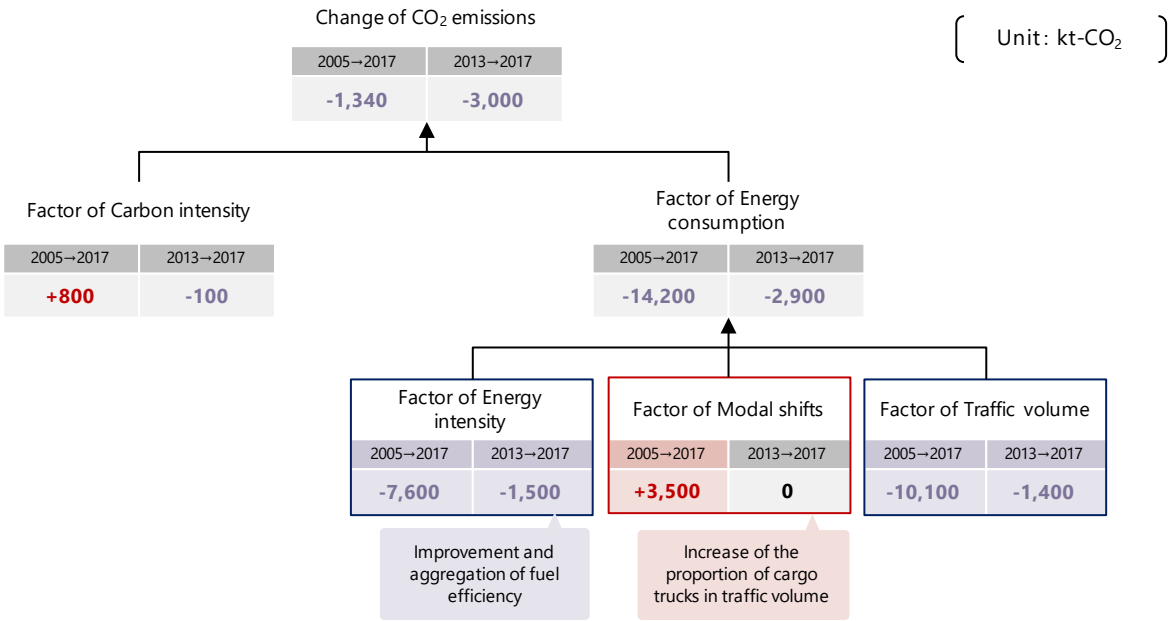


Figure 1-27 Factor of change of CO_2 emissions from Freight sector (Transportation) in FY 2015

Residential Sector

CO_2 emissions in the residential sector in FY 2017 were 186 Mt, which increased by 8.9% compared to FY 2005 and decreased by 10.7% compared to FY 2013.

The largest increase factor from FY 2005 was the factor of carbon intensity, which was due to the increase in the carbon intensity of electricity, followed by the factor of number of households, which was due to an increase in the number of households. On the other hand, the largest decrease factor from FY 2005 was the factor of number per household, which was due to the decrease in the size of households, followed by the factor of energy intensity (excluding the factor of temperature), which was due to the expansion of energy and power saving activities.

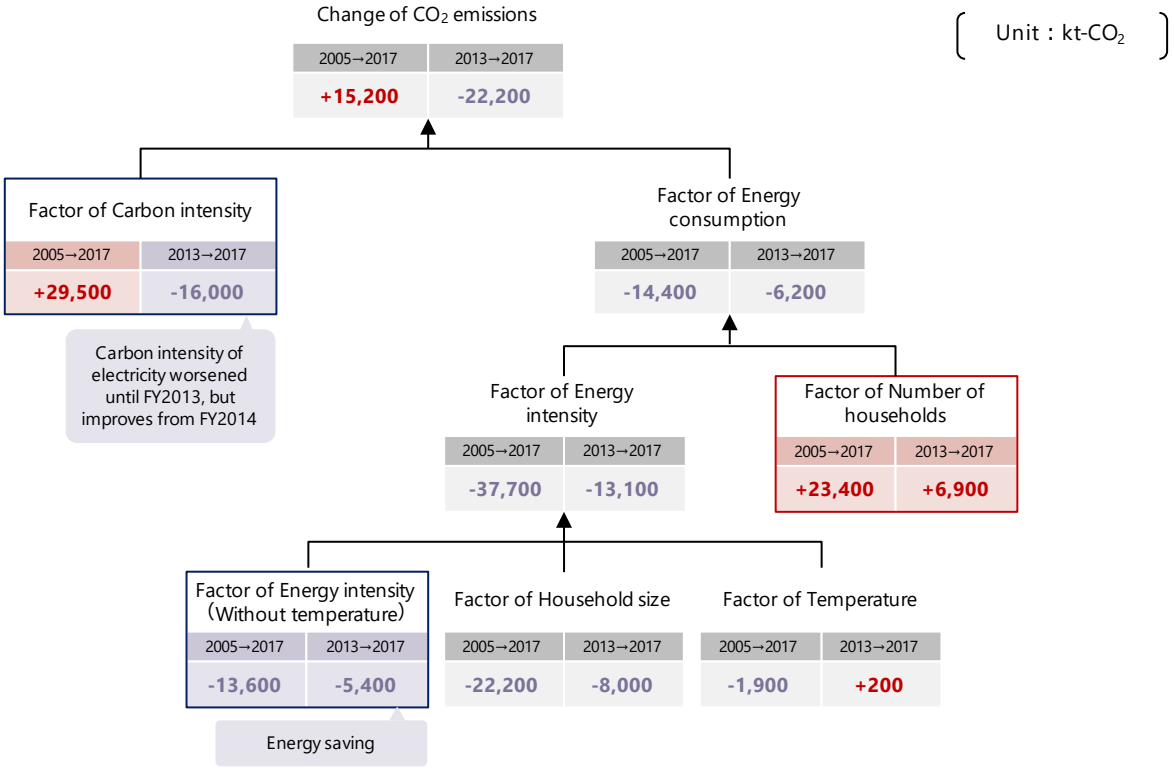


Figure 1-28 Factor of change of CO_2 emissions from Residential sector in FY 2015

Commercial and Other Sector

CO_2 emissions in the commercial and other sector in FY 2017 were 207 Mt, which decreased by 5.9% compared to FY 2005 and by 12.2% compared to FY 2013.

The largest decrease factor from FY 2005 was the factor of energy intensity, which was due to the expansion of energy and power saving activities, followed by the factor of productivity, which was due to the decrease in industrial activity per floor space. On the other hand, the increase factors were the factor of carbon intensity, which was due to the increase of carbon intensity of electricity, followed by the factor of floor space, which was due to the increase in floor space.

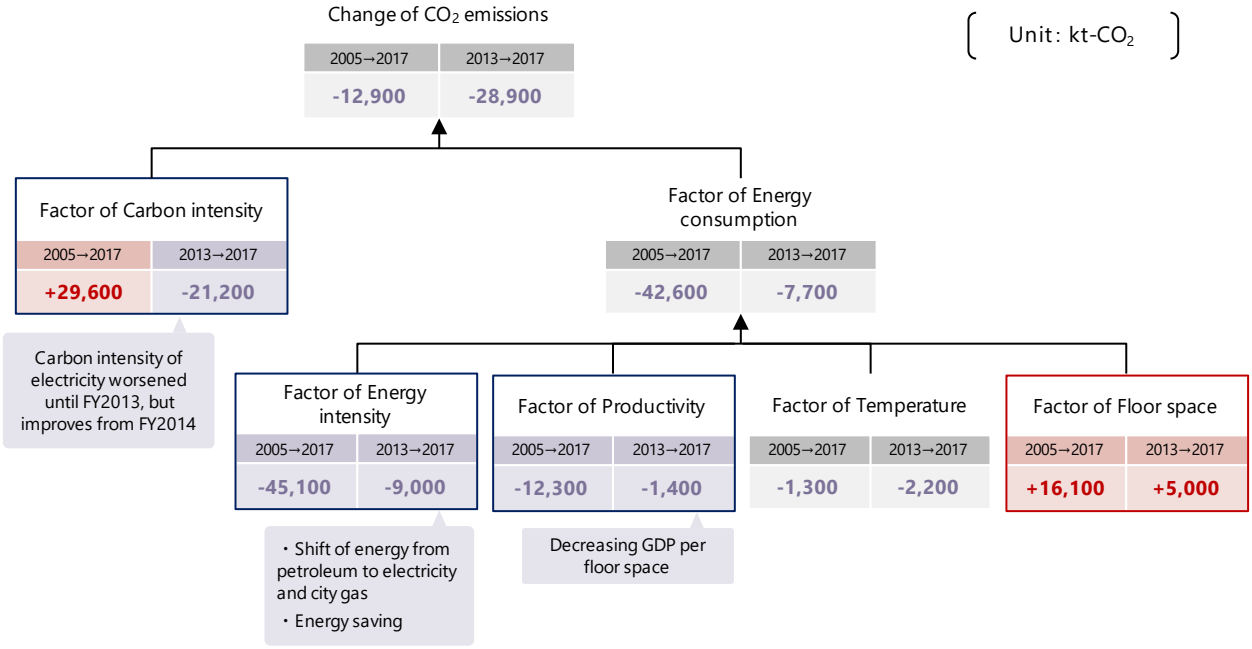


Figure 1-29 Factor of change of CO_2 emissions from Commercial and other sector in FY 2015

Summary

A Summary of factor analysis of energy-related CO_2 emissions by sector from FY 2005 to FY 2017 is shown in Table 1-17.

Table 1-17 Summary of factor analysis of energy-related CO_2 emissions by sector from FY 2005 to FY 2017

(Unit : kt-CO_2)

Sector		Factor of Activity		Factor of Carbon intensity				Factor of Temperature	Total Change of CO_2 emissions
		Activity data	Changes in CO_2 emissions		Factor of Carbon intensity (excluding Electricity)	Factor of Carbon intensity (Electricity)	Factor of Energy consumption		
Total		Population	+6,700	-96,300	-1,600	+90,600	-185,400	-	-89,600
Industries (factories, etc.)		Factor of GDP per capita	+45,500	-100,100	-3,900	+26,200	-122,400	-	-54,600
Transport	Passenger	Traffic volume	+2,600	-20,100	+1,500	+1,800	-23,500	-	-17,500
	Freight	Traffic volume	-10,100	-3,300	+700	+100	-4,000	-	-13,400
Commercial and other (commerce, service, office, etc.)		Floor area	+16,100	-27,800	+2,300	+27,400	-57,400	-1,300	-12,900
Residential		Number per household	+23,400	-6,300	-1,500	+31,100	-35,800	-1,900	+15,200
Energy transformation (power plnats, etc.)		Power generation amount	-	-	-	-	-	-	+53,600

Increase of production
Decrease of traffic volume
Increase of floor space
Increase of number of ho useholds
Energy saving
Increase of carbon intensity

Note: Balloons are the main factors that may have affected the increase or decrease.
The total and breakdown may not match due to rounding.
The total is the result of the direct factorization of energy-related CO_2, and it does not match the sum of the factors of each sector.
The factor of carbon intensity (electricity) is covering only purchased electricity, and private power generation is included in the factor of carbon intensity (excluding electricity) (except energy transformation sector).

1.1.6 Trends in precursors and SO_X emissions

Under the revised UNFCCC reporting guidelines on annual inventories for the Parties included in Annex I to the Convention, it is necessary to report emissions not only of the seven types of GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3), but also emissions of precursors (NO_X, CO, and NMVOC) as well as SO_X. Their emission trends are indicated below.

Nitrogen oxide (NO_X) emissions in FY 2017 were 1.4 Mt. They decreased by 30.3% compared to FY 1990, by 29.4% compared to FY 2005, and by 1.1% compared to FY 2013.

Carbon monoxide (CO) emissions in FY 2017 were 2.7 Mt. They decreased by 38.9% compared to FY 1990, by 10.0% compared to FY 2005, and by 2.3% compared to FY 2013[12].

Non-methane volatile organic compounds (NMVOC) emissions in FY 2017 were 0.9 Mt. They decreased by 58.4% compared to FY 1990, by 34.4% compared to FY 2005, and by 5.7% compared to FY 2013.

Sulfur oxide (SO_X)[13] emissions in FY 2017 were 0.7 Mt. They decreased by 44.3% compared to FY 1990, by 31.2% compared to FY 2005, and by 2.8% compared to FY 2013.

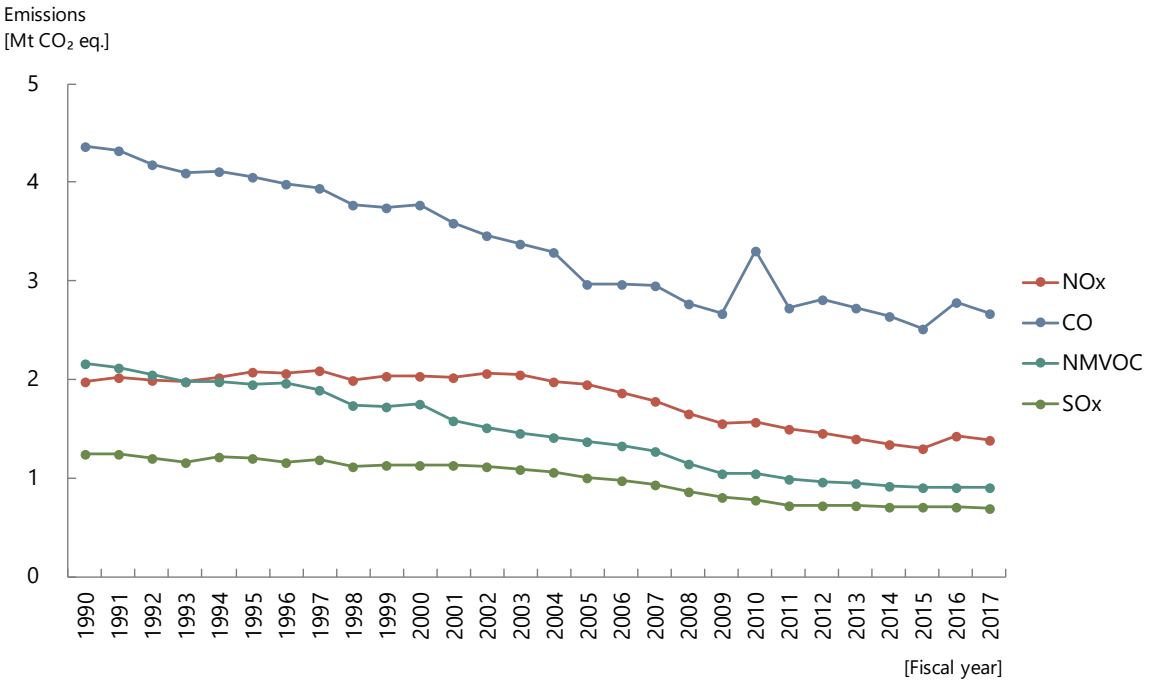


Figure 1-30 Trends in emissions of precursors and SO_X

[12] The reason for the increase of CO emissions in FY2010 compared to the previous year was the change in the EF for road transportation, and the reason for the decrease in CO emissions in FY2011 compared to the previous year was the change in the share of furnace types in the iron and steel industry.

[13] Most SO_X consists of SO_2. For major sources, SO_2 emissions are estimated.

Table 1-18 Trends in emissions of precursors and SO_X

Indirect GHGs	Emissions [Mt CO_2 eq.]								Changes in emissions
	1990	1995	2000	2005	2010	2013	2015	2017	2005-2017
NOx	2.0	2.1	2.0	2.0	1.6	1.4	1.3	1.4	**-29.4%**
CO	4.4	4.1	3.8	3.0	3.3	2.7	2.5	2.7	**-10.0%**
NMVOC	2.2	2.0	1.7	1.4	1.0	1.0	0.9	0.9	**-34.4%**
SOx	1.3	1.2	1.1	1.0	0.8	0.7	0.7	0.7	**-31.2%**

1.1.7 Emissions and Removals from Activities under Article 3.3 and 3.4 of the Kyoto Protocol (KP-LULUCF)

The net removals from Kyoto Protocol Article 3.3 and 3.4 activities in FY 2017 were 42.9 $MtCO_2$ eq. The breakdown of emissions and removals by each activity is shown below.

Table 1-19 Accounting summary for activities under articles 3.3 and 3.4 of the Kyoto Protocol (CRF Accounting table)

GREENHOUSE GAS SOURCE AND SINK ACTIVITIES	Base Year (1990)	NET EMISSIONS/REMOVALS						Accounting parameters	Accounting quantity
		2013	2014	2015	2016	2017	Total		
	(kt CO_2 eq.)								
A. Article 3.3 activities									
A.1. Afforestation/reforestation		-1,607	-1,610	-1,604	-1,598	-1,569	-7,989		-7,989
Excluded emissions from natural disturbances		NA	NA	NA	NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		NA	NA	NA	NA	NA	NA		NA
A.2. Deforestation		2,029	2,032	2,141	2,137	1,846	10,185		10,185
B. Article 3.4 activities									
B.1. Forest management							-251,184		-251,184
Net emissions/removals		-51,065	-51,394	-49,002	-46,463	-46,135	-244,060		
Excluded emissions from natural disturbances		NA	NA	NA	NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		NA	NA	NA	NA	NA	NA		NA
Any debits from newly established forest (CEF-ne)		NA	NA	NA	NA	NA	NA		NA
Forest management reference level (FMRL)		0	0	0	0	0	0		
Technical corrections to FMRL		1,097	1,284	1,438	1,581	1,724	7,124		
Forest management cap								0	0
B.2. Cropland management (if elected)	10,281	3,625	4,370	4,291	4,764	4,515	21,565		-29,842
B.3. Grazing land management (if elected)	841	-273	-95	-161	-219	-257	-1,005		-5,211
B.4. Revegetation (if elected)	-79	-1,223	-1,241	-1,262	-1,280	-1,290	-6,295		-5,900
B.5. Wetland drainage and rewetting (not elected)	NA	NA	NA	NA	NA	NA	NA		NA

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

1.1.8 Key Category Analysis

A key category is one that is prioritized in improving methodologies for estimating emissions and removals because its estimate has a significant influence on a country's total inventory of greenhouse gases in terms of the absolute level, the trend, or the uncertainty in emissions and removals.

The key category analysis in FY 2017 and the base year of the UNFCCC (1990), which were carried out in accordance with the *2006 IPCC Guidelines* (Approach 1 level assessment[14] and

[14] The calculated values for the proportion are added from the category that accounts for the largest proportion, until the sum reaches 95% for Approach 1 and 90% for Approach 2. Approach 1 level assessment uses emissions and removals

trend assessment,[15] Approach 2 level assessment and level assessment and trend assessment) are shown in Table 1-20 and Table 1-21 . A total of 44 sources and sinks were identified as Japan's key categories in FY 2017, and 40 sources and sinks were identified in FY 1990.

Table 1-20 Japan's key categories in FY 2017

	Category Code	A IPCC Code	B IPCC Category		C GHGs	Ap1-L	Ap1-T	Ap2-L	Ap2-T
#1	A-02	1.A.1	Energy Industries	Solid Fuels	CO_2	#1	#1	#1	#1
#2	A-16	1.A.3	Transport	b. Road Transportation	CO_2	#2		#3	
#3	A-08	1.A.2	Manufacturing Industries and Construction	Solid Fuels	CO_2	#3	#7	#2	#10
#4	A-03	1.A.1	Energy Industries	Gaseous Fuels	CO_2	#4	#3	#6	#8
#5	A-25	1.A.4	Other Sectors	Liquid Fuels	CO_2	#5	#5	#5	#7
#6	A-01	1.A.1	Energy Industries	Liquid Fuels	CO_2	#6	#2	#7	#3
#7	D-01	4.A	Forest Land	1. Forest Land remaining Forest Land	CO_2	#7	#12	#4	#14
#8	A-07	1.A.2	Manufacturing Industries and Construction	Liquid Fuels	CO_2	#8	#4	#11	#4
#9	A-27	1.A.4	Other Sectors	Gaseous Fuels	CO_2	#9	#8	#23	#23
#10	B-26	2.F	Product uses as substitutes for ODS	1. Refrigeration and Air conditioning	HFCs	#10	#6	#10	#5
#11	A-09	1.A.2	Manufacturing Industries and Construction	Gaseous Fuels	CO_2	#11	#9	#31	#26
#12	B-01	2.A	Mineral Product	1. Cement Production	CO_2	#12	#11	#24	#24
#13	C-04	3.C	Rice Cultivation		CH_4	#13		#28	
#14	E-04	5.C	Incineration and Open Burning of Waste		CO_2	#14		#14	
#15	A-22	1.A.3	Transport	d. Domestic Navigation	CO_2	#15	#21		
#16	A-13	1.A.3	Transport	a. Domestic Aviation	CO_2	#16	#23		
#17	A-10	1.A.2	Manufacturing Industries and Construction	Other Fossil Fuels	CO_2	#17	#18	#13	#17
#18	A-28	1.A.4	Other Sectors	Other Fossil Fuels	CO_2	#18		#18	
#19	C-01	3.A	Enteric Fermentation		CH_4	#19		#12	#21
#20	B-15	2.C	Metal Production	1 Iron and Steel Production	CO_2	#20			
#21	D-03	4.B	Cropland	1. Cropland remaining Cropland	CO_2		#16	#20	#9
#22	C-03	3.B	Manure Management		N_2O			#9	
#23	C-05	3.D	Agricultural Soils	1. Direct Emissions	N_2O			#27	
#24	E-01	5.A	Solid Waste Disposal		CH_4		#15		#12
#25	B-21	2.D	Non-energy Products from Fuels and Solvent Use		CO_2			#15	#28
#26	B-27	2.F	Product uses as substitutes for ODS	2. Foam Blowing Agents	HFCs		#25	#19	#15
#27	B-06	2.B	Chemical Industry	Other products except Anmonia	CO_2			#17	#25
#28	A-06	1.A.1	Energy Industries		N_2O				#27
#29	E-08	5.D	Wastewater Treatment and Discharge		N_2O			#30	
#30	B-23	2.E	Electronics Industry		PFCs			#16	#29
#31	C-06	3.D	Agricultural Soils	2. Indirect Emissions	N_2O			#8	#18
#32	Ind-02		Indirect CO2	from IPPU sector	Ind CO_2		#24	#29	#16
#33	B-34	2.G	Other Product Manufacture and Use		SF_6		#13	#21	#2
#34	B-31	2.F	Product uses as substitutes for ODS	5. Solvents	PFCs		#22		
#35	A-18	1.A.3	Transport	b. Road Transportation	N_2O			#26	#13
#36	E-06	5.C	Incineration and Open Burning of Waste		N_2O			#22	
#37	D-12	4.E	Settlements	2. Land converted to Settlements	CO_2		#26		#22
#38	D-02	4.A	Forest Land	2. Land converted to Forest Land	CO_2		#17		#19
#39	A-32	1.B	Fugitive Emission from Fuel	1.Fugitive emissions from Solid Fuels	CH_4		#19		#6
#40	B-24	2.E	Electronics Industry		SF_6			#25	
#41	B-09	2.B	Chemical Industry	4. Caprolactam, Glyoxal and Glyoxylic Acid Production	N_2O				#11
#42	B-10	2.B	Chemical Industry	9. Fluorochemical Production (Fugitive Emissions)	HFCs		#10		#30
#43	B-08	2.B	Chemical Industry	3. Adipic Acid Production	N_2O		#14		#20
#44	B-12	2.B	Chemical Industry	9. Fluorochemical Production (Fugitive Emissions)	SF_6		#20		

N.B.1) Ap1-L: Approach 1-Level Assessment, Ap1-T: Approach 1-Trend Assessment,
Ap2-L: Approach 2-Level Assessment, Ap2-T: Approach 2-Trend Assessment
N.B.2) Figures recorded in the Level and Trend columns indicate the ranking of individual levels and trend assessments.

from each category directly and Approach 2 level assessment analyzes the emissions and removals of each category, multiplied by the uncertainty of each category.

[15] The calculated results, regarded as trend assessment values, are added from the category whose proportion to the total of trend assessment values is the largest, until the total reaches 95% for Approach 1 and 90% for Approach 2. Approach1 level assessment uses emissions and removals from each category directly and Approach 2 level assessment analyzes the emissions and removals of each category, multiplied by the uncertainty of each category.

Table 1-21 Japan's key categories in FY 1990

	Category Code	A IPCC Code	B IPCC Category		C GHGs	Ap1-L	Ap2-L
#1	A-08	1.A.2	Manufacturing Industries and Construction	Solid Fuels	CO_2	#1	#1
#2	A-16	1.A.3	Transport	b. Road Transportation	CO_2	#2	#3
#3	A-01	1.A.1	Energy Industries	Liquid Fuels	CO_2	#3	#4
#4	A-07	1.A.2	Manufacturing Industries and Construction	Liquid Fuels	CO_2	#4	#6
#5	A-25	1.A.4	Other Sectors	Liquid Fuels	CO_2	#5	#8
#6	A-02	1.A.1	Energy Industries	Solid Fuels	CO_2	#6	#7
#7	A-03	1.A.1	Energy Industries	Gaseous Fuels	CO_2	#7	#19
#8	D-01	4.A	Forest Land	1. Forest Land remaining Forest Land	CO_2	#8	#2
#9	B-01	2.A	Mineral Product	1. Cement Production	CO_2	#9	#21
#10	A-27	1.A.4	Other Sectors	Gaseous Fuels	CO_2	#10	
#11	B-10	2.B	Chemical Industry	9. Fluorochemical Production (Fugitive Emissions)	HFCs	#11	
#12	A-22	1.A.3	Transport	d. Domestic Navigation	CO_2	#12	
#13	C-04	3.C	Rice Cultivation		CH_4	#13	#32
#14	E-04	5.C	Incineration and Open Burning of Waste		CO_2	#14	#17
#15	A-09	1.A.2	Manufacturing Industries and Construction	Gaseous Fuels	CO_2	#15	
#16	D-03	4.B	Cropland	1. Cropland remaining Cropland	CO_2	#16	#10
#17	E-01	5.A	Solid Waste Disposal		CH_4	#17	#15
#18	C-01	3.A	Enteric Fermentation		CH_4	#18	#14
#19	B-34	2.G	Other Product Manufacture and Use		SF_6	#19	#5
#20	B-15	2.C	Metal Production	1 Iron and Steel Production	CO_2	#20	
#21	B-08	2.B	Chemical Industry	3. Adipic Acid Production	N_2O	#21	
#22	A-13	1.A.3	Transport	a. Domestic Aviation	CO_2	#22	
#23	D-02	4.A	Forest Land	2. Land converted to Forest Land	CO_2	#23	#30
#24	A-28	1.A.4	Other Sectors	Other Fossil Fuels	CO_2	#24	#22
#25	B-02	2.A	Mineral Product	2. Lime Production	CO_2	#25	
#26	A-32	1.B	Fugitive Emission from Fuel	1.Fugitive emissions from Solid Fuels	CH_4	#26	#11
#27	C-05	3.D	Agricultural Soils	1. Direct Emissions	N_2O	#27	#24
#28	Ind-02		Indirect CO2	from IPPU sector	Ind CO_2		#16
#29	A-10	1.A.2	Manufacturing Industries and Construction	Other Fossil Fuels	CO_2		#31
#30	C-03	3.B	Manure Management		N_2O		#12
#31	D-12	4.E	Settlements	2. Land converted to Settlements	CO_2		#29
#32	B-06	2.B	Chemical Industry	Other products except Anmonia	CO_2		#18
#33	A-18	1.A.3	Transport	b. Road Transportation	N_2O		#13
#34	C-06	3.D	Agricultural Soils	2. Indirect Emissions	N_2O		#9
#35	E-08	5.D	Wastewater Treatment and Discharge		N_2O		#28
#36	B-21	2.D	Non-energy Products from Fuels and Solvent Use		CO_2		#25
#37	B-09	2.B	Chemical Industry	4. Caprolactam, Glyoxal and Glyoxylic Acid Product	N_2O		#20
#38	B-23	2.E	Electronics Industry		PFCs		#26
#39	E-06	5.C	Incineration and Open Burning of Waste		N_2O		#27
#40	B-24	2.E	Electronics Industry		SF_6		#23

N.B.1) Ap1-L: Approach 1-Level Assessment, Ap2-L: Approach 2-Level Assessment

N.B.2) Figures recorded in the Level and Trend columns indicate the ranking of individual levels and trend assessments.

1.2 Brief Description of National Inventory Arrangements

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

The government of Japan is to calculate the emissions and removals of GHGs for Japan and disclose the results every year, in accordance with Article 7 of Chapter 1 "General Provisions", the Act on Promotion of Global Warming Countermeasures[16], which determines the domestic measures for the UNFCCC and Kyoto Protocol. The Ministry of the Environment (MOE), with the cooperation of relevant ministries, agencies and organizations, prepares Japan's national inventory and compiles the supplementary information required under Decision 2/CMP.8. which is annually submitted in accordance with the UNFCCC and the Kyoto Protocol.

The MOE assumes overall responsibilities for the national inventory and organizes the Committee for the Greenhouse Gas Emission Estimation Methods (Committee) in order to integrate the latest scientific knowledge into the inventory and to modify it to meet international requirements. The estimation of GHG emissions and removals are then carried out by taking the decisions of the Committee into consideration. Substantial activities, such as the estimation of emissions and removals and the preparation of the Common Reporting Format (CRF) tables 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) by compiling various statistics and provide relevant information on supplementary information required under Decision 2/CMP.8. The relevant ministries and agencies check the inventories (i.e., CRF, NIR), including the spreadsheets that are actually utilized for the estimation (Japan National Greenhouse gas Inventory files, hereinafter referred to as "JNGI files"), as a part of the Quality Control (QC) activities.

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

Figure 1-31 shows the overall institutional arrangement for Japan's inventory preparation. More detailed information on the roles and responsibilities of the relevant ministries, agencies and organizations in the inventory preparation process is described below.

[16] Enacted in October 1998. The latest amendment was made on May 27, 2016.

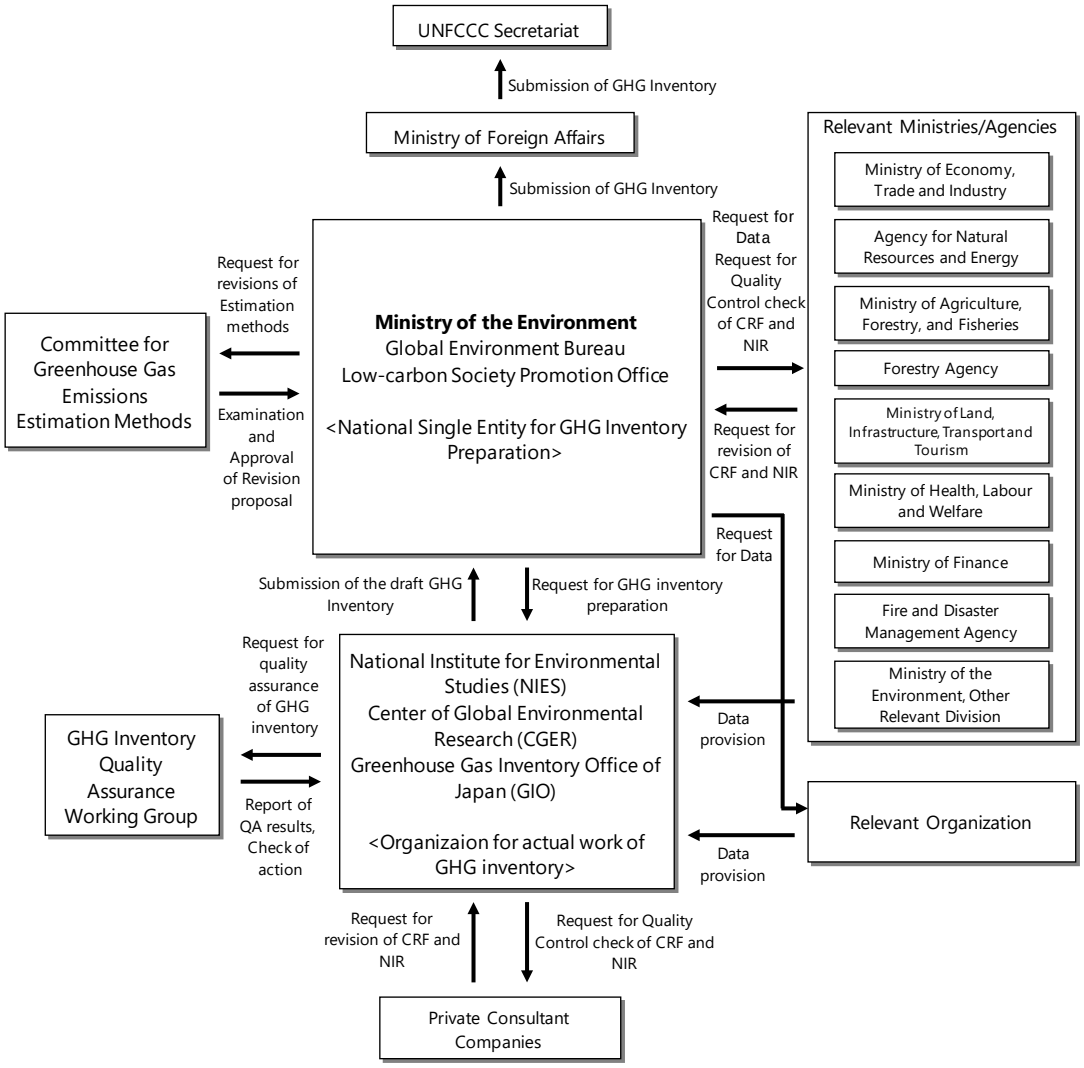


Figure 1-31 Japan's Institutional Arrangements for the National Inventory Preparation

1.2.2 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.

(1) 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 UNFCCC Inventory Reporting Guidelines and the Kyoto Protocol Article 5.1.
- It is responsible for editing and submitting the inventory.
- It coordinates the Quality Assurance and Quality Control (QA/QC) activities for the inventory.
- It prepares the QA/QC plan.
- It prepares the inventory improvement plan.

(2) 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.

(3) Relevant Ministries/Agencies

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

- Preparation and provision of data such as activity data and the emission factors required for the preparation of the inventory
- Confirmation of data provided for the preparation of the inventory
- Confirmation of the inventory (CRF, NIR, JNGI files, and other information) prepared by the GIO (Category-specific QC)
- (When necessary), responding to questions from expert review teams (ERTs) 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 in-country review by ERTs

(4) Relevant Organizations

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

- Preparation and provision of data such as activity data and emission factors required for the preparation of the inventory
- Confirmation of data provided for the preparation of the inventory
- (When necessary), responding to questions from ERTs about the statistics controlled by relevant organizations, or about certain data they have prepared, and preparing comments on draft reviews

(5) 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 MOE. Its role is to consider the methods for calculating inventory emissions and removals and consider the selection of parameters, such as activity data (AD) and emission factors (EFs). Under the Committee, the inventory working group (WG) that examines cross-cutting issues, and the breakout groups that consider sector-specific problems (Breakout group on Energy and Industrial Processes, Breakout group on Transport, Breakout group on F-gases [HFCs, PFCs, SF_6, and NF_3], Breakout group on Agriculture, Breakout group on Waste, Breakout group on LULUCF, and Breakout group on NMVOC) are set up. The inventory WG and the breakout groups comprise experts in various fields, and consider suggestions for inventory improvements.

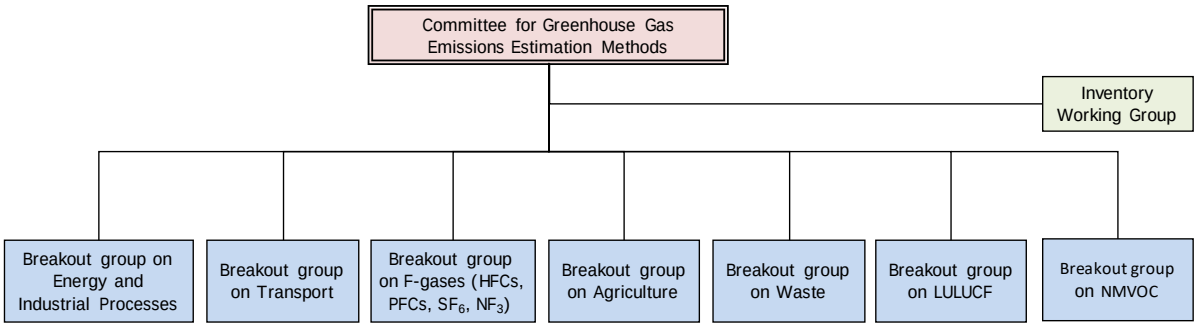


Figure 1-32 Structure of the Committee for the Greenhouse Gas Emissions Estimation Methods

(6) Private Consulting Companies

Private consultant companies that are contracted by the MOE to perform tasks related to inventory compilation play the following roles in inventory compilation based on their contracts.

- Quality Control (QC) of the inventory (CRF, NIR, JNGI files) compiled by the MOE and the GIO
- (When necessary), providing support for responding to questions from ERTs and for preparing comments on draft reviews
- (When necessary), providing support for responding to in-country review by ERTs

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

The GHG Inventory Quality Assurance Working Group (the QAWG) is an organization for QA activities and comprises 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.

1.2.3 Brief Description of the Inventory Preparation Process

■ Annual Inventory Preparation Cycle

Table 1-22 shows the annual cycle of inventory preparation. The inventory preparation cycle is set in conjunction with Japan's fiscal year calendar (starting April 1 and ending March 31 of the next year) In Japan, in advance of the estimation of national inventory 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 1-22 Annual Inventory Preparation Cycle

*Inventory preparation in fiscal yaer "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	Holding the meeting of the QAWG	MOE, GIO	→	→	→	→								
2	Discussion on the inventory improvement	MOE, GIO		→	→	→	→							
3	Holding the meeting of the Committee	MOE, (GIO, Private consultant)		→	→	→	→	→	→	→	→			
4	Collection of data for the national inventory	MOE, GIO, Relevant Ministries/Agencies, Relevant organization, Private consultant								→	→	→	→	
5	Preparation of a draft of CRF	GIO, Private consultant									→	→	→	
6	Preparation of a draft of NIR	GIO, Private consultant									→	→	→	
7	Implementation of the exterior QC and the coordination with the relevant ministries and agencies	MOE, GIO, Relevant Ministries/Agencies, Private consultant										→	→	→
8	Correction of the drafts of CRF and NIR	MOE, GIO, Private consultant											→	→
9	Submission and official announcement of the national inventory	MOE, Ministry of Foreign Affairs, GIO												★

MOE: Ministry of the Environment
GIO: Greenhouse Gas Inventory Office of Japan
Committee: Committee for the Greenhouse Gas Emission Estimation Methods
QAWG: Inventory Quality Assurance Working Group

■ Process of the Inventory Preparation

(1) Holding the meeting of the Greenhouse Gas Inventory Quality Assurance Working Group (QAWG) (Step 1)

The QAWG, which is composed of experts who are not directly involved in nor related to the inventory preparation process, is organized in order to conduct peer reviews and assure the inventory's quality and to find possible improvements.

This QAWG reviews the appropriateness of the estimation methodologies, AD, EFs, and the contents of the CRF and NIR. The 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.

(2) Discussion on the inventory improvement (Step 2)

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 of the UNFCCC, the recommendations of the QAWG, the items needing improvement as identified at former Committee's meetings, and any other items requiring revision as determined during previous inventory preparations. The schedule for the expert evaluation (step 3) is developed by taking the above-mentioned information into account.

(3) Holding meetings of the Committee for the Greenhouse Gas Emission Estimation Methods [evaluation and examination of estimation methods by experts] (Step 3)

The MOE holds meetings of the Committee in which estimation methodologies for an annual inventory and the issues that require technical reviews are discussed by experts with different scientific backgrounds.

(4) Collection of data for the national inventory (Step 4)

The data required for preparing the national inventory and the supplementary information

required under Decision 2/CMP.8 are collected.

(5) Preparation of a draft of CRF [including the implementation of the key category analysis and the uncertainty assessment] (Step 5)

The data input and estimation of emissions and removals are carried out simultaneously by utilizing JNGI files, which have interconnecting links based on the calculation formulas for emissions and removals. Subsequently, the key category analysis and the uncertainty assessment are also carried out.

(6) Preparation of a draft of NIR (Step 6)

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 that require an additional description by taking the discussion at step 2 into account. The GIO prepares the new NIR by updating the data and by adding and revising descriptions in the previous NIR.

(7) Implementation of the external QC and the coordination with the relevant ministries and agencies (Step 7)

As a QC activity, the selected private consulting companies check the JNGI files and the initial draft of the CRF (the 0th draft) prepared by the GIO (external QC). The companies not only check the input data and the calculation formulas in the files but also check the estimations by re-calculating the total amounts of GHG emissions and removals determined by utilizing the same files. Because of this crosscheck, any possible data input and emission estimation mistakes are avoided. They also check the content and descriptions of the initial draft of the NIR (the 0th draft) prepared by the GIO. JNGI files, draft CRF and draft NIR, which have been checked by the private consulting companies, are regarded as the primary drafts of 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, which are estimated based on confidential data, are only sent out for confirmation to the ministry and/or agency that provided the confidential data.

(8) Correction of the drafts of CRF and NIR (Step 8)

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 7), the MOE, GIO, and relevant ministries and/or agencies that submit requests for a revision then coordinate the details of any revision, 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 is no additional request for revision, the secondary drafts are considered the final versions.

(9) Submission and official announcement of the national inventory (Step 9)

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 website (http://www.env.go.jp/) with additional relevant information. The inventory is also published on the GIO's website (http://www-gio.nies.go.jp/).

1.2.4 Process for the Inventory Recalculations

In accordance with the UNFCCC Reporting Guidelines and the *2006 IPCC Guidelines*, Annex I Parties should recalculate their inventories for the base year and all subsequent years of the time series in the cases of 1) application of new estimation methods, 2) addition of new categories for emissions and removals, and 3) data refinement.

In Japan, improvements in the calculation methods are considered in accordance with necessity whenever an inventory item requiring improvement is identified because of, for example, a UNFCCC review or an observation by the QAWG, progress in international negotiations such as the creation of new guidelines, progress or changes in scientific research or in the compilation of statistics, or the acquisition of new information by the system for calculating, reporting, and publishing GHG emissions. Proposals for improving the estimation of emissions and removals are considered by scientific research or the Committee, and the results are incorporated into the inventory. Figure 1-33 is a diagram of the inventory improvement process.

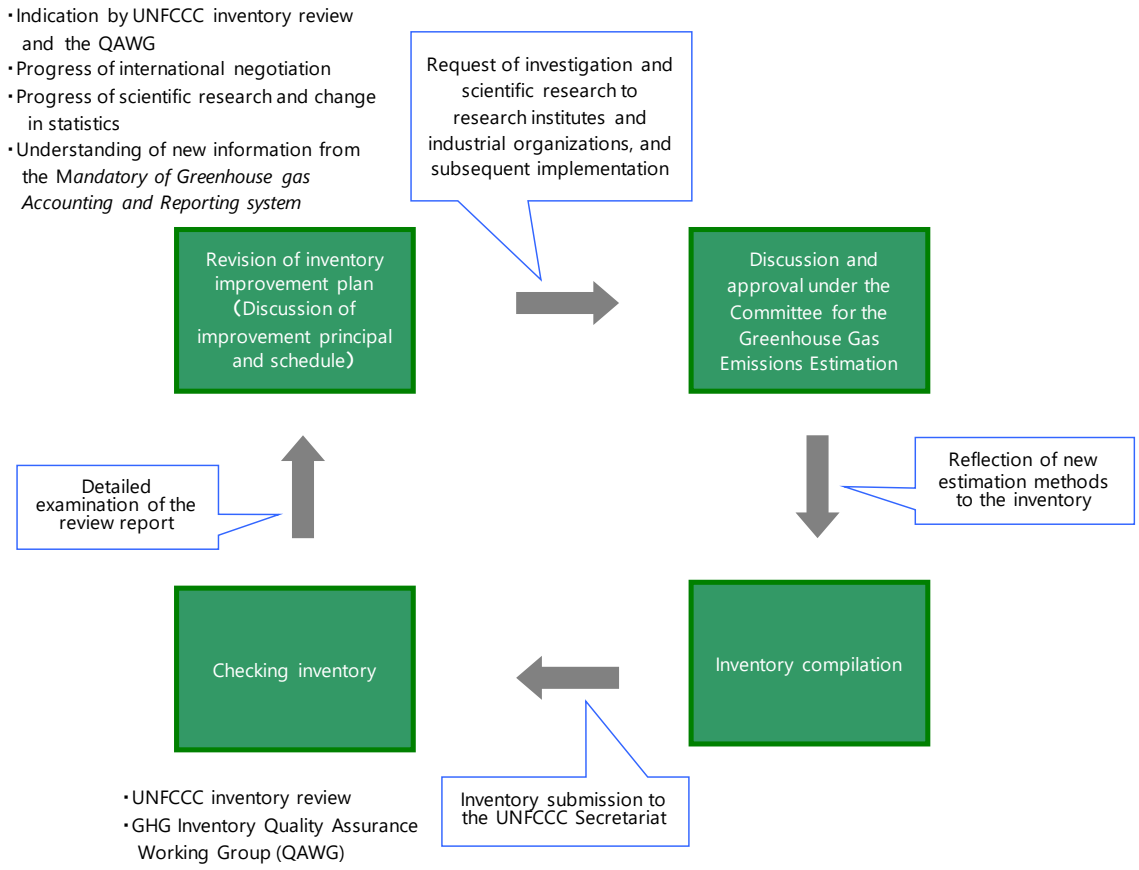


Figure 1-33 Diagram of the inventory improvement process

1.2.5 Information on the QA/QC Process

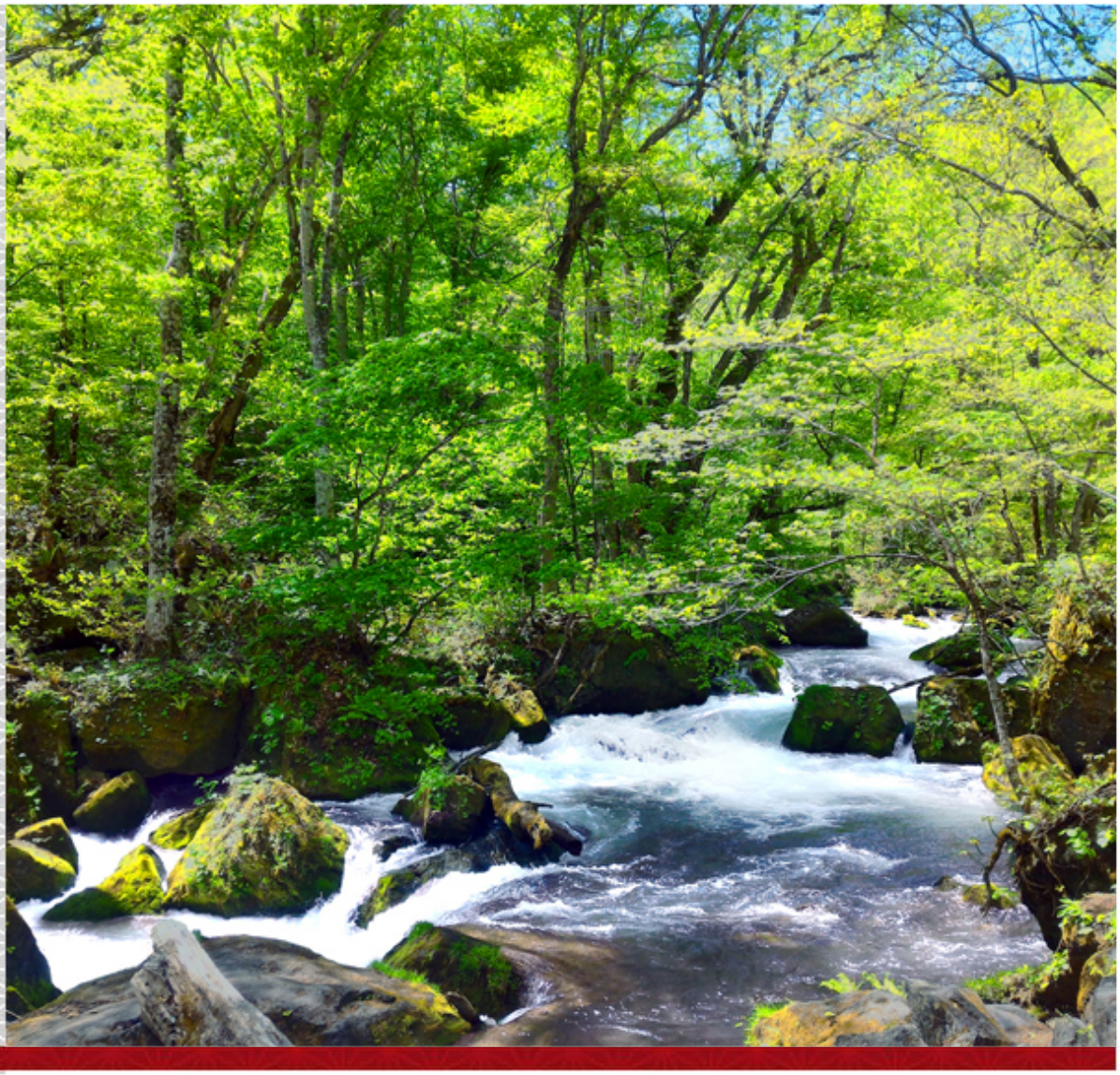
When compiling the inventory in Japan, inventory quality is controlled by performing QC activities (such as checking the correctness of calculations and archive of documents) at each step in accordance with the *2006 IPCC Guidelines*. In Japan, the QC activities relating to inventory compilation performed by personnel belonging to the agencies involved in inventory compilation—that is, the MOE (including the GIO and private consultant companies), relevant ministries and agencies—are considered to be QC. External reviews by experts who are outside the inventory compilation system are considered to be QA. They assess data quality from the perspectives of scientific knowledge and data availability with respect to current calculation methods. Table 1-23 sketches Japan's QA/QC activities.

Table 1-23 Summary of Japan's QA/QC activity

	Implementing entity	Main contents of activity
QC (Quality Control)	Ministry of the Environment (Low-carbon Society Promotion Office, Global Environment Bureau)	・Coordinating QA/QC activities for inventory preparation ・Establishing QA/QC plan ・Developing inventory improvement plan
	Greenhouse Gas Inventory Office of Japan, Center for Global Environmental Research, National Institute for Environmental Studies (GIO)	・Conducting general QC check ・Archiving QA/QC activity records and relevant data and documents ・Developing inventory improvement plan ・Revising QA/QC plan
	Relevant Ministry and Agencies	・Checking data necessary for inventory preparation ・Checking JNGI files and inventory prepared by GIO (Category-specific QC)
	Committee for the Greenhouse Gas Emissions Estimation Methods	・Discussing and assessing estimation methods, EFs, and AD (Category-specific QC)
	Private Consultant Companies	・Checking JNGI files and inventory prepared by GIO (Category-specific QC)
QA (Quality Assurance)	Inventory Quality Assurance Working Group (QAWG)	・Conducting expert peer review of inventory

1.2.6 Changes in National inventory Arrangements since BR3

There is no change in the national inventory arrangements since Japan's third Biennial Report (BR3) submitted in December 2017.



Chapter 2

Quantified Economy-Wide Emission Reduction Targets

Chapter 2 provides information on Japan's quantified economy-wide emission reduction targets for the year FY 2020 and FY 2030.

2.1 Emission Reduction target for 2020

Japan's greenhouse gas emission reduction and removal target is a 3.8% or more emission reduction in 2020 compared to the 2005 level. This target was resubmitted to the UNFCCC secretariat on May 13, 2016.

For the LULUCF sector, Japan will use net removals by LULUCF activities in accordance with the accounting rule under the second commitment period of the Kyoto Protocol by continually implementing the necessary policies and measures. Of them, the targets for the amount of net removals by forest carbon sinks and revegetation are to ensure approximately 38 $MtCO_2$ or more and 1.2 $MtCO_2$, respectively. The amount of net removals by carbon sinks in agricultural soils from cropland management and grazing land management is estimated at approximately 7.7 $MtCO_2$.

Japan establishes and implements the Joint Crediting Mechanism (JCM) in order both to appropriately evaluate contributions from Japan to GHG emission reductions or removals in a quantitative manner achieved through the diffusion of low carbon technologies, products, systems, services, and infrastructure, as well as implementation of mitigation actions in developing countries, and to use them to achieve Japan's emission reduction target.

The details of Japan's emission reduction target for 2020 are the following.

[Base year] (CTF Table 2(a))

Base year	FY 2005
Emission reduction target	3.8% or more of base year
Period for reaching target	FY 2020

[Gases, sectors covered and GWP] (CTF Table 2(b), (c))

Gases covered	Base year for each gas	GWP values
CO_2	FY 2005	IPCC Fourth Assessment Report (AR4)
CH_4	FY 2005	IPCC Fourth Assessment Report (AR4)
N_2O	FY 2005	IPCC Fourth Assessment Report (AR4)
HFCs	CY 2005	IPCC Fourth Assessment Report (AR4)
PFCs	CY 2005	IPCC Fourth Assessment Report (AR4)
SF_6	CY 2005	IPCC Fourth Assessment Report (AR4)
NF_3	CY 2005	IPCC Fourth Assessment Report (AR4)

Sector covered	Energy Transport Industrial Processes Agriculture LULUCF Waste

[Approach to counting emissions and removals from the LULUCF sector] (CTF Table 2(d))

LULUCF in base year level and target	Base year: Excluded Target year: Included	The GHG emission level of the base year is calculated based on the national total GHG emissions without LULUCF in FY 2005. The GHG emission level in the target year (FY 2020) consists of the national total GHG emissions without LULUCF and the LULUCF contribution calculated based on the LULUCF accounting approach explained below. (This is the same reporting approach under the Kyoto Protocol)
Contribution of LULUCF is calculated using	Activity-based approach The LULUCF contribution is the net removals by specific LULUCF activities accounted in accordance with the LULUCF rule and modality under the second commitment period of the Kyoto Protocol. For forest carbon sinks (contains Afforestation/Reforestation, Deforestation and Forest Management [FM] activities), the contribution is the annual average of net removals accounted for the period of FY 2013 - FY 2020, from the lands where activities have been implemented since FY1990. These lands are identified in line with the IPCC *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol* (KPSG). The FMRL is set as zero with the narrow approach[17] adopted for the FM land, and technical correction to the FMRL constructed from the historical trend of HWP emissions and removals is applied. Carbon sinks in agricultural soils from cropland management and grazing land management, and revegetation are accounted based on the net-net approach comparing with the net emissions and/or removals in the reference year (FY1990) and the target year (FY 2020).	

[Market based mechanisms] (CTF Table 2(e)I, II)

Possible scale of contributions of market-based mechanisms under the Convention (Estimated $ktCO_2$ eq.)	CERs	NE
	ERUs	NE
	AAUs	NE
	Carry-Over units	NE
	Other mechanism units under the Convention	NE
Possible scale of contributions of other market-based mechanisms (Estimated $ktCO_2$ eq.)	JCM	NE

[Other information] (CTF Table 2(f))

Other information	–

[17] The narrow approach is one of the methods to assume the contribution of net emissions and removals resulted from mitigation actions. In this approach, human induced contribution of forest removals is assumed not from the removals of a whole managed forest but from forests where forest management practices have been implemented since the specific year.

2.2 Emission Reduction target for 2030 (Note: as of November 2019)

Japan's GHG emission reduction target under the Paris Agreement is at the level of a reduction of 26.0% by fiscal year (FY) 2030 compared to FY 2013 (25.4% reduction compared to FY 2005) (approximately 1,042 Mt-CO_2 eq. as FY 2030 emissions), set as a feasible reduction target by bottom-up calculation with concrete policies, measures, and individual technologies taking into adequate consideration, *inter alia*, technological and cost constraints, and set based on the amount of domestic emission reductions and removals assumed to be obtained and consistent with its energy mix. This target was submitted to the UNFCCC in July 2015 as Japan's Intended Nationally Determined Contribution (INDC), which was registered as the Nationally Determined Contribution (NDC) with the entry into force of the Paris Agreement.

The details of Japan's emission reduction target for 2030 are the following.

2.2.1 Information to facilitate clarity, transparency and understanding

Base years	FY 2013 and FY 2005; FY 2013 is the base year mainly used for presenting Japan's NDC
Target year	Japan's FY 2030 Period for implementation : from April 1, 2021 to March 31, 2031 (FY 2021 to FY 2030)
Sectors	All sectors and categories encompassing the following: (a) Energy -Fuel Combustion (Energy industries, Manufacturing industries and Construction, Transport, Commercial/Institutional, Residential, Agriculture/Forestry/Fishing, and Other) -Fugitive emissions from fuels -CO_2 transport and storage (b) Industrial processes and product use (c) Agriculture (d) Land Use, Land-Use Change and Forestry (LULUCF) (e) Waste
Gases	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3
Coverage	100%

2.2.2 GHG emissions and removals

■ GHG emissions reductions

(1) Energy-Originated CO_2

Approximately 90% of GHG emissions in Japan is covered by energy-originated CO_2. The target for emissions of energy-originated CO_2 is set at 25.0% reductions compared to FY 2013 level (24.0% reduction compared to FY 2005 level) (approximately 927 $MtCO_2$). The estimated emissions in FY 2030 in each sector are shown in Table 2-1.

Table 2-1 Estimated emissions of energy-originated CO_2 in each sector

	Estimated emissions of each sector in FY 2030	FY 2013(FY 2005)
Energy originated CO_2	927	1,235 (1,219)
Industry	401	429 (457)
Commercial and other	168	279 (239)
Residential	122	201 (180)
Transport	163	225 (240)
Energy conversion	73	101(104)

[$MtCO_2$]

(2) Non-energy originated CO_2

The target is set as a 6.7% reduction compared to the FY 2013 level (17.0% reduction compared to the FY 2005 level) (approximately 70.8 $MtCO_2$).

(3) Methane

The target is set as a 12.3% reduction compared to the FY 2013 level (18.8% reduction compared to the FY 2005 level) (approximately 31.6 $MtCO_2$ eq.).

(4) Nitrous oxide

The target is set as a 6.1% reduction compared to the FY 2013 level (17.4% reduction compared to the FY 2005 level) (approximately 21.1 $MtCO_2$ eq.).

Table 2-2 Estimated emissions of non-energy-originated CO_2, methane and nitrous oxide

	Estimated emissions of each gas in FY 2030	FY 2013(FY 2005)
Non-energy originated CO_2	70.8	75.9 (85.4)
Methane (CH_4)	31.6	36.0 (39.0)
Nitrous oxide (N_2O)	21.1	22.5 (25.5)

[$MtCO_2$ eq.]

(5) Fluorinated gases (HFCs, PFCs, SF_6 and NF_3)

The target is set as a 25.1% reduction compared to the Calendar Year (CY) 2013 level (4.5% increase compared to the CY 2005 level) (approximately 28.9 $MtCO_2$ eq.).

Table 2-3 Estimated emissions of fluorinated gases

	Estimated emissions in CY 2030	CY 2013(CY 2005)	
Fluorinated gases	28.9	38.6	(27.7)
HFCs	21.6	31.8	(12.7)
PFCs	4.2	3.3	(8.6)
SF_6	2.7	2.2	(5.1)
NF_3	0.5	1.4	(1.2)

[$MtCO_2$ eq.]

* Fluorinated gases are estimated on a CY basis.

2.2.3 Removals by LULUCF

The target for removals is set as approximately 37 $MtCO_2$ (corresponding to a 2.6% reduction in total emissions in FY 2013 [corresponding to a 2.6% reduction in total emissions in FY 2005]) (approximately 27.8 $MtCO_2$ by forest carbon sink measures [corresponding to a 2.0% reduction in total emissions in FY 2013 {corresponding to 2.0% reduction in total emissions in FY 2005}], and approximately 9.1 $MtCO_2$ by carbon sinks in agricultural soils from cropland management and grazing land management, and revegetation [corresponding to a 0.6% reduction in total emissions in FY 2013 {corresponding to a 0.7% reduction inf total emissions in FY 2005}]).

2.2.4 Joint Crediting Mechanism (JCM) and other international contributions

Japan establishes and implements the JCM with partner countries in order both to appropriately evaluate contributions from Japan to GHG emission reductions or removals in a quantitative manner achieved through the diffusion of low carbon technologies, products, systems, services, and infrastructure, as well as implementation of mitigation actions in developing partners, and to use them to achieve Japan's emission reduction target. Apart from contributions achieved through private sector based projects, accumulated emission reductions or removals by FY 2030 through governmental JCM programs to be undertaken within the government's annual budget are estimated to range from 50 to 100 $MtCO_2$. As part of international contributions other than the JCM, worldwide emission reduction potential in FY 2030 through the diffusion of leading technologies by Japanese industries' actions is estimated to be at least 1 billion tCO_2.

Japan will also actively contribute internationally towards, *inter alia*, human resource development and promotion of development and diffusion of technologies relating to emission reductions in developing countries.

Chapter 3

Progress in Achievement of Quantified Economy-Wide Emission Reduction Targets and Relevant Information

3.1 Policymaking Process

3.1.1 Overall Framework of Promotion of Policies and Measures

In the Basic Environment Law (November 19, 1993, Act No. 91) that defines the basic principles regarding environmental conservation in Japan and outlines the basic direction of national policy, proactive promotion of the Global Environmental Conservation is regulated. The Government formulates the Basic Environment Plan[18] based on Article 15, paragraph 1, of the Law to comprehensively and strategically promote measures related to environmental conservation. The global warming countermeasure is an important component of the plan.

Additionally, regarding the promotion of global warming countermeasures, there is a specific legislation the Act on the Promotion of Global Warming Countermeasures (1998, Act No. 117). The Government established the Plan for Global Warming Countermeasures (Cabinet Decision on May 13, 2016) based on Article 8, paragraph 1, of the Act and the Action Policy for Global Warming Countermeasures based on the Paris Agreement (decision by the Global Warming Prevention Headquarters on December 22, 2015) in order for the national government, local governments, businesses, and citizens to promote global warming countermeasures in a comprehensive and strategic manner. The Plan for Global Warming Countermeasures is the only general plan regarding global warming in Japan. This plan sets targets for reducing greenhouse gas emissions and removals, basic matters concerning measures that businesses and citizens should implement, and basic matters concerning measures that the national government and local governments should implement in order to achieve the target.

3.1.2 Promotion System of the Plan for Global Warming Countermeasures

The Government established the Global Warming Prevention Headquarters with the Prime Minister as the chairperson and all ministers as members, and the executive committee of the Global Warming Prevention Headquarters which is the director-level committee of government ministries. These organizations take the initiative in maintaining close communication among the relevant government ministries and agencies to work on tasks. They gather opinions from intellectuals and experts on the relevant councils at the proper times in the proper manner and maintain coordination with the relevant organizations.

In the regions, relevant government ministries and agencies use the Regional Energy and Global Warming Mitigation Councils set up in the individual regional blocks for them to follow up on and support regional efforts with local governments and Regional Councils for the Mitigation of Global Warming.

3.1.3 Progress Management of the Plan for Global Warming Countermeasures

The Global Warming Prevention Headquarters inspects the target achievement status by types of greenhouse gases and other categories, relevant indicators, and the progress of individual

[18] The fifth Basic Environment Plan determined by the Cabinet on April 17, 2018, is the latest as of November 2019.

actions and measures every year based on stringent rules and regular evaluations and examinations by the relevant councils. Accurate inspections require the identification of the latest conditions. Thus, the relevant government ministries and agencies strive to quickly calculate the necessary values used for the inspection of the amount of emissions reduced, indicators to evaluate the effects of measures, and the relevant indicators (hereinafter referred to as "measure evaluation indicator").

Specifically, the Global Warming Prevention Headquarters or the executive committee of the Global Warming Prevention Headquarters clarifies the actual values of all indicators from one year before the inspection (or actual values from two years ago if the values from one year before are unavailable). They also present the outlooks for the indicators to evaluate individual measures (outlook for each year if data are available) from the year of the progress inspection to FY 2030. They also clarify the status of measures implemented one year before as the grounds for setting the outlook for the measure evaluation indicators and the contents of measures being implemented for the current year. Furthermore, they present policies and measures on budget proposals, tax reform proposals, and bills that will be implemented in the next fiscal year or later. These data and information are used to evaluate individual policies and measures. If policies and measures showing slow progress are identified, improvement and reinforcement of these policies and measures will be considered. In such cases, new policies and measures are beyond policies and measures already included in the Plan for Global Warming Countermeasures will also explored.

When necessary, the progress review includes a detailed examination of the relationship between indicators to evaluate individual measures and the amount of emissions reduced as the effects of implementing the applicable measures. Proper evaluation methods should be quickly established for fields without sufficient evaluation methods at this point, such as the indicators to evaluate policies and measures that will lead to the reform of socioeconomic systems.

The grounds for the estimated emission reductions for individual measures and the outcomes of progress review are made available to the public on the Internet so that the public can receive proper information about measures and their progress.

In addition to the annual progress review, targets and measures set in the Plan for Global Warming Countermeasures are examined at least every three years based on data for the amount of greenhouse gas emissions (final values) of two years before, which is released around April of every year; the amount of greenhouse gas emissions (preliminary values) from the previous year, which is released around December of every year; and the review of the Biennial Report (BR) and the National Communication (NC) that the Government submits to the secretariat of the United Nations Framework Convention on Climate Change, taking into account the situation of the amount of greenhouse gas emissions and removals and other circumstances in Japan. The outcomes of the examination are used to review the Plan for Global Warming Countermeasures as necessary, and the Cabinet Decision will be subsequently made for any revision.

The outlook discussed above is prepared on the basis of the provisions set in the Paris Agreement and COP 21 decisions until 2020. After 2020, the outlook will be prepared on the basis of the provisions of the five-year cycle of target submissions and updates set in the Agreement and the decisions. Information on the efforts will be reported and reviewed internationally in accordance with the transparency framework under the Paris Agreement in

the future.

3.1.4 Information on Changes in Domestic Institutional Arrangements

There has been no change in the domestic institutional arrangements in Japan with regard to the reporting to the UNFCCC and the system for promoting global warming countermeasures since December 2017 when the BR3 was submitted.

3.2 Policies and Measures on Mitigation Actions and Their Effects

3.2.1 Direction of Global Warming Countermeasures by Japan

Japan will lead global warming countermeasures based on scientific knowledge with international cooperation.

■ Actions to achieve the midterm target (reduction target for FY 2030)

Japan ensures domestic emission reductions and removals based on Japan's NDC submitted to the Secretariat of the UNFCCC. Japan thereby makes steady progress toward achieving the midterm target, which is at the level of reduction of 26.0% by FY 2030 compared to FY 2013 (25.4% reduction compared to FY 2005).

■ Strategic actions to achieve long-term targets

The Paris Agreement requested that all Parties strive to formulate and communicate long-term low greenhouse gas emission development strategy, and the COP 21 invited Parties to communicate their strategy to the UN by 2020. In Japan, the long-term strategy under the Paris Agreement as growth strategy was approved by the Cabinet in June 2019 and submitted to the UNFCCC secretariat (refer to Annex II for an overview of the long-term strategy under the Paris Agreement as growth strategy).

Based on this long-term strategy, Japan aims to realize a *decarbonized society* as the ultimate goal and accomplish it ambitiously as early as possible in the second half of this century. To this end, Japan deems it indispensable to realize *a virtuous circle between environment and growth* towards the vision with business-led disruptive innovations.

The long-term strategies set the visions and the direction of policies and measures in the various fields of energy, industry, and community and living. Moreover, in an effort to achieve *a virtuous circle between environment and growth*, the following efforts will be implemented in a cross-cutting manner: (1) the promotion of innovation for practical application and wide use of cross-sectoral decarbonization technologies leading to drastic reductions in GHG, while achieving costs that allow commercialization for social application; (2) appropriately visualizing corporate efforts in innovation and mobilizing finances for innovation by financial institutions; and (3) business-led promotion of competitive technologies and products with high environmental performance by promoting co-innovation benefiting participants from both countries.

Global efforts to reduce greenhouse gas emissions

The development of innovative technologies is the key to the pursuit of global warming countermeasures and economic growth at the same time. Effective emission reductions around the world are necessary in order to reduce global greenhouse gas emissions. Japan promotes developments and demonstration based on the Innovation Plan for Environmental Technology (September 13, 2013, Council for Science and Technology Policy). At the same time, Japan is going to reinforce the research and development of innovative technologies in promising fields irrespective of the course of conventional initiatives based on the National Energy and Environment Strategy for Technological Innovation towards 2050 (April 19, 2016, Council for Science, Technology and Innovation). In addition, Japan uses its advanced technologies to make maximum contributions to reducing global greenhouse gas emissions.

Moreover, to realize a decarbonized society, Japan will develop a Progressive Environment Innovation Strategy within 2019, which address clear cost, technical and institutional issues, and specific measures for implementation in society.

3.2.2 Basic Concept of Global Warming Countermeasures

Integrated improvement of the environment, economy, and society

Japan promotes global warming countermeasures that would also benefit the comprehensive improvement of the environment, economy, and society by using regional resources, technological innovation, and creative ideas so that global warming countermeasures would boost the economy of Japan, create employment, and solve regional problems.

Specific actions include drastic measures for the intensive promotion of energy efficiency, maximum use of renewable energy, acceleration of the development and application of technologies, and reform of lifestyles and workstyles so as to realize economic growth and the high-quality lives of its citizens and to promote the reduction of greenhouse gas emissions while boosting regional economies.

Steady implementation of measures listed in Japan's NDC

The midterm target in Japan's NDC was established on the basis of the aggregation of measures, policies, and technologies supported by a thorough examination of the various issues of technological limitations and costs so that it would remain in alignment with the energy mix. Therefore, the steady implementation of measures listed in Japan's NDC is important in achieving the midterm target. Japan, therefore, strives for the steady implementation of various policies and measures, such as a voluntary approach, regulatory approach, economic approach, and information approach, while effectively taking advantage of the characteristics of each approach.

Response to the Paris Agreement

Japan with faithfully communicate and update its NDC in a five-year cycle, implements the reporting, and responds sincerely to reviews related to the progress of implementation and achievement towards the target stipulated in the Paris Agreement. Japan will also make active contribution to the development of detailed international rules for the implementation of the Paris Agreement. Japan will respond to the reporting and reviewing of activities by other Parties under the Paris Agreement as well.

Furthermore, Japan advances its efforts to support developing countries and promote innovation based on the Actions for Cool Earth 2.0 (ACE 2.0) and the long-term strategy that has already been submitted.

Contribution to reducing the global greenhouse gas emissions through the reinforcement of research and development and the diffusion of advanced low-carbon technologies

The development of innovative technologies is the key to the pursuit of global warming countermeasures and economic growth at the same time.

Japan reinforces the research and development of innovative technologies in promising fields based on the National Energy and Environment Strategy for Technological Innovation towards 2050. Japan also promotes the diffusion of advanced low-carbon technologies and activities to mitigate global warming through the Joint Crediting Mechanism and other efforts.

Raising awareness of all actors, call to action, and reinforcement of cooperation

The problem of global warming is deeply related to socioeconomic activities, regional societies, and the lives of citizens. Thus, all actors, including the national government, local governments, businesses, and citizens, need to become involved with and cooperate in mitigation activities.

Therefore, Japan actively distributes and shares information on exacerbating global warming, specific actions that require greater efforts to achieve the reduction target, and actions that individual citizens should take in a visible and easy-to-understand manner. Japan then trains people who can raise the necessary information and puts it into practice and implements public campaigns to change awareness and takes action at all levels with its citizens.

In addition, Japan encourages individual actors to actively become involved with policies and measures and reinforces cooperation among them by frequently distributing and sharing information on the progress of global warming countermeasures.

Importance of assessment and review processes (PDCA)

To constantly monitor and maintain the effectiveness of this plan after its establishment, Japan inspects the annual progress of individual measures implemented by the national government based on measure evaluation indicators and revises the plan when necessary.

3.2.3 Information on Policies and Measures

More than 80 specific global warming policies and measures as defined in the Plan for Global Warming Countermeasures are outlined by the following items:

- Policies and measures for GHG emission reductions and removals
- Cross-sectoral measures
- Fundamental Measures
- Initiatives by Public Organizations
- Development of Public Campaigns

For major policies and measures that are expected to deliver significant emissions in the sector of energy-related CO_2 and gas, the outlines and the results of progress assessment of the policies and measures to be conducted at the time of progress management, which is specified in 3.1.3, are also included in this report as examples. Progress in reducing emissions is evaluated on the following five-point scale of A to E based on the estimates of measure evaluation indicators from FY 2018 to FY 2030 (in cases where estimates cannot be obtained, qualitative forecasts from FY 2018 to FY 2030), which are based on the actual performance values up to FY 2017:

A: If current efforts continue, the measure evaluation indicators are expected to exceed the target levels by FY 2030, and the actual performance value for FY 2017 has already exceeded the target levels for FY 2030.

B: If current efforts continue, the measure evaluation indicators are expected to exceed the target levels by FY 2030 (but do not meet the criteria of A).

C: If current efforts continue, the measure evaluation indicators are expected to reach the same levels as the target levels in FY 2030).

D: If current efforts continue, the measure evaluation indicators are expected to fall below the target levels for FY 2030.

E: Other (efforts for which quantitative data cannot be obtained)

The outlines of policies and measures and details of emission reductions (performance and forecast) are listed in Table 3-2 (p. 126). For some policies and measures, the estimated mitigation impact is not reported since quantitative data and required statistical information cannot be obtained.

Policies and measures for greenhouse gas emission reductions and removals

(1) Policies and Measures for Greenhouse Gas Emission Reductions

- Energy-related CO_2

  Japan works to realize an energy mix through thorough energy conservation, full use of renewable energy, while limiting the burdens on people, improvement in the efficiency of thermal power generation, use of nuclear power generation whose safety is approved, and diversification of fuels in different categories by shifting to natural gas in the industry sector based on the policies in the Strategy for Energy Reform (April 18, 2016 decision of Ministry of Economy, Trade and Industry).

  Japan strengthens public campaigns to facilitate all levels of people to work on mitigating global warming together, raise their awareness, and encourage them to make wise choices by selecting low-carbon products, services, and initiatives so that the lifestyles of the Japanese people will be appropriate for a low-carbon society.

  The national government, local governments, businesses, and citizens participate and cooperate in developing low-carbon cities and regions by building compact cities and reconstructing public transportation networks.

A. Policies and Measures by Sectors (Industrial, Residential, Commercial, Transport,

etc.)

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

1) Promotion and Enhancement of Voluntary Action Plans of Industries

- Steady Implementation of Industry's Action Plans for a Low-Carbon Society and Evaluation and Verification of Progress

<Outline of policies and measures>

The Japan Business Federation and industries have voluntarily established Greenhouse Gas Emission Reduction Plans (hereinafter referred to as "the Voluntary Action Plans" including plans up to FY 2012 set by individual industry types) and have been evaluated for making high achievements to reduce emissions. Based on the reduction initiatives conducted under the Voluntary Action Plans and the evaluation and verification of the initiatives in the process of initiatives under the Kyoto Protocol Target Achievement Plan, businesses are expected to continue voluntary initiatives as the central players in ensuring steady emission reductions by industries.

Voluntary methods like this have benefits in terms of improving the transparency, reliability, and the possibility of achieving targets, and while they require a certain level of involvement of the government, allow individual entities to select better measures using their creativity and ideas, and encourage entities to work toward higher targets. Thus, it is extremely important for the industry to keep working to reduce greenhouse gas emissions while taking advantage of these benefits. Therefore, each business operator in the industrial community establishes and implements the contents and objectives of Greenhouse Gas Emission Reduction Plans as initiatives after FY 2013 and reviews them when necessary based on regular evaluations and verifications by paying attention to the following viewpoints to respond to social demands while recognizing the benefits of respecting the dependency of the industries. (In the industry, commercial, transport, and energy conversion sectors, the Greenhouse Gas Emission Reduction Plans refer to plans to reduce the greenhouse gas emissions set by each industry group as a member of the Japan Business Federation and non-member industry group. Plans set by individual industry groups are hereinafter called "the Industry's Action Plans for a Low-Carbon Society.")

(i) Industry groups that have not set the Industry's Action Plans for a Low-Carbon Society are regardless of their participation in the Voluntary Action Plans under the Kyoto Protocol Target Achievement Plan.

(ii) The Industry's Action Plans for a Low-Carbon Society provide CO_2 reduction targets with the perspective of reducing greenhouse gas emissions based on the full use of best available technologies (BATs) and active efforts to commit to energy conservation. Industry groups explain to external stakeholders that targets are the highest level they can possibly achieve. The important point is to gather data that will enable the comparison of energy efficiency and CO_2 emissions between Japan and other countries so that they can evaluate the difficulty of achieving the target level and the level of efforts required by industry groups. Also, BAT and best practices, when presented in advance, enable the evaluation of efforts done by each industry group, in addition to the progress toward achieving the target level. Targets should be continuously re-evaluated by flexibly raising numerical targets when new additional BATs become available through technological advancement, for example.

* Indicators of targets mainly include energy consumption intensity, energy consumption, CO_2

emission intensity, CO_2 emissions, and reduction from business as usual (BAU) that are selected on the basis of autonomous decisions by each industry group. Methods of setting targets need continuous exploration.

(iii) The Industry's Action Plans for a Low-Carbon Society are implemented on the basis of the PDCA cycle as practiced before to ensure effectiveness, transparency, and reliability. Plans targeting 2030 require a long-term commitment. Thus, assumptions need to be clarified, and various factors, such as social and industrial structures, as well as technological advancement, must be taken into account while ensuring transparency.

(iv) In addition to the emission reduction targets (commitments) raised in (ii) above, businesses contribute to a reduction in CO_2 emissions by supplying low-carbon products and services while cooperating with the relevant industry groups. Businesses also work on improving the awareness and knowledge of the public on the mitigation of global warming.

(v) Each industry group actively works on global warming countermeasures through the overseas development of low-carbon products and services, transfer of technologies and know-how to developing countries with the motivation to mitigate global warming based on international rules, and reinforcement of international cooperation by the private sector from the perspective of contributing to the worldwide effort to mitigate global warming. They must also present how they contribute to reductions with initiatives based on their business types.

(vi) Each industry group actively develops and commercializes innovative technologies from the mid-to-long-term perspective that might extend beyond 2030.

(vii) Each business of the operators also conducts international comparisons based on reliable data and actively distributes the information to the outside in order to provide logical information to overseas markets and consumers in regard to transactions based on the Industry's Action Plan for a Low-Carbon Society.

Based on the above perspectives from (i) to (vii), the government organizes relevant councils and committees to strictly and regularly assess and verify initiatives implemented on the basis of the Industry's Action Plans for a Low-Carbon Society established by each industry group and the Industry's Action Plans for a Low-Carbon Society for 2030.

<Progress assessment of policies and measures>

The progress assessment results against the targets for FY 2030 of each industry in the Industry's Action Plans for a Low-Carbon Society are shown in Table 3-1.

Table 3-1 Target indicators, target levels, and progress assessment results of each industry for their Industry's Action Plans for a Low-Carbon Society

Type of industry	Target indicator	Base year/BAU	Actual performance					Target level		Assessment of progress
			2013	2014	2015	2016	2017	2020	2030	
Indusrty sector										
Industry under Ministry of Finance										
Brewers Association of Japan	CO_2 emissions	$ktCO_2$	491.5	481.4	473.5	465.5	462.1			A
	CO_2 emissions	BAU	▲13%	▲15%	▲16%	▲18%	▲18%	▲54$ktCO_2$	▲102$ktCO_2$	
Japan Tobacco Inc.	CO_2 emissions	$ktCO_2$	93.0	89.0	83.0	80.0	75.0			E
	CO_2 emissions	FY2009	▲10%	▲12%	▲16%	▲18%	▲21%	▲20%	—	
Industry under Ministry of Health, Labour and Welfare										
The Federation of Pharmaceutical Manufacturers' Associations of Japan	CO_2 emissions	$ktCO_2$	2,543.3	2,436.5	2,374.0	2,380.5	2,293.5			B
	CO_2 emissions	FY2005	▲21%	▲24%	▲24%	▲23%	▲24%	▲23%	▲25%	
	CO_2 emission intensity (amount of sales/CO_2 emissions)	FY2005	1.6 times	1.6 times	1.6 times	1.6 times	1.6 times		3 times	
Industry under Ministry of Fisheries, Forestry and Agriculture										
Japan Starch & Sweeteners Industry Association	CO_2 emissions	$ktCO_2$	1,051	1,180	1,255	1,245	1,238			C
	CO_2 emission intensity	FY2005	▲3%	+9%	+14%	+13%	+12%	▲3%	▲5%	
Japan Dairy Industry Association	CO_2 emissions	$ktCO_2$	1,195	1,154	1,159	1,117	1,036			B
	Energy consumption intensity	FY2013	+0%	▲2%	+0%	▲1%	+2%	▲1% (Annual rate)	—	
	CO_2 emissions	FY2013	+0%	▲3%	▲3%	▲7%	▲13%	—	▲15%	
Japan Soft Drink Association	CO_2 emissions	$ktCO_2$	1,209	1,147	1,141	1,131	1,105			B
	CO_2 emission intensity	FY1990	+1%	▲3%	▲8%	▲10%	▲15%	▲10%	—	
	CO_2 emission intensity	FY2012	+1%	▲3%	▲7%	▲10%	▲15%	—	▲18%	
Japan Baking Industry Association	CO_2 emissions	$ktCO_2$	1,085	1,091	1,070	1,047	1,020			A
	CO_2 emission intensity	FY2013	+0%	▲6%	▲8%	▲11%	▲15%	▲1% (Annual rate)	▲1% (Annual rate)	
Japan Canners Association	CO_2 emissions	$ktCO_2$	755	679	634	788	1,062			B
	Energy consumption intensity	FY2009	▲5%	▲15%	▲9%	▲13%	▲7%	▲1% (Annual average)	▲1% (Annual average)	
Japan Beet Sugar Association	CO_2 emissions	$ktCO_2$	638	653	704	601	661			A
	Energy consumption intensity	FY2010	▲15%	▲19%	▲21%	▲12%	▲17%	▲15%	▲15%	
Japan Oilseed Processors Association	CO_2 emissions	$ktCO_2$	557	586	615	593	571			A
	CO_2 emission intensity	FY1990	▲23%	▲20%	▲17%	▲21%	▲25%	▲16%	▲16%	
	CO_2 emissions	FY1990	▲17%	▲13%	▲9%	▲12%	▲15%	▲8%	▲8%	
All Nippon Kashi Association	CO_2 emissions	$ktCO_2$	974	973	960	916	949			B
	CO_2 emissions	FY2013	+0%	▲0%	▲1%	▲6%	▲3%	▲7%	▲17%	
	CO_2 emission intensity	FY2013	+0%	▲7%	▲18%	▲25%	▲26%	▲7%	▲17%	
Japan Sugar Refiners' Association	CO_2 emissions	$ktCO_2$	390	376	365	358	345			A
	CO_2 emissions	FY1990	▲33%	▲35%	▲37%	▲38%	▲40%	▲33%	▲33%	
Japan Frozen Food Association	CO_2 emissions	$ktCO_2$	437	403	419	514	499			B
	Energy consumption intensity	FY2013	+0%	▲3%	▲5%	▲6%	▲9%	▲8.7%	▲17.4%	
Japan Ham & Sausage Processors Cooperative Association	CO_2 emissions	$ktCO_2$	569	569	561	550	547			A
	Energy consumption intensity	FY2011	▲6%	▲4%	▲6%	▲6%	▲8%	▲5%	▲1% (Annual average)	
Flour Millers Association	CO_2 emissions	$ktCO_2$	305	303	286	275	268			B
	CO_2 emission intensity	FY1990	+39%	+38%	+28%	+24%	+20%	▲16.5%	—	
	CO_2 emission intensity	FY2013	+0%	▲1%	▲7%	▲11%	▲14%	—	▲32.1%	
All Japan Coffee Association	CO_2 emissions	$ktCO_2$	118	116	120	131	120			A
	CO_2 emission intensity	FY2005	▲33%	▲38%	▲41%	▲40%	▲45%	▲15%	▲25%	
Japan Soy-sauce Association	CO_2 emissions	$ktCO_2$	198	182	174	170	168			B
	CO_2 emissions	FY1990	▲5%	▲12%	▲16%	▲18%	▲19%	▲18%	▲23%	
Japan Convenience Foods Industry Association	CO_2 emissions	$ktCO_2$	234	236	240	231	269			B
	CO_2 emission intensity	FY1990	▲21%	▲24%	▲25%	▲27%	▲18%	▲30%	▲21%	
Nihon Hamburg & Hamburger Association	CO_2 emissions	$ktCO_2$	110	106	105	106	103			C
	Energy consumption intensity	FY2011	+7%	+8%	+15%	+11%	+14%	▲5%	▲1% (Annual average)	
Japan Association of Mayonnaise & Dressings	CO_2 emissions	$ktCO_2$	62	60	58	57	55			B
	CO_2 emissions	FY2012	+1%	▲1%	▲6%	▲7%	▲10%	▲8.7%	▲21.7%	
	CO_2 emission intensity	FY2012	▲1%	▲3%	▲9%	▲11%	▲15%	▲5.1%	▲18.2%	
Japan Rice Millers Association	CO_2 emissions	$ktCO_2$	70	70	70	86	87			B
	Energy consumption intensity	FY2005	▲3%	▲7%	▲3%	▲10%	▲9%	▲10%	▲12%	

Type of industry	Target indicator	Base year/BAU	Actual performance					Target level		Assessment of progress
			2013	2014	2015	2016	2017	2020	2030	
Industry under Ministry of Economy, Trade and Industry										
The Japan Iron and Steel Federation	CO_2 emissions	$ktCO_2$	194,408	191,803	184,085	182,643	181,200			B
	CO_2 emissions	BAU	+0.3%	+0.6%	▲1.0%	▲1.3%	▲1.3%	▲5MtCO_2 (▲3MtCO_2+actual achivement of waste plastics)	▲9MtCO_2	
Japan Chemical Industry Association	CO_2 emissions	$ktCO_2$	63,626	62,654	61,157	59,645	60,317			A
	CO_2 emissions	BAU	▲2%	▲2%	▲4%	▲6%	▲9%	▲1.5MtCO_2	▲2MtCO_2	
Japan Paper Association	CO_2 emissions	$ktCO_2$	18,750	18,035	17,729	17,927	17,889			A
	CO_2 emissions	BAU	▲13%	▲14%	▲15%	▲15%	▲16%	▲1,390ktCO_2	▲2,860ktCO_2	
Japan Cement Association	CO_2 emissions	$ktCO_2$	18,065	17,744	17,177	16,956	17,318			A
	Energy consumption intensity	FY2010	▲0.8%	▲1.2%	▲2.0%	▲3.2%	▲2.5%	▲1.1%	▲1.4%	
Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention	CO_2 emissions	$ktCO_2$	12,937	13,313	13,414	13,978	14,414			A
	Improvement rate of energy intensity	FY2012	▲7.08%	▲10.63%	▲11.06%	▲13.22%	▲20.49%	▲7.73%	▲16.55%	
Japan Auto Parts Industries Association	CO_2 emissions	$ktCO_2$	7,681	7,414	6,837	6,954	6,986			B
	CO_2 emission intensity	FY2007	▲13%	▲13%	▲15%	▲12%	▲13%	▲13%	▲20%	
Japan Automobile Manufacturers Association / Japan Auto-Body Industries Association	CO_2 emissions	$ktCO_2$	7,473	7,150	6,633	6,745	6,657			B
	CO_2 emissions	FY1990	▲25%	▲28%	▲33%	▲32%	▲33%	▲35%	▲38%	
Japan Mining Industry Association	CO_2 emissions	$ktCO_2$	4,489	4,407	4,040	3,684	3,614			B
	CO_2 emission intensity	FY1990	▲13%	▲16%	▲18%	▲23%	▲23%	▲15%	▲26%	
Lime Manufacture Association	CO_2 emissions	$ktCO_2$	2,463	2,460	2,226	2,246	2,267			B
	CO_2 emissions	BAU	▲7.4%	▲7.5%	▲6.2%	▲9.5%	▲10.4%	▲150ktCO_2	▲270ktCO_2	
The Japan Rubber Manufactures Association	CO_2 emissions	$ktCO_2$	2,106	2,036	1,902	1,819	1,741			B
	CO_2 emission intensity	FY2005	▲9%	▲9%	▲6%	▲7%	▲9%	▲15%	▲21%	
Japan Textile Finishers' Association	CO_2 emissions	$ktCO_2$	1,124	1,149	1,117	1,092	1,039			A
	CO_2 emissions	FY1990	▲69%	▲69%	▲70%	▲71%	▲72%	▲64%	▲65%	
Japan Aluminium Association	CO_2 emissions	$ktCO_2$	1,462	1,490	1,442	1,449	1,417			A
	Energy consumption intensity	BAU	▲4%	▲7%	▲7%	▲5%	▲4%	▲0.8GJ/t	▲1.0GJ/t	
Japan Federation of Printing Industries	CO_2 emissions	$ktCO_2$	1,445	1,382	1,333	1,289	1,179			A
	CO_2 emissions	FY2010	▲10%	▲12%	▲12%	▲13%	▲18%	▲8.2%	▲16.9%	
Flat Glass Manufacturers Association of Japan	CO_2 emissions	$ktCO_2$	1,171	1,102	1,063	1,060	1,087			B
	CO_2 emissions	FY2005	▲13%	▲18%	▲21%	▲21%	▲19%	▲25.5%	▲32%	
Japan Glass Bottle Association	CO_2 emissions	$ktCO_2$	895	848	852	838	809			B
	CO_2 emissions	FY2012	+4%	▲1%	▲1%	▲3%	▲6%	▲9.9%	▲18.1%	
	Energy consumption	FY2012	▲1%	▲7%	▲6%	▲6%	▲8%	▲12.7%	▲20.7%	
The Japanese Electric Wire & Cable Makers'Association	CO_2 emissions	$ktCO_2$	961	914	881	853	825			B
	Energy consumption	FY2005	▲17%	▲19%	▲20%	▲20%	▲20%	▲20%	▲23%	
The Japan Bearing Industry Association	CO_2 emissions	$ktCO_2$	847	836	788	781	784			A
	CO_2 emission intensity	FY1997	▲21%	▲26%	▲24%	▲24%	▲28%	▲23%	▲28%	
The Japan Society of Industrial Machinery Manufacturers	CO_2 emissions	$ktCO_2$	583	584	551	545	534			A
	Energy consumption intensity	FY2008-FY2012(average of 5 years)	▲3%	▲7%	▲16%	▲9%	▲11%	▲1% (Annual average)	—	
	CO_2 emissions	FY2013	+0%	+0%	▲5%	▲7%	▲8%	—	▲6.5%	
Japan Copper and Brass Association	CO_2 emissions	$ktCO_2$	476	457	423	451	400			B
	Energy consumption intensity	BAU	▲3%	▲7%	▲6%	▲3%	▲4%	▲4%	▲6%	
Japan Construction Equipment Manufacturers Association	CO_2 emissions	$ktCO_2$	503	473	403	410	447			B
	Energy consumption intensity	FY2008-FY2012(average of 5 years)	▲16%	▲24%	▲27%	▲20%	▲30%	▲8%	—	
	Energy consumption intensity	FY2013	+0%	▲9%	▲12%	▲5%	▲16%	—	▲17%	
Limestone Association of Japan	CO_2 emissions	$ktCO_2$	282	279	271	265	263			B
	CO_2 emissions	BAU	▲1%	▲1%	▲1%	▲2%	▲3%	▲4.4ktCO_2	▲5.9ktCO_2	
Japan Sanitary Equipment Industry Association	CO_2 emissions	$ktCO_2$	257	232	199	196	197			A
	CO_2 emissions	FY1990	▲48%	▲53%	▲60%	▲60%	▲60%	▲50%	▲55%	

Type of industry	Target indicator	Base year/BAU	Actual performance					Target level		Assessment of progress
			2013	2014	2015	2016	2017	2020	2030	
Japan Machine Tool Builders' Association	CO_2 emissions	$ktCO_2$	363	370	354	334	337			A
	Energy consumption intensity	Average of FY2008-FY2012	▲4%	▲16%	▲20%	▲17%	▲24%	▲7.7%	▲12.2%	
Japan Petroleum Development Association	CO_2 emissions	$ktCO_2$	254	221	215	211	203			B
	CO_2 emissions	FY2005	+14%	▲1%	▲12%	▲5%	▲9%	▲5%	—	
	CO_2 emissions	FY2013	▲0%	▲13%	▲23%	▲17%	▲20%	—	▲28%	
Japan Prefabricated Construction Suppliers & Manufacturers Association	CO_2 emissions	$ktCO_2$	163	138	137	137	134			C
	CO_2 emission intensity	FY2010	▲2%	▲6%	▲3%	▲3%	+1%	▲10%	▲10%	
Japan Industrial Vehicles Association	CO_2 emissions	$ktCO_2$	48	47	44	43	42			B
	CO_2 emissions	FY2005	▲31%	▲33%(For FY2020 target) ▲32%(For FY2030 target)	▲37%(For FY2020 target) ▲36%(For FY2030 target)	▲39%(For FY2020 target) ▲38%(For FY2030 target)	▲39%	▲37.5%	▲41.0%	
Japan Carbon Association	CO_2 emissions	$ktCO_2$	-	748	653	521	595			B
	CO_2 emission intensity	FY2010	—	—	—	▲5.3%	▲4.3%	▲2.5%	—	
	CO_2 emissions	FY2010	—	—	—	▲5.3%	▲4.3%	—	▲.5.0%	
Industry under Ministry of Land, Infrastructure, Transport and Tourism										
The Shipbuilders' Association of Japan/The Cooperative Association of Japan Shipbuilders	CO_2 emissions	$ktCO_2$	651	695	691	705	674			C
	CO_2 emission intensity	FY2012	+17%	+27%	+26%	+38%	+33%	▲5%	—	
	CO_2 emissions	FY2013	+0%	+7%	+7%	+8%	+3%	—	▲6.5%	
Japan Ship Machinery and Equipment Association	CO_2 emissions	$ktCO_2$	85	85	80	83	70			A
	Energy consumption intensity	FY1990	▲30%	▲29%	▲27%	▲23%	▲33%	▲27%	▲30%	
Japan Marine Industry Association	CO_2 emissions	$ktCO_2$	45	61	60	60	45			C
	CO_2 emissions	FY2010	▲17%	+10%	+10%	+0%	+7%	▲1% (Annual rate)	▲14%	
Japan Association of Rolling Stock Industries	CO_2 emissions	$ktCO_2$	36	36	34	34	35			B
	CO_2 emissions	FY1990	▲22%	▲22%	▲26%	▲26%	▲24%	▲33%	▲35%	
Japan Federation of Construction Contractors	CO_2 emissions	$ktCO_2$	4,113	4,382	4,313	4,237	4,119			B
	CO_2 emission intensity	FY1990	▲18%	▲18%	▲19%	▲19%	▲21%	▲20%	▲25%	
Japan Federation of Housing Organizations	CO_2 emissions (Whole life cycle)	万tCO_2	260 (22,183)	240 (20,891)	239 (19,943)	241 (19,965)	228 (20,790)			D
	CO_2 emissions of construction phase (Whole life cycle)	FY1990	▲52% (+33%)	▲55% (+25%)	▲56% (+19%)	▲55% (+19%)	▲58% (+24%)	270 (15,810)	—	
	Environmental performance of new housing	—	—	—	—	—	—	—	Realization of ZEH with new housing average	

Type of industry	Target indicator	Base year/BAU	Actual performance					Target level		Assessment of progress
			2013	2014	2015	2016	2017	2020	2030	
Commercial and Other Sector										
Industry under Financial Services Agency										
Japanese Bankers Association	CO_2 emissions	$ktCO_2$	1,390	1,340	1,260	1,200	1,110			A
	Energy consumption intensity	FY2009	▲17%	▲18%	▲20%	▲22%	▲24%	▲10.5%	▲19.0%	
The Life Insurance Association of Japan	CO_2 emissions	$ktCO_2$	1,106	1,019	956	851	796			A
	Energy consumption intensity	FY2009	▲13%	▲15%	▲17%	▲18%	▲19%	▲1% (Annual average)	–	
	Energy consumption intensity	FY2020	▲3%	▲6%	▲7%	▲9%	▲10%	–	less than 0%	
The General Insurance Association of Japan	CO_2 emissions	$ktCO_2$	270	257	235	223	200			A
	Energy consumption intensity	FY2009	▲15%	▲13%	▲16%	▲16%	▲18%	▲10.5%	▲14.8%	
The National Association of Shinkin Banks	CO_2 emissions	$ktCO_2$	321	302	281	272	258			B
	Energy consumption	FY2009	▲11%	▲14%	▲17%	▲17%	▲18%	▲10.5%	▲19.0%	
Community Bank Shinyo Kumiai	CO_2 emissions	$ktCO_2$	–	–	–	–	–			A
	Energy consumption	FY2006	▲11%	▲15%	▲15%	▲20%	▲19%	▲10%	–	
	Energy consumption	FY2009	▲9%	▲13%	▲13%	▲18%	▲18%	–	▲18%	
Japan Securities Dealers Association	CO_2 emissions	$ktCO_2$	194	180	168	161	147			A
	Energy consumption intensity	FY2009	▲22%	▲23%	▲26%	▲28%	▲30%	▲10%	▲20%	
Industry under Ministry of Internal Affairs and Communications										
Telecommunications Carriers Association	CO_2 emissions	$ktCO_2$	5,706	5,652	5,520	5,204	5,010			B
	Energy consumption intensity	FY2013	+0%	▲24%	▲48%	▲65%	▲74%	▲80%	▲90%	
Telecom Services Association	CO_2 emissions	$ktCO_2$	1,021	963	895	894	811			A
	Energy consumption intensity	FY2013	+0%	▲3%	▲6%	▲4%	▲9%	▲1%	▲2%	
The Japan Commercial Broadcasters Association	CO_2 emissions	$ktCO_2$	245	226	223	222	220			A
	CO_2 emission intensity	FY2012	▲6%	▲6%	▲6%	▲7%	▲13%	▲8%	▲10%	
Japan Broadcasting Corporat	CO_2 emissions	$ktCO_2$	211	199	188	185	171			A
	CO_2 emission intensity	FY2011	▲0%	▲12%	▲16%	▲16%	▲21%	▲15%	▲15%	
Japan Cable and Telecommunications Association	CO_2 emissions	$ktCO_2$	–	–	–	109	112			D
	Energy intensity	FY2016	–	–	–	+0%	+12%	more than ▲1%	–	
	Energy consumption intensity	FY2020	–	–	–	–		–	more than ▲1%	
Japan Satellite Broadcasting Association	CO_2 emissions	$ktCO_2$	10	9	8	7	6			B
	Energy consumption intensity	FY2010	▲4%	▲10%	▲11%	▲11%	▲12%	▲13%	▲15%	
Japan Internet Providers Association	CO_2 emissions	$ktCO_2$	–	–	58	53	57			A
	Energy consumption intensity	FY2015	–	–	+0%	▲17%	▲16%	▲1%	▲1%	
Industry under Ministry of Education, Culture, Sports, Science and Technology										
The Federation of All Japan Private Schools' Associations	CO_2 emissions	$ktCO_2$	–	–	–	–	–			E
	CO_2 emissions	FY2015	–	–	+0%	+5%	–	▲1% (annual rate)	–	
Industry under Ministry of Health, Labour and Welfare										
Japan Medical Association / Council of 4 Hospitals	CO_2 emissions	$ktCO_2$	9,170	8,776	8,515	8,705	–			D
	CO_2 emission intensity	FY2006	▲18%	▲21%	▲22%	▲21%	–	–	▲25%	
Japanese Consumers Co-operative Union	CO_2 emissions	$ktCO_2$	–	–	–	–	–			D
	CO_2 emissions	FY2005	▲11%	▲14%	▲14%	▲19%	▲21%	▲15%	–	
	CO_2 emissions	FY2013	–	–	–	–	–	–	▲40%	
Industry under Ministry of Fisheries, Forestry and Agriculture										
Japan Processed Foods Wholesalers Association	CO_2 emissions	$ktCO_2$	291	326	322	289	273			A
	Energy consumption intensity	FY2011	+2%	▲2%	▲9%	▲5%	▲7%	▲5%	▲5%	
Japan Foodservice Association	CO_2 emissions	$ktCO_2$	7,209	6,824	6,794	6,722	6,472			B
	Energy consumption intensity	FY2013	+0%	▲4%	▲5%	▲8%	▲10%	▲6.8%	▲15.7%	

Type of industry	Target indicator	Base year/BAU	Actual performance					Target level		Assessment of progress
			2013	2014	2015	2016	2017	2020	2030	
Industry under Ministry of Economy, Trade and Industry										
Japan Chain Stores Association	CO_2 emissions	$ktCO_2$	5,400	4,950	3,929	2,910	2,271			A
	Energy consumption intensity	FY1996	▲24%	▲23%	▲32%	▲33%	▲34%	▲24%	▲24%	
Japan Franchise Association	CO_2 emissions	$ktCO_2$	4,402	4,594	4,488	4,472	4,301			B
	Energy consumption intensity	FY2013	+0%	+1%	▲2%	▲3%	▲5%	▲6.8%	▲15.7%	
Japan Council of Shopping Centers	CO_2 emissions	$ktCO_2$	3,317	2,759	2,701	2,594	2,550			A
	Energy consumption intensity	FY2005	▲30%	▲32%	▲34%	▲35%	▲37%	▲13%	▲23%	
Japan Department Stores Association	CO_2 emissions	$ktCO_2$	1,896	1,716	1,586	1,513	1,339			B
	Energy consumption intensity	FY2013	+0%	▲6%	▲11%	▲12%	▲14%	▲6.8%	▲15.7%	
Ote Kaden Ryutsu Kyoukai (home appliances retail)	CO_2 emissions	$ktCO_2$	810	777	713	703	671			B
	Energy consumption intensity	FY2006	▲41.0%	▲43.5%	▲44.8%	▲45.7%	▲48.0%	▲48.3%	▲49.1%	
Japan DIY Industry Association	CO_2 emissions	$ktCO_2$	487	463	463	466	349			B
	Energy consumption intensity	FY2004	▲52%	▲54%	▲52%	▲53%	▲51%	▲15%	—	
	Energy consumption intensity	FY2013	▲12%	▲16%	▲13%	▲14%	▲11%	—	▲17%	
Japan Information Technology Services Industry Association	CO_2 emissions	$ktCO_2$	206	166	134	115	105			B
	(Office) Energy consumption intensity	FY2006	▲11%	▲27%	▲34%	▲33%	▲35%	▲2%	▲37.7%	
	CO_2 emissions	$ktCO_2$	643	617	553	522	440			
	(Data center) Energy consumption intensity	FY2006	▲8%	▲7%	▲7%	▲7%	▲7%	▲5.5%	▲7.8%	
Japan Association of Chain Drug Stores	CO_2 emissions	$ktCO_2$	1,325	1,502	1,551	1,590	1,689			B
	Energy consumption intensity	FY2013	▲0%	▲7%	▲16%	▲19%	▲21%	▲19%	▲26%	
Japan Foreign Trade Council, Inc.	CO_2 emissions	$ktCO_2$	54	51	45	41	37			B
	Energy consumption	FY2013	+0%	▲3%	▲6%	▲10%	▲10%	▲6.8%	▲15.7%	
Japan LP Gas Association	CO_2 emissions	$ktCO_2$	31	30	28	28	27			B
	Energy consumption	FY2010	▲5%	▲7%	▲8%	▲7%	▲6%	▲5%	▲9%	
Japan Leasing Association	CO_2 emissions	$ktCO_2$	9	18	17	16	15			B
	Energy consumption intensity	FY2013	+0%	+8%	+3%	▲4%	▲4%	▲5%	▲5%	
Industry under Ministry of Land, Infrastructure, Transport and Tourism										
The Japan Warehousing Association Inc.	CO_2 emissions	$ktCO_2$	1,190	1,060	1,210	1,220	1,220			B
	Energy intensity	FY1990	▲15%	▲18%	▲19%	▲19%	▲19%	▲16%	▲20%	
Japan Association of Refrigerated Warehouses	CO_2 emissions	$ktCO_2$	1,064	1,031	976	956	901			B
	Energy consumption intensity	FY1990	▲12%	▲13%	▲15%	▲15%	▲16%	▲15%	▲20%	
Japan Hotel Association	CO_2 emissions	$ktCO_2$	631	606	575	550	536			A
	Energy consumption intensity	FY2010	▲9%	▲12%	▲14%	▲14%	▲15%	▲10%	▲15%	
Japan Ryokan & Hotel Association	CO_2 emissions	$ktCO_2$	—	—	—	50	57			A
	Energy consumption intensity	FY2016	—	—	—	0%	▲10%	▲0%	▲10%	
Japan Automobile Service Promotion Association	CO_2 emissions	$ktCO_2$	4,155	4,165	4,185	4,191	4,133			B
	CO_2 emissions	FY2007	▲8%	▲8%	▲7%	▲7%	▲9%	▲10%	▲15%	
The Real Estate Companies Association of Japan	CO_2 emissions	$ktCO_2$	—	—	—	—	—			B
	Energy consumption intensity	FY2005	▲21%	▲24%	▲25%	▲26%	▲25%	▲25%	▲30%	
Japan Building Owners and Managers Association	CO_2 emissions	$ktCO_2$	—	—	—	—	—			B
	Energy consumption	FY2009	▲9%	▲14%	▲15%	▲13%	▲15%	▲15%	▲20%	
Industry under Ministry of the Environment										
National Federation of Industrial Waste Management Associations	CO_2 emissions	$ktCO_2$	5,095	5,184	5,355	5,385	5,399			C
	GHG emissions	FY2010	+3%	+5%	+8%	+9%	+9%	±0%	▲10%	
The Japan Newspaper Publishers & Editors Association	CO_2 emissions	$ktCO_2$	537	499	467	452	419			D
	Energy consumption intensity	FY2013	—	▲5.8% (Annual average)	▲5.0% (Annual average)	▲4.4% (Annual average)	▲4.2% (Annual average)	—	▲1% (Annual average)	
Zenkoku Pet Kyoukai (pet retail)	CO_2 emissions	$ktCO_2$	5	5	6	5	5			C
	CO_2 emission intensity	FY2012	+28%	+34%	+4%	▲18%	+0.4%	±0%	±0%	
Industry under National Police Agency										
All Japan Pachinko Association	CO_2 emissions	$ktCO_2$	5,020	4,470	4,260	4,010	3,830			A
	CO_2 emissions	FY2007	▲15%	▲22%	▲23%	▲25%	▲26%	▲18%	▲22%	
All Nippon Amusement Machine Operators' Union	CO_2 emissions	$ktCO_2$	253	237	238	233	225			A
	CO_2 emissions	FY2012	▲7%	▲13%	▲12%	▲14%	▲17%	▲8.9%	▲16.6%	

Type of industry	Target indicator	Base year/BAU	Actual performance					Target level		Assessment of progress
			2013	2014	2015	2016	2017	2020	2030	
Transport Sector										
Industry under Ministry of Land, Infrastructure, Transport and Tourism										
The Japanese Shipowners' Association	CO_2 emissions	$ktCO_2$	55,388	54,172	52,145	52,582	54,025			A
	CO_2 emission intensity	FY1990	▲38%	▲43%	▲41%	▲39%	▲48%	▲20%	▲30%	
Japan Trucking Association	CO_2 emissions	$ktCO_2$	40,790	41,000	40,910	40,680	40,870			B
	CO_2 emission intensity	FY2005	▲9%	▲7%	▲4%	▲7%	▲7%	▲22%	▲31%	
The Scheduled Airlines Association of Japan	CO_2 emissions	$ktCO_2$	19,785	20,858	22,183	23,052	23,877			B
	CO_2 emission intensity	FY2005	▲12%	▲16%	▲15%	▲18%	▲21%	▲21%	–	
	CO_2 emission intensity	FY2012	▲1%	▲6%	▲5%	▲8%	▲11%	–	▲16%	
Japan Federation of Coastal Shipping Associations	CO_2 emissions	$ktCO_2$	7,221	7,257	7,039	7,131	7,026			B
	CO_2 emissions	FY1990	▲16%	▲15%	▲18%	▲17%	▲18%	▲31%	▲34%	
Japan Passengerboat Association	CO_2 emissions	$ktCO_2$	3,613	3,656	3,509	3,479	3,424			A
	CO_2 emission intensity	FY1990	▲0.9%	▲1.9%	▲5.2%	▲5.4%	▲9.0%	▲6%	–	
	CO_2 emission intensity	FY2012	▲1%	▲2%	▲6%	▲6%	▲10%	–	▲3.6%	
Japan Federation of Hire-Taxi Associations	CO_2 emissions	$ktCO_2$	3,383	3,254	3,100	2,861	2,729			A
	CO_2 emissions	FY2010	▲12%	▲15%	▲19%	▲25%	▲29%	▲20%	▲25%	
Nihon Bus Association	CO_2 emissions	$ktCO_2$	3,757	3,732	3,664	3,594	3,480			B
	CO_2 emission intensity	FY2010	+2%	+3%	+3%	+3%	▲0%	▲6%	–	
	CO_2 emission intensity	FY2015	–	–	–	+0%	▲3%	–	▲6%	
The Association of Japanese Private Railways	CO_2 emissions	$ktCO_2$	2,860	2,740	2,610	2,560	2,450			A
	Energy consumption intensity	FY2010	▲4%	▲6%	▲7%	▲6%	▲6%	▲5.7%	▲5.7%	
East Japan Railway Company	CO_2 emissions	$ktCO_2$	2,150	2,230	2,160	2,180	2,120			B
	Energy consumption	FY2013	+0%	▲1%	▲2%	▲3%	▲2%	▲6.2%	▲25%	
West Japan Railway Company	CO_2 emissions	$ktCO_2$	1,854	1,813	1,761	1,711	1,643			A
	Energy consumption	FY2010	▲3%	▲2%	▲2%	▲2%	▲2%	▲3%	▲2%	
Central Japan Railway Company	CO_2 emissions	$ktCO_2$	–	–	–	–	–			A
	Energy consumption intensity	FY1995	▲26%	▲27%	▲28%	▲28%	▲28%	▲25%	▲25%	
The Japan Harbor Transportation Association	CO_2 emissions	$ktCO_2$	390	384	377	378	377			B
	CO_2 emission intensity	FY2005	▲10%	▲11%	▲10%	▲10%	▲11%	▲12%	▲20%	
Japan Freight Railway Company	CO_2 emissions	$ktCO_2$	648	623	601	563	551			B
	Energy consumption intensity	FY2013	+0%	▲4%(For FY2020 target) ▲2%(For FY2030 target)	▲7%(For FY2020 target) ▲4%(For FY2030 target)	▲13%(For FY2020 target) ▲7%(For FY2030 target)	▲15%(For FY2020 target) ▲8%(For FY2030 target)	▲7%	▲15%	
Kyushu Railway Company	CO_2 emissions	$ktCO_2$	–	–	–	–	–			B
	Energy consumption intensity	FY2011	▲0.8%	▲0.6%	▲2%	▲0.8%	▲1.7%	▲2.5%	▲2.5%	
Hokkaido Railway Company	CO_2 emissions	$ktCO_2$	321	314	305	308	305			B
	Energy consumption intensity	FY1995	▲14%	▲14%	▲15%	▲17%	▲19%	▲14%	–	
	Energy consumption intensity	FY2013	+0%	▲0%	▲1%	▲4%	▲6%	–	▲7%	
All Japan Freight Forwarders Association	CO_2 emissions	$ktCO_2$	129	129	127	125	123			B
	CO_2 emissions	FY2009	▲3%	▲3%	▲5%	▲6%	▲8%	▲11%	▲20%	
Shikoku Railway Company	CO_2 emissions	$ktCO_2$	80	77	77	76	74			A
	Energy consumption	FY2010	▲5%	▲8%	▲7%	▲6%	▲7%	▲8%	▲8%	

Type of industry	Target indicator	Base year/BAU	Actual performance					Target level		Assessment of progress
			2013	2014	2015	2016	2017	2020	2030	
Transport Sector										
Industry under Ministry of Land, Infrastructure, Transport and Tourism										
The Japanese Shipowners' Association	CO_2 emissions	$ktCO_2$	55,388	54,172	52,145	52,582	54,025			A
	CO_2 emission intensity	FY1990	▲38%	▲43%	▲41%	▲39%	▲48%	▲20%	▲30%	
Japan Trucking Association	CO_2 emissions	$ktCO_2$	40,790	41,000	40,910	40,680	40,870			B
	CO_2 emission intensity	FY2005	▲9%	▲7%	▲4%	▲7%	▲7%	▲22%	▲31%	
The Scheduled Airlines Association of Japan	CO_2 emissions	$ktCO_2$	19,785	20,858	22,183	23,052	23,877			B
	CO_2 emission intensity	FY2005	▲12%	▲16%	▲15%	▲18%	▲21%	▲21%	—	
	CO_2 emission intensity	FY2012	▲1%	▲6%	▲5%	▲8%	▲11%	—	▲16%	
Japan Federation of Coastal Shipping Associations	CO_2 emissions	$ktCO_2$	7,221	7,257	7,039	7,131	7,026			B
	CO_2 emissions	FY1990	▲16%	▲15%	▲18%	▲17%	▲18%	▲31%	▲34%	
Japan Passengerboat Association	CO_2 emissions	$ktCO_2$	3,613	3,656	3,509	3,479	3,424			A
	CO_2 emission intensity	FY1990	▲0.9%	▲1.9%	▲5.2%	▲5.4%	▲9.0%	▲6%	—	
	CO_2 emission intensity	FY2012	▲1%	▲2%	▲6%	▲6%	▲10%	—	▲3.6%	
Japan Federation of Hire-Taxi Associations	CO_2 emissions	$ktCO_2$	3,383	3,254	3,100	2,861	2,729			A
	CO_2 emissions	FY2010	▲12%	▲15%	▲19%	▲25%	▲29%	▲20%	▲25%	
Nihon Bus Association	CO_2 emissions	$ktCO_2$	3,757	3,732	3,664	3,594	3,480			B
	CO_2 emission intensity	FY2010	+2%	+3%	+3%	+3%	▲0%	▲6%	—	
	CO_2 emission intensity	FY2015	—	—	—	+0%	▲3%	—	▲6%	
The Association of Japanese Private Railways	CO_2 emissions	$ktCO_2$	2,860	2,740	2,610	2,560	2,450			A
	Energy consumption intensity	FY2010	▲4%	▲6%	▲7%	▲6%	▲6%	▲5.7%	▲5.7%	
East Japan Railway Company	CO_2 emissions	$ktCO_2$	2,150	2,230	2,160	2,180	2,120			B
	Energy consumption	FY2013	+0%	▲1%	▲2%	▲3%	▲2%	▲6.2%	▲25%	
West Japan Railway Company	CO_2 emissions	$ktCO_2$	1,854	1,813	1,761	1,711	1,643			A
	Energy consumption	FY2010	▲3%	▲2%	▲2%	▲2%	▲2%	▲3%	▲2%	
Central Japan Railway Company	CO_2 emissions	$ktCO_2$	—	—	—	—	—			A
	Energy consumption intensity	FY1995	▲26%	▲27%	▲28%	▲28%	▲28%	▲25%	▲25%	
The Japan Harbor Transportation Association	CO_2 emissions	$ktCO_2$	390	384	377	378	377			B
	CO_2 emission intensity	FY2005	▲10%	▲11%	▲10%	▲10%	▲11%	▲12%	▲20%	
Japan Freight Railway Company	CO_2 emissions	$ktCO_2$	648	623	601	563	551			B
	Energy consumption intensity	FY2013	+0%	▲4%(For FY2020 target) ▲2%(For FY2030 target)	▲7%(For FY2020 target) ▲4%(For FY2030 target)	▲13%(For FY2020 target) ▲7%(For FY2030 target)	▲15%(For FY2020 target) ▲8%(For FY2030 target)	▲7%	▲15%	
Kyushu Railway Company	CO_2 emissions	$ktCO_2$	—	—	—	—	—			B
	Energy consumption intensity	FY2011	▲0.8%	▲0.6%	▲2%	▲0.8%	▲1.7%	▲2.5%	▲2.5%	
Hokkaido Railway Company	CO_2 emissions	$ktCO_2$	321	314	305	308	305			B
	Energy consumption intensity	FY1995	▲14%	▲14%	▲15%	▲17%	▲19%	▲14%	—	
	Energy consumption intensity	FY2013	+0%	▲0%	▲1%	▲4%	▲6%	—	▲7%	
All Japan Freight Forwarders Association	CO_2 emissions	$ktCO_2$	129	129	127	125	123			B
	CO_2 emissions	FY2009	▲3%	▲3%	▲5%	▲6%	▲8%	▲11%	▲20%	
Shikoku Railway Company	CO_2 emissions	$ktCO_2$	80	77	77	76	74			A
	Energy consumption	FY2010	▲5%	▲8%	▲7%	▲6%	▲7%	▲8%	▲8%	
Energy Conversion Sector										
Industry under Ministry of Economy, Trade and Industry										
The Electric Power Council for a Low Carbon Society	CO_2 emissions	$ktCO_2$	493,000	469,000	441,000	430,000	411,000			B
	CO_2 emissions	BAU	—	▲60%(For FY2020 target) ▲38%(For FY2030 target)	▲64%(For FY2020 target) ▲41%(For FY2030 target)	▲89%(For FY2020 target) ▲56%(For FY2030 target)	▲96%(For FY2020 target) ▲61%(For FY2030 target)	▲7MtCO_2	▲11MtCO_2	
	CO_2 emission intensity	—	+53%	+49%	+44%	+39%	+34%	—	about 0.37kg-CO_2/kWh	
Petroleum Association of Japa	CO_2 emissions	$ktCO_2$	40,326	38,233	38,335	38,443	38,083			B
	Energy reduction	BAU	▲58%(For FY2020 target) ▲30%(For FY2030 target)	▲71%(For FY2020 target) ▲38%(For FY2030 target)	▲90%(For FY2020 target) ▲47%(For FY2030 target)	▲101%(For FY2020 target) ▲53%(For FY2030 target)	▲121%(For FY2020 target) ▲64%(For FY2030 target)	▲0.53*10^6 KL	▲10^6 KL	
The Japan Gas Association	CO_2 emissions	$ktCO_2$	456	476	445	459	454			A
	CO_2 emission intensity	FY1990	▲91%	▲90%	▲91%	▲91%	▲91%	▲89%	▲88%	
	Energy consumption intensity	FY1990	▲89%	▲88%	▲89%	▲89%	▲88%	▲86%	▲84%	

The definition of "A" to "E" in the column of "Assessment of progress" is as follows.
A: Actual performance of CO_2 emissions in FY 2017, etc. achieves the target level in FY 2030
B: Actual performance of CO_2 emissions in FY 2017, etc. does not achieve the target level in FY 2030, but are decreased compared to the base year or the BAU
C: Actual performance of CO_2 emissions in FY 2017, etc. does not achieve the target level of FY 2030, and are increased compared to the base year or the BAU
D: Data are not estimated (new development, change of target level, review of aggregation method, etc.)
E: Target is not yet established

■ Initiatives in the Commercial, Residential, and Transport Sectors in the Industry

The industry contributes to a reduction in CO_2 emissions in the commercial, residential, and transport sectors through weight saving and functional improvement of materials, development and supply of energy-efficient low-carbon products, improvement of the efficiency of logistics systems through modal shifts, promotion of the use of next-generation automobiles and public transportation, and participation in public campaigns to mitigate global warming.

2) Promotion of Introduction of Highly Energy-efficient Equipment and Devices

■ Thorough Energy Management at Factories and Buildings

Japan promotes thorough energy management and the introduction of energy-efficient equipment and devices based on the Act on the Rational Use of Energy (1979, Act No. 49).

Specifically, business operators are classified into four classes (S, A, B, and C) and evaluated by periodic reports submitted based on the Act on the Rational Use of Energy. Stagnating business operators are intensively investigated, and the names of operators with excellent performance are publicized by business types and praised. Through these measures, Japan intensively promotes energy efficiency using various initiatives under the Act on the Rational Use of Energy.

In addition, the benchmark system that sets energy efficiency targets at the level that 10% to 20% of businesses in the same business types can achieve is extended from the manufacturing industries to the retail and service industries. The goal was to expand to include 70% of the energy consumed by all industries by FY 2018, and it was accomplished in March 2019.

■ Promotion of Introduction of Highly Energy-Efficient Equipment and Devices (cross-industrial)

<Outline of policies and measures>

The industry sector promotes the introduction of energy-efficient equipment and devices for the main energy-consuming devices used in a variety of business types, such as air conditioners, lighting devices, industrial furnaces, boilers, and cogeneration systems.

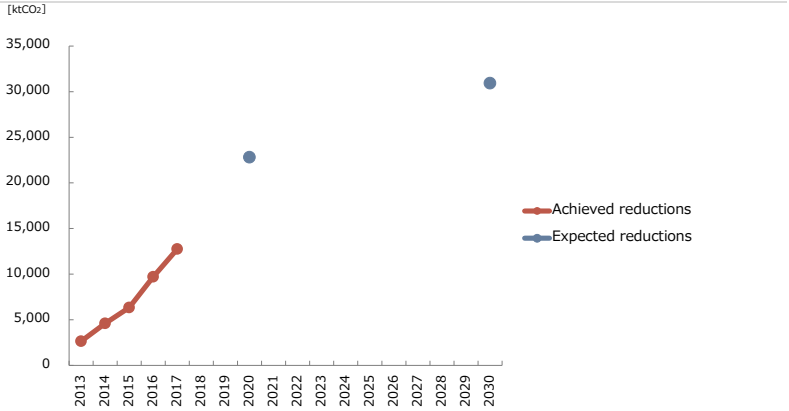
<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	1. Act on the Rational Use of Energy (Energy Conservation Act): ・ Promote energy conservation efforts, such as the thorough management of energy and the introduction of high efficiency facilities, targeting businesses that use energy. ・ Based on the top-runner program, set the energy consumption efficiency level for the target year by giving due consideration to the energy conservation level of the most energy-efficient product among the designated products at the time and the prospect of technology advancement and promote the efficiency improvement of the target equipment by imposing on manufacturers a duty of efforts toward the achievement of the target levels by the target year. ・ The Act of the Partial Revision of the Act on the Rational Use of Energy, which was enacted in the 196th ordinary session of the Diet, came into force on December 1, 2018. It promotes a cross-industry capital investment where more than one company collaborates with one another.
Tax	1. Tax system to promote investment in the sophistication of energy conservation and renewable energy (sophisticated energy efficiency enhancement facilities, etc.) (FY 2018): ・ Toward the realization of an energy mix, tax measures, such as special depreciation of corporate tax, are conducted (1) when the businesses subject to regulate under the Energy Conservation Act make an investment in energy conservation based on medium and long-term plans, and (2) when the businesses certified under the Energy Saving Partnership Plan make a capital investment required for the implementation of the Plan. ・ Special depreciation (30%) or tax exemption (7% only for small and medium-sized enterprises [SMEs])
Subsidy	1. Subsidies to support businesses for the rational use of energy: Subsidize the expenses required to implement the following: replacement of existing facilities with energy-efficient facilities and systems by the plant or workplace, energy conservation, and power peak measures with renovation, such as improvement of the production processes, and energy conservation measures among businesses. 2. Project to promote a productivity revolution of small and medium-sized enterprises with the introduction or operational improvement of energy-efficient facilities: Support the introduction of highly energy-efficient facilities equipped with the function of visualization of energy use and dispatch energy conservation promotion experts to the businesses that have introduced such facilities to promote the efficient use of energy with improved operation of energy-efficient facilities.

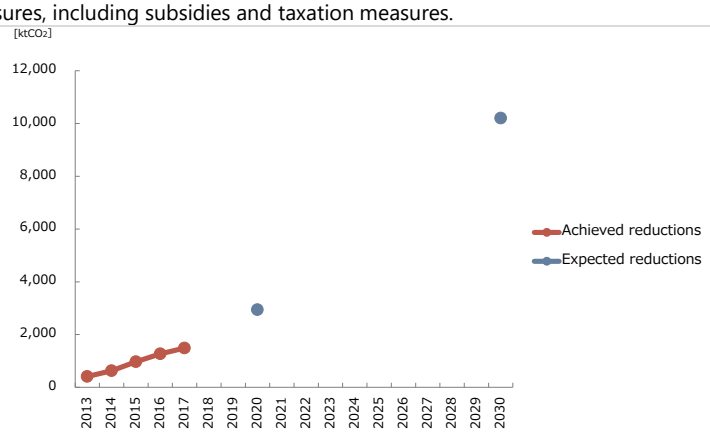
<Progress assessment of policies and measures>

(Introduction of low-carbon industrial furnaces)

Progress in the emission reductions	C (Expected to be at the same levels as the target levels for FY 2030)
Supplement to the assessment and reasons	The performance results of the measure evaluation indicator (the cumulative total of units introduced), the amount of energy conserved, and the emission reductions are on the increase for all facilities and equipment. This is due to the acceleration of a shift to high-efficiency facilities and equipment, which has resulted from the promotion of improvement in energy consumption efficiency of facilities under the Energy Conservation Act and the provision of support for the introduction of high-efficiency facilities and equipment. Investment in and introduction of high-efficiency air conditioning by businesses will be further promoted with control measures under the Act on the Rational Use of Energy and support measures, including subsidies and taxation measures.

Emission reductions ($ktCO_2$)	

(Introduction of cogeneration)

Progress in the emission reductions	C (Expected to be at the same levels as the target levels for FY 2030)
Supplement to the progress assessment and reasons	The performance results of the measure evaluation indicator (the cumulative volume of cogeneration introduced), the amount of energy conserved, and the emission reductions are on the increase for all facilities and equipment. This is due to the improvement in energy consumption efficiency of facilities with the top-runner program under the Energy Conservation Act and the acceleration of a shift to high-efficiency facilities and equipment, which resulted from the promotion of improvement of energy consumption efficiency of equipment under the Energy Conservation Act and the provision of support for the introduction of high-efficiency facilities and equipment. However, while a certain amount of progress can be found, the current progress is as expected compared to the forecast based on the assumption that the measure evaluation indicator changes linearly toward the estimate for FY 2030. Investment in and introduction of cogeneration by businesses will be further promoted with control measures under the Act on the Rational Use of Energy and support measures, including subsidies and taxation measures.
Emission reductions ($ktCO_2$)	

- Promotion of Introduction of Highly Energy-Efficient Equipment and Devices (manufacturing sector)

(Iron and steel industry)

As an introduction of cutting-edge technologies, the iron and steel industry promote the spread of highly efficient power demand facilities, waste heat recovery systems, and power generation systems and expands the use of waste plastics to alternate coal to be charged into coke ovens.

The industry also develops highly efficient and low-carbon innovative production process technologies and promotes energy conservation and the reduction of CO_2 emissions with the practical use of such technologies by around 2030.

(Chemical industry)

The chemical industry, in accordance with the characteristics of each process, promotes the reduction in CO_2 emissions by spreading best practice technologies (BPT) listed by the International Energy Agency (IEA) as commercially utilized advanced technologies, recovering emitted energies, and rationalization of the process. The industry also contributes to reducing CO_2 emissions by promoting the development and introduction of new innovative energy-saving technologies.

(Ceramic, stone, and clay manufacturing industry)

The industry introduces highly energy-efficient equipment and promotes the use of wastes as an alternative thermal energy to improve energy efficiency in the cement production process. The industry also aims to improve the energy efficiency of the cement and glass production processes while maintaining equivalent quality as existing products by the practical use and introduction of advanced processing technologies.

(Pulp, paper, and paper products industry)

The installation of pulpers that allow more efficient pulping of recovered paper than existing ones in the deinked pulp manufacturing process will be supported in order to reduce energy consumption.

Also, at the renewal timing of recovery boilers used to generate steam by incinerating concentrated black liquor (pulp waste liquor), the installation of the ones with more elevated features in temperature, pressure, and energy efficiency will be supported.

- Promotion of Introduction of Highly Energy-efficient Equipment and Devices (construction and fields that use special motor vehicles)

The industry certifies fuel-efficient construction machinery so that the operators could choose easily excellent fuel-performance machinery. Carbon dioxide emissions are also reduced in construction work and fields that use special motor vehicles to support the introduction of certified machinery.

- Promotion of Introduction of Highly Energy-efficient Equipment and Devices (Greenhouse horticulture, agricultural machinery, and fishery sector)

Development and the diffusion of efficient and low-cost energy consumption technologies (e.g., heat pumps, heating systems using woody biomass) are promoted as a measure to reduce greenhouse gas emissions in greenhouse horticulture. Energy efficiency improvements are also promoted through CO_2 reductions emissions from agricultural machinery and energy conservation measures in fishing vessels with LED fishing lights and energy-efficient outboard

engines.

3) Implementation of thorough Energy Management

■ Implementation of thorough Energy Management using FEMS

The industry sector has already been conducting a certain level of energy management due to the mandatory energy management required by the Act on the Rational Use of Energy. More energy efficiency and CO_2 emission reductions are realized through additional energy efficiency actions based on objective data by making energy consumption visible by promoting the introduction of Factory Energy Management System (FEMS) with the Internet of Things (IoT).

■ Promotion of Emissions Reductions Measures among Small and Medium-sized Businesses

To reinforce energy efficiency and emission reductions measures among small and medium-sized businesses, public relations to raise awareness of energy saving, boosting the potential capacity of energy efficiency and CO_2 reductions through energy efficiency diagnoses, and CO_2 emission reductions potential diagnoses, the implementation of detailed lectures to energy managers of companies, and the horizontal spreading of best practices to promote energy efficiency. In addition, focusing on the improvement of energy consumption per unit, support is provided for small and medium-sized businesses to introduce emission reductive equipment.

Regional organizations, financial institutions, chambers of commerce, and local governments construct platforms together to provide detailed regional supports for small and medium-sized businesses to take energy efficiency actions. With the platforms, they provide a wide range of supports for finding small and medium-sized business operators trying to take energy efficiency actions and providing follow-ups to assist operational improvement and capital investment. The

4) Promotion of Energy Efficiency Actions through Collaboration Industry Groups

Additional energy efficiency becomes possible when factories and businesses cooperate with each other in energy circulation. Therefore, energy efficiency actions conducted through the cooperation of multiple businesses are supported.

In addition, the evaluation system based on the Act on the Rational Use of Energy was constructed in 2016 to encourage factory owners and building owners to cooperate in accommodating and using the waste heat, which cannot be used and is released by factories.

(b) Initiatives in the Commercial and Other Sector

1) Promotion and Enhancement of Voluntary Action Plans of Industry (Reprinted p.56)

■ Steady Implementation of Industry's Action Plans for a Low-Carbon Society and Evaluation and Verification of Progress (Reprinted p.56)

2) Improvement of the Energy Efficiency of buildings

<Outline of policies and measures>

- Promotion of Mandatory Compliance with Energy Conservation Standards Targeting New Construction

For newly constructed buildings, the scope of buildings subject to obligations to comply with energy-saving standards in order to take highly effective measures according to the characteristics of each building size and application in order to ensure conformity with energy-saving standards. Building Energy Efficiency Act Amendment (2015 Law 53rd) including contents to expand to medium-scale building was promulgated on May 17, 2019. The environment will be prepared for the smooth start of the requirements. Specifically, support is provided for the diffusion of energy conservation measures and the development of new technologies, services, and construction methods that will improve the energy efficiency of buildings, construction materials, and machinery. Support is also provided to encourage voluntary investment in energy conservation by the private sector.

- Improvement of Energy Efficiency of Existing Buildings (Renovation)

For newly built buildings, it will be important to promote compliance with energy conservation standards for existing buildings, while ensuring conformity to energy conservation standards. Specifically, through enhancement and diffusion of energy conservative performance and environmental efficiency for verifying and labeling systems are used to promote the renovation of existing buildings for better energy efficiency and lower carbon footprints so that energy efficiency will be an additional asset value of buildings and reflected in the rents and so on.

- Promotion of Net-Zero-Energy Building (ZEB)

ZEB guidelines are prepared for major commercial building types, such as hospitals and schools, to realize and diffuse ZEBs. The goal of the diffusion of ZEBs is to demonstrate ZEBs among newly constructed public buildings by 2020 and to realize ZEBs as the average of new constructions by 2030.

- Promotion of Diffusion of Certified Low-carbon Building

Certified low-carbon construction projects (construction projects with not less than 10% energy consumption compared to the energy efficiency standards) under the Low Carbon City Act (2012, Act No. 84) will be increased. Associated standards are revised based on the progress of implemented measures.

- Promotion of Enhancement and Diffusion of Verifying and Labeling System for Energy Conservation and Environmental Performance

The energy efficiency labeling system and housing performance indication system based on the Building Energy Efficiency Act and CASBEE that evaluate comprehensive environmental performance will be improved and promoted.

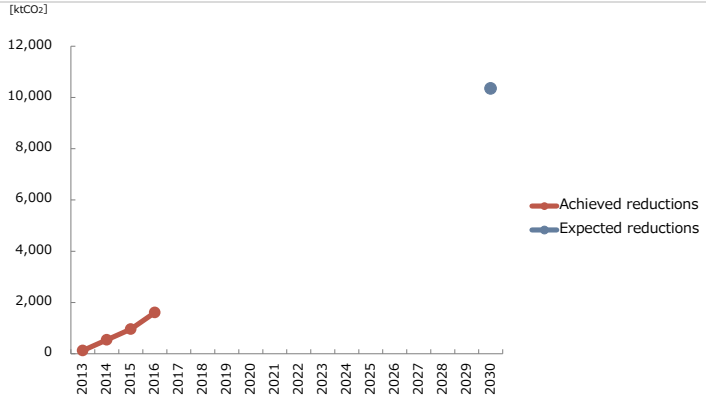
<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	Building Energy Efficiency Act
Tax	SME Management Reinforcement Tax System
Subsidy	1 Support for the leading projects with the high feasibility of reducing CO_2 emissions 2 Support for the renovation of buildings for energy conservation 3 Support for the introduction of high-performance facilities and equipment that contribute to the realization of ZEB (Net Zero Energy Building) 4 CO_2 emission reductions promotion project for buildings for business purposes (Subsidy for the renovation of buildings for rent and ZEB demonstration projects)
Technology Development	Support for the development of pioneering technology
Dissemination and Awareness Raising	Creation of a system for the development of energy-efficient houses and buildings
Other	1. Development and dissemination of the Comprehensive Assessment System for Built Environment Efficiency (CASBEE) 2. Dissemination of the Building-Housing Energy-Efficiency Labeling System (BELS) 3. Dissemination and promotion of the Building Materials Top-runner program

<Progress assessment of policies and measures>

(Promotion of Mandatory Compliance with Energy Conservation Standards Targeting New Construction)

Progress in the emission reductions	C (Expected to be at the same levels as the target levels for FY 2030)
Supplement to the progress assessment and reasons	The performance results of the measure evaluation indicator (the rate of compliance with energy conservation criteria for new buildings with a floor area of 2,000 m^2 or more), the amount of energy conserved, and emission reductions are on the increase. This seems to be due to the acceleration of improvement in the energy conservation performance of new buildings, which has resulted from the dissemination and promotion of low-carbon buildings with high-energy conservation performance and the provision of support for leading projects with the high feasibility of conserving energy and reducing CO_2 emissions. However, while certain progress can be found, further efforts are required to achieve the targets. Since September 2018, the Architecture and Environment Working Group, Architecture Subcommittee, Social Infrastructure Improvement Council, has discussed the reinforcement of building-housing energy conservation measures, and on January 31, 2019, the Social Infrastructure Improvement Council submitted a report titled the *Future Measures for the Energy Conservation of Buildings and Housing* to the Minister of Land, Infrastructure, Transport and Tourism (second report). Based on the report, a bill to partially reform the Act on the Improvement of Energy Consumption Performance of Buildings (Building Energy Efficiency Act) was submitted to the ordinary session of the Diet for FY 2019. In the future, the improvement of energy conservation performance of new buildings will continue to be promoted with regulatory measures under the Building Energy Efficiency Act and subsidy-based support measures.

Emission reductions ($ktCO_2$)	

3) Promotion of Introduction of Highly Energy-Efficient Equipment and Devices

- Thorough Energy Management at Factories and Buildings (Reprinted p.69)

- Diffusion of Advanced Highly Energy-efficient Equipment and Devices

<Outline of policies and measures>

The development of energy conservation technologies will be accelerated to further improve the efficiency of individual devices and systems. The diffusion of high efficiency, energy conservative devices is also promoted.

The goal is to increase the use of high-efficiency lighting devices, such as LED lamps, to 100% in the flow by 2020 and 100% in the stock by 2030. To achieve these goals, the diffusion of high-efficiency lighting devices will be promoted by expanding the top-runner standards of lighting devices and by applying the top-runner program to incandescent lamps in FY 2016.

The introduction of energy-efficient industrial water heaters, such as heat-pump water heaters and latent heat recovery type water heaters, will be supported. The energy efficiency will also be improved for refrigeration air conditioners by advanced coolant management technologies. Necessary information will be distributed through leading low-carbon technology (L2-Tech) and other systems.

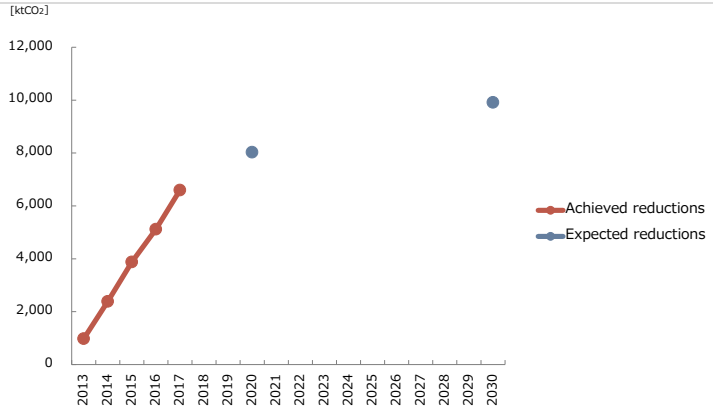
<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	1. Act on the Rational Use of Energy (Energy Conservation Act) (1979): ・ Promote energy conservation efforts, such as thorough energy management and the introduction of high-efficiency facilities targeting businesses that use energy. ・ Based on the top-runner program, set the energy consumption efficiency level for the target year while giving due consideration to the energy conservation level and expected technology advancement of the most energy-efficient products at the time among the designated products and promote the improvement of efficiency of the target equipment by imposing on manufacturers the obligation to make the best effort toward the achievement of the target level by the target year.

Instrument	Performance and Future Plans
Subsidy	(Ministry of Economy, Trade and Industry) 1. Subsidies to support businesses for the rational use of energy: Subsidize the expenses required to implement a shift to energy conservation facilities and systems by the plant or workplace, energy conservation, and power peak measures with renovation, such as the improvement of the production process, and energy conservation measures among businesses. 2. Project to promote the productivity revolution of small and medium-sized enterprises with the introduction or operational improvement of energy conservation equipment: Support the introduction of highly energy-efficient facilities equipped with the function of visualization of energy use and dispatch energy conservation promotion experts to the businesses that have introduced such facilities to promote the efficient use of energy with improved operation of energy-efficient facilities.

<Progress assessment of policies and measures>

(Introduction of high-efficiency lighting)

Progress in the emission reductions	B (Expected to exceed the target levels for FY 2030)
Supplement to the progress assessment and reasons	The performance results of the measure evaluation indicators, the amount of energy conserved, and the emission reductions are on the increase. The current progress exceeds the forecast based on the assumption that the measure evaluation indicators change linearly toward the estimate for FY 2030. This seems to be due to the promotion of improvement in energy consumption efficiency of all equipment with the top-runner program under the Energy Conservation Act and the provision of support, such as subsidies, for the introduction of high efficiency equipment. In the future, capital investment in high efficiency lighting by businesses will be further promoted with regulatory measures under the Building Energy Efficiency Act and subsidy-based support measures.
Emission reductions ($ktCO_2$)	

■ Improvement of Energy Efficiency of Equipment and Devices through Top-Runner Programs

<Outline of policies and measures>

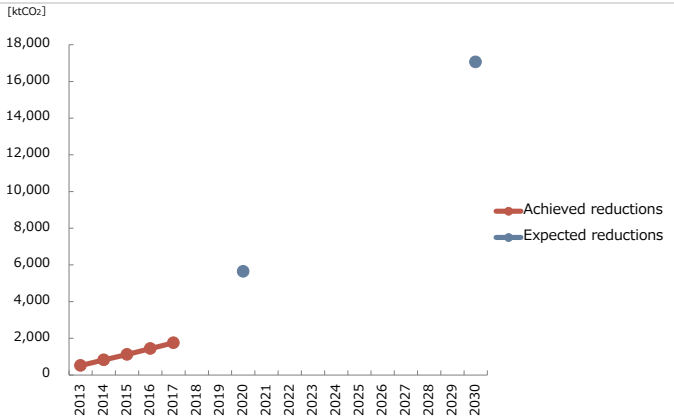
The top-runner program was established in FY 1998 under the Act on the Rational Use of Energy. Target equipment and devices have gradually increased since then. The number of energy consuming devices targeted in this system was 28 items in FY 2015. Additional devices for this system will continue to be explored. At the same time, standards of targeted devices that reached the targeted years will be revised to improve their energy efficiency.

<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	1. Act on the Rational Use of Energy (Energy Conservation Act) (1979): ・ Promote the energy conservation efforts, such as thorough energy management and the introduction of high efficiency facilities targeting businesses that use energy. ・ Based on the top-runner program, set the energy consumption efficiency level for the target year by giving due consideration to the energy conservation level of the most energy-efficient product among the designated products at the time as well as the prospect of technology advancement and promote the efficiency improvement of the target equipment by imposing on manufacturers the duty of efforts toward the achievement of the target levels by the target year.
Subsidy	(Ministry of Economy, Trade and Industry) 1. Subsidies to support businesses for the rational use of energy (FY 2008): Subsidize the expenses required to implement a shift to energy conservation facilities and systems by the plant or workplace, energy conservation and power peak measures with renovation, such as improvement of the production process, and energy conservation measures among businesses. 2. Project to promote productivity revolution of small and medium-sized enterprises with introduction or operational improvement of energy conservation equipment: Support the introduction of highly energy-efficient facilities equipped with the function of visualization of energy use and dispatch the energy conservation promotion experts to the businesses that have introduced such facilities to promote the efficient use of energy with improved operation of energy-efficient facilities. 3. Subsidies for projects to promote the introduction of innovative energy conservation technology in houses and buildings (FY 2012): Support the introduction of the ZEHs (Net Zero Energy Houses) with a combination of high-performance building materials, high-performance facilities and equipment, and storage batteries. *ZEH: Housing that aims to cover annual energy consumption by renewable energy after having achieved significant energy conservation 4. Project to accelerate the dissemination of net-zero energy houses (ZEHs) (FY 2016): *The outline of this item is the same as the one mentioned in 3. (Ministry of the Environment) 1. Project to promote low carbon houses with ZEH (FY 2017): For detached houses, support businesses that build or rebuild houses that meet the promulgated ZEH requirements. (Ministry of Land, Infrastructure, Transport and Tourism) 1. Community-type Housing Greening Project (FY 2017): Provide support to ZEHs built with collaboration among small and medium-sized building contractors

<Progress assessment of policies and measures>

Progress in the emission reductions	D (Expected to fall below the target levels for FY 2030)
Supplement to the progress assessment and reasons	The performance results of the amount of energy conserved and the emission reductions are on the increase. This has resulted from the acceleration of a shift to high efficiency equipment by promoting the improvement of energy consumption efficiency of all equipment with the top-runner program under the Energy Conservation Act and providing support for the introduction of high efficiency equipment with subsidies. However, further efforts are required to achieve the targets since the current progress falls below the forecast level based on the assumption of linearly changing measure evaluation indicator for FY 2030. One of the reasons seems to be the slow

	dissemination of energy conservation equipment. In the future, the improvement of the top-runner criteria by setting priorities should be promoted since there is still room for improvement in energy consumption and energy efficiency, and the dissemination of energy-efficient equipment should also be promoted by leveraging support measures, such as subsidies.
Emission reductions ($ktCO_2$)	

4) Implementation of Thorough Energy Management

- Thorough Energy Management Through the Use of BEMS and Consultation on Energy Conservation

<Outline of policies and measures>

Building Energy Management System (BEMS) is designed to display the energy consumption status and support optimum operations of equipment and devices, such as lighting devices and air conditioners, to support energy efficiency and CO_2 emission reductions in an entire building. BEMS will be introduced to about half of the buildings by 2030. In addition, energy consumption data obtained through BEMS will be used to enable more efficient and effective energy management in buildings.

Implementation of diagnoses on the potential capacity of GHG emission reductions and the introduction of devices utilized the results of the diagnoses will be promoted. Actions conducted beyond the boundaries of individual stakeholders, such as building owners, tenants, and energy suppliers, will be promoted. Furthermore, with the promotion of Eco-tuning, which conducts the appropriate operational improvement of the equipment, devices, and systems, greenhouse gas emissions will be reduced with ensuring the comfort and productivity of buildings.

The introduction of energy efficiency equipment and devices, and downsizing, or the optimization of equipment and devices, will be promoted using businesses (ESCO) that provide comprehensive energy efficiency services and warrant energy efficiency effects based on the results of visualizing energy consumption and energy efficiency diagnoses.

The efficient use of lighting will also be promoted by setting proper lighting intensity based on indoor conditions.

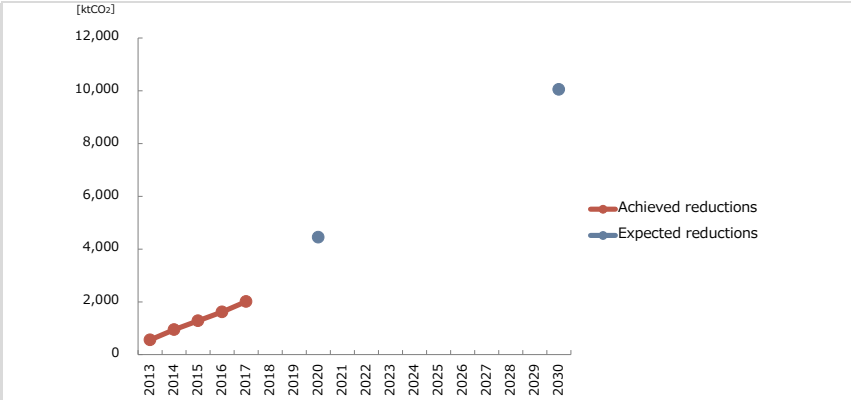
<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	1. Act on the Rational Use of Energy (Energy Conservation Act) (1979): Targeting businesses that use energy, promote energy conservation efforts, such as thorough energy management and the introduction of high efficiency facilities.

Instrument	Performance and Future Plans
Subsidy	(Ministry of Economy, Trade and Industry) 1. Subsidies for projects to promote the introduction of innovative energy conservation technology into houses and buildings (FY 2012): Support for demonstration projects that use high-performance building materials and high-performance facilities and equipment, which are the components of ZEBs (net-zero energy buildings). *ZEB: Housing that aims to cover annual energy consumption by renewable energy after having achieved significant energy conservation 2. Subsidies to support businesses for the rational use of energy: Subsidize the expenses required to implement a shift to energy conservation facilities and systems by the plant or workplace, energy conservation, and power peak measures with renovation, such as the improvement of the production process, and energy conservation measures among businesses. 3. Subsidies for projects to promote the introduction of energy conservation measures (FY 2004): Implement the diagnosis of the potential of energy conservation/power saving free of charge for small and medium-sized and leading medium-sized enterprises. Moreover, in order to promote the energy conservation efforts proposed by the diagnosis project, build a platform in 44 locations to provide detailed regional energy conservation consultation in light of the management status of small and medium-sized enterprises. (Ministry of the Environment) 1. Subsidies for projects to promote measures to control CO_2 emissions (projects to promote a shift to ZEBs and CO_2 reduction in facilities for business purposes): Support the renovation of buildings for rent and ZEB demonstration projects. 2. Eco-tuning Business Model Establishment Project: In an effort to establish a business model where income is generated from the utility costs that have been reduced by eco-tuning buildings for business purposes, consider the establishment of a system to certify businesses or qualified persons and implement eco-tuning across the country. 3. Project to support the diagnosis of CO_2 reduction potential and the implementation of measures: Provide support to business establishments, such as plants and workplaces, for the expenses of CO_2 reduction potential diagnosis.

<Progress assessment of policies and measures>

Progress in the emission reductions	D (Expected to fall below the target level for FY 2030)
Supplement to the progress assessment and reasons	The performance results of the measure evaluation indicators, the amount of energy conserved, and the emission reductions are on the increase. This has resulted from the promotion of energy management by the introduction of BEMS, which was brought by promoting thorough energy management in offices and buildings based on the energy conservation notification (criteria of judgment by businesses on the rational use of energy in plants) and providing support for the introduction of BEMS with subsidies and the projects to support the demonstration of turning buildings into ZEBs. However, while a certain amount of progress can be found in policies and measures, the current progress seems to fall below the forecast based on the assumption that the measure evaluation indicators change linearly toward the forecast for FY 2030. Therefore, further efforts should be made to achieve the targets. In the future, continue to encourage businesses to make a capital investment in BEMS and promote thorough energy management with BEMS with control measures under the Energy Conservation Act and support measures, such as subsidies.

Emission reductions ($ktCO_2$)	

- Promotion of Emissions Reduction Policies Among Small and Medium-Sized Business Operators (Reprinted p.69)

5) Expansion of Holistic and Efficient Use of Energy

- Expansion of Holistic and Efficient Use of Energy

Large energy conservation and CO_2 emission reduction effects are expected when multiple facilities and buildings share energies, such as electricity and heat, and use unused energies. Such practices are also desirable from the viewpoint of disaster management and the promotion of regional development. Thus, opportunities for urban development will be seized to promote holistic and efficient use of energy at district levels to realize area-wide energy conservation and CO_2 emission reductions while simultaneously using renewable energy.

A variety of stakeholders, such as the national government, local governments, energy suppliers, and regional developers, must work together to provide support for the use of urban development plans, conduct simulations to find areas where holistic and efficient use of energy will be effective, compute the expected energy conservation and CO_2 emission reduction effects, and install and use of facilities and systems that contribute to the efficient use of energy.

6) Other Policies and Measures

- Development of Low-Carbon Cities Through the Improvement of the Thermal Environment by Preventing Heat Island Effects

Japan promotes comprehensive carbon reduction in cities through the improvement of the thermal environment by implementing measures associated with the heat island effects, such as the reduction of anthropogenic heat, improvement of urban surfaces, improvement of urban structures, improvement of lifestyles, and implementation of proper measures to reduce the effects on human health using knowledge obtained through the observation, investigation, and study of the heat island effects mainly in urban areas. Specific initiatives include the promotion of the improvement of energy efficiency by energy-consuming devices, promotion of the diffusion of low-carbon buildings, promotion of the development and diffusion of next-generation automobile technologies, promotion of traffic flow measures, and the promotion of the use of unutilized energy to reduce the emissions of anthropogenic heat from human activities, such as from air conditioning systems and automobiles, in order to reduce overall CO_2 emissions in cities. The ground coverages are also improved in entire areas by

securing green spaces through the park maintenance greening of public spaces and government facilities, greening of building lots using green region systems, and the conservation of privately owned green spaces and farmlands to counteract the reduced evapotranspiration caused by expanding artificial ground coverages and to prevent heating of the ground surface. Urban conditions are also improved by promoting the development of water and green networks and the development of nature-oriented river works from the perspective of securing the flow of wind from green spaces and water surfaces. In addition, citizens are encouraged to improve their lifestyles with the public campaign to mitigate global warming named Cool Choice, including Cool Biz and Warm Biz, while using proper temperature setups for cooling and heating. Local governments and business operators are also encouraged to implement proper measures depending on the characteristics of their regions, districts, and business practices.

- Introduction of Renewable Energy and Energy-Saving in Water Supply and Sewage Systems

Energy conservation facilities, such as energy-saving and high-efficiency devices and inverter control of pumps, will be introduced to water supply systems. Renewable power generation systems, such as small-scale hydropower generators and solar power generators, will also be introduced.

Energy saving is promoted in sewage systems by the improvement of facility operations and the introduction of high-efficiency devices in aeration systems of reaction tanks and sludge dehydrators. The promotion of the substitution of fossil fuel to solid fuels made from sewage sludge, power generation using biogas from sewage sludge, and the effective use of heat exchanged from sewage and treated sewage water are also conducted.

- Initiatives in Waste Management

The 3Rs initiatives that contribute greenhouse gas emission reductions are promoted. In addition, further energy recovery from waste disposal facilities, such as generating power-using waste, will be promoted. Energy conservation measures are implemented at waste disposal facilities and recycling facilities. Greenhouse gases emitted from refuse collecting trucks are also reduced.

- Schematic Promotion of Joint Measures Implemented by Multiple Government Ministries and Agencies

Cooperation among relevant government agencies is established based on plans to effectively and efficiently implement initiatives in all fields in order to ensure that reduction targets for FY 2030 in the Commercial and Other Sectors will be achieved. They are going to cooperate in thorough energy conservation, use of renewable energy, and low carbonizing of buildings.

7) Development of Public Campaigns (Discussed later p.124)

- Promotion of Public Campaigns (Discussed later p.124)

8) Initiatives by Public Organizations (Discussed later p.122)

(c) Initiatives in the Residential Sector

1) Development of Public Campaigns (Discussed later p.124)

- Promotion of Public Campaigns (Discussed later p.124)

2) Improvement of Energy Efficiency of Housing

<Outline of policies and measures>

- Promotion of Compliance with Energy Conservation Standards Targeting New Housing

In order to ensure compliance with energy-saving standards for newly-built houses, the notification obligation system has been streamlined and explanations required from architects to architects to take highly effective measures according to the characteristics of each house size and use. Building Energy Efficiency Act Amendment (2015 Law No. 53) was revised on May 17, 2019 to revise a part of the law on the improvement of energy consumption performance of buildings, including the contents of what to do. The environment will be established for smooth implementation of the regulations while paying sufficient attention to the improvement of construction technologies of small to medium-sized contractors and carpenters and the position of traditional wood housing. Specifically, support is provided to accelerate energy conservation measures and the development of new technologies, services, and construction methods that will contribute to energy conservation in housing, construction materials, and devices.

- Promotion of Renovation of Thermal Insulation for Existing Housing

The promotion to conform the energy consumption standards will gradually promote with newly constructed housing. Meanwhile, the promotion of energy conservation renovation becomes important for existing housing. Specifically, subsidies are provided for installing high-performance insulation materials and windows to improve the thermal insulation of existing housing. Housing renovated to improve energy efficiency can also receive tax cuts. In addition, energy efficiency performance and environmental performance evaluation and labeling systems will be improved and promulgated so that energy efficiency will become reflected in the asset value of housing. Improvement of energy efficiency and CO_2 emission reductions in housing will be promoted through these measures. The number of energy conservation reforms of existing housing will be doubled by 2020 with these measures.

In addition, more information will be provided for residents in regard to the benefits of installing energy-efficient devices, facilities, and construction materials, depending on the conditions of energy consumption.

- Support for Energy Conservation and Low-CO_2 Model Housing

Support is provided for housing that acts as energy conservation and low-CO_2 models, such as zero energy houses (ZEH), life cycle carbon minus housing (LCCM), and certified low-carbon housing to promote the construction of housing with higher performances. The goal of this measure is to turn more than half of newly constructed custom-built detached houses constructed by housing manufacturers into ZEHs by 2020.

- Promotion of the Diffusion of Certified Low-Carbon Housing

Tax breaks are provided for newly constructing or purchasing certified low-carbon housing.

Technical support is also provided for small and medium-sized contractors. The goal is to diffuse their effects to other housing and increase the number of certified low-carbon housing, including existing housing.

- Promotion of Enhancement and Diffusion of Evaluation and Labeling Systems for Energy Efficiency and Environmental Performances

Energy efficiency labeling systems and housing performance indication systems based on the Building Energy Efficiency Act and CASBEE that evaluate comprehensive environmental performance, including the perspectives of non-energy benefits (NEB), will be improved and promoted for more uses.

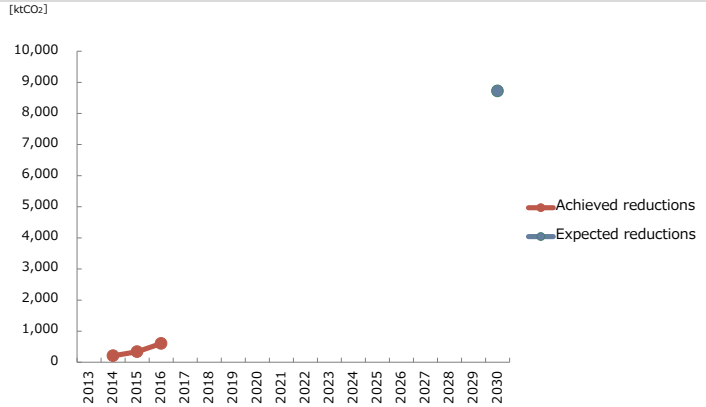
<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	Building Energy Efficiency Act
Tax	1. Mortgage tax break pertaining to remodeling for energy efficiency 2. Tax system to promote remodeling of houses for energy efficiency 3. Investment-type tax break to promote remodeling for energy efficiency 4. Special tax measures for new houses certified under the Low Carbon City Promotion Act
Subsidy	1. Promotion of energy conservation in housing and buildings with the leading projects to promote CO_2 reduction in housing and buildings 2. Promotion of building new eco-houses and renovating houses for energy efficiency by leveraging the eco-point system for housing 3. Support for zero energy housing efforts by small and medium-sized building contractors 4. Support for the dissemination of net-zero energy houses (ZEHs) (Ministry of the Environment) 5. Support for the dissemination of net-zero energy houses (ZEHs) (Agency for Natural Resources and Energy) 6. Promotion of energy-efficient rental housing 7. Support for the circulation of housing stock 8. Support for insulation retrofit of houses that use high-performance building materials 9. Support for the introduction of next-generation energy conservation building materials
Loan	Implementation of an interest rate cut with Flat 35 S of the Japan Housing Finance Agency
Technology Development	Support for the development of leading technology
Dissemination and Awareness Raising	Creation of a system for the development of energy-efficient housing and buildings
Other	1. Promotion and dissemination of the Housing Performance Indication System 2. Development and dissemination of the Comprehensive Assessment System for Built Environment Efficiency (CASBEE) 3. Dissemination of the Building-Housing Energy-Efficiency Labeling System (BELS) 4. Dissemination and promotion of the building material top-runner program

<Progress assessment of policies and measures>

(Promotion of Compliance with Energy Conservation Standards Targeting New Housing)

Progress in the emission reductions	D (Expected to fall below the target level for FY 2030)
Supplement to the progress	The performance results of the measure evaluation indicator (the rate of conformity to the energy conservation standards in new housing), the amount of energy conserved, and the

assessment and reasons	emission reductions are on the increase. This seems to be due to the enhancement of energy efficiency performance of new housing with the top-runner program under the Building Energy Efficiency Act and support for net-zero energy houses (ZEHs). However, while certain progress can be found, further efforts are required to achieve the targets. Since September 2018, the Architecture and Environment Working Group, Architecture Subcommittee, Social Infrastructure Improvement Council, has discussed the reinforcement of building-housing energy conservation measures, and on January 31, 2019, the Social Infrastructure Improvement Council submitted a report titled the *Future Measures for Energy Conservation of Buildings and Housing* to the Minister of Land, Infrastructure, Transport and Tourism (second report). Based on the report, a bill to partially reform the Act on the Improvement of Energy Consumption Performance of Buildings (Building Energy Efficiency Act), which includes the addition of leading housing businesses that provide custom-built houses and apartments for rent to the targets of the top-runner program and the development of a system that requires architects to explain energy efficiency performance in small housing and buildings to building owners, was submitted to the 2019 ordinary session of the Diet. In the future, efforts to improve the energy efficiency performance of new housing will be further promoted with regulatory measures under the Building Energy Efficiency Act and support measures, such as subsidies.
Emission reductions ($ktCO_2$)	

3) Promotion of Introduction of Highly Energy-Efficient Equipment and Devices

■ Diffusion of Highly Energy-efficient Equipment and Devices

<Outline of policies and measures>

The development of energy conservation technologies will be further accelerated for more improvement in the efficiency of individual devices and systems. The use of high efficiency, energy conservative devices is also promoted.

The goal is to increase the use of high-efficiency lighting devices, such as LED lamps, to 100% in the flow by 2020 and 100% in the stock by 2030. To achieve these goals, the diffusion of high-efficiency lighting devices will be promoted by expanding the top-runner standards of lighting devices such as applying the top-runner program to the incandescent lamps in FY 2016. The introduction of energy-efficient water heating systems, such as heat pump-type water heaters and latent heat recovery-type water heaters, are also promoted.

Household fuel cells (Ene-Farm) are a decentralized energy system that produces hydrogen from city gas and LP gas and generates electricity through the chemical reaction between the hydrogen and the oxygen in the air. It also effectively uses the heat released from the electricity generation process to achieve up to more than 90% of total energy efficiency. The public-private joint initiative aims to support the self-sustaining market by lowering the price of the system and try to introduce 5.30 million units in 2030.

They also distribute necessary information through leading low-carbon technology (L2-Tech) and other systems.

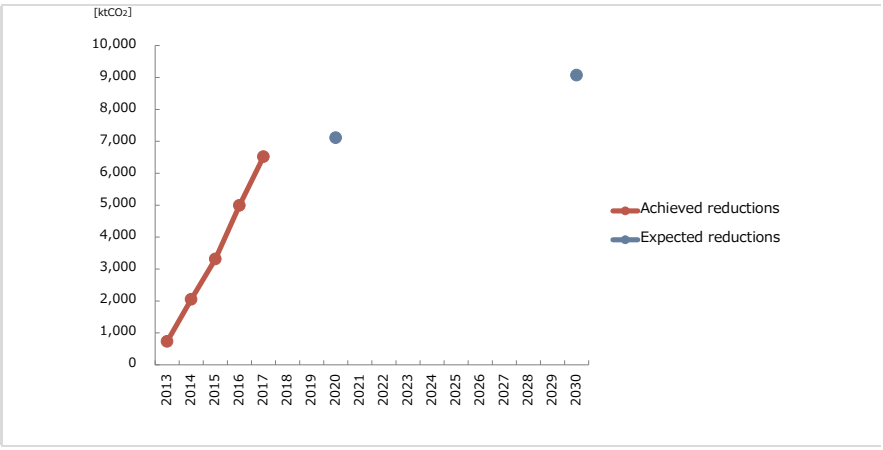
<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	Act on the Rational Use of Energy (Energy Conservation Act): Based on the top-runner program, set the energy consumption efficiency level for the target year by giving due consideration to the energy conservation level, as well as the prospect of technology advancement of the most energy-conserving product, at the time among the designated products and promote the improvement of efficiency of the target equipment by imposing on manufacturers the obligation to make the best effort toward the achievement of the target level by the target year.
Subsidy	1. Subsidy for the project to support the introduction of fuel cells for consumer use (FY 2009): Implementation of subsidies for the introduction of ENE-FARM. (*) In 2017, the name was changed to subsidies for projects to support the introduction of ENE-FARM with an eye toward the expansion of fuel cell use. 2. Subsidy to promote the introduction of innovative energy conservation technology in housing and buildings (FY 2012): Support the introduction of the ZEHs (net zero energy houses) with a combination of high-performance building materials, high-performance facilities and equipment, and storage batteries. *ZEH: Housing that aims to cover annual energy consumption by renewable energy after having achieved significant energy conservation 3. Project to accelerate the dissemination of net-zero energy houses (ZEHs) (FY 2016): *The outline of this item is the same as the one mentioned in 2. 4. Project to promote low carbon housing with ZEH (FY 2017) <Ministry of the Environment>: For detached houses, support businesses that build or rebuild houses that meet the promulgated ZEH requirements. 5. Community-type Housing Greening Project (FY 2017) <Ministry of Land, Infrastructure, Transport and Tourism>: Provide support for ZEHs built with collaboration among small and medium-sized building contractors.

<Progress assessment of policies and measures>

(Introduction of high-efficiency lighting)

Progress in the emission reductions	B (Expected to exceed the target level for FY 2030)
Supplement to the progress assessment and reasons	The performance results of the measure evaluation indicators, the amount of energy conserved, and the emissions reduced are on the increase. The current progress seems to exceed the forecast level based on the assumption of linearly changing measure evaluation indicators for FY 2030. This seems to be due to the acceleration of a shift to high efficiency lighting, which was enabled by promoting the improvement of energy consumption efficiency of all equipment with the top-runner program under the Energy Conservation Act and providing subsidies and support for the introduction of high efficiency equipment as part of support for the dissemination of ZEHs. In the future, the introduction of high efficiency lighting will continue to be promoted with regulatory measures under the Building Energy Efficiency Act and subsidy-based support measures.

Emission reductions ($ktCO_2$)	

- Improvement of Energy Efficiency of Equipment and Devices through Top-Runner Programs (Reprinted p.69)

4) Implementation of Thorough Energy Management

- Implementation of Thorough Energy Management Using HEMS and Smart Meters

The Home Energy Management System (HEMS) is designed to display energy consumption to encourage users to engage in the optimal use of air conditioners, lighting, and other energy-consuming equipment and appliances to promote energy conservation and CO_2 emission reductions by an entire house. Japan aims for the installation of the HEMS in almost all households by 2030. Japan also accelerates the installation of smart meters that measure household energy consumption in detail and make energy consumption visible when connected to the HEMS. More efficient energy management is promoted in households by effectively using the energy consumption data of the HEMS.

5) Other Policies and Measures

- Schematic Promotion of Joint Measures Implemented by Multiple Government Ministries and Agencies

Cooperation among relevant government agencies is established based on plans to effectively and efficiently implement initiatives in all fields in order to ensure that the reduction targets for FY 2030 in the residential sector will be achieved through thorough energy conservation, use of renewable energy, and low carbonizing of housing.

(d) Initiatives in the Transport Sector

1) Promotion and Enhancement of Voluntary Action Plans of Industry (Reprinted p.56)

- Steady Implementation of Industry's Action Plans for a Low-Carbon Society and Evaluation and Verification of Progress (Reprinted p.56)

2) Measures Concerning Vehicles

<Outline of policies and measures>

- Diffusion of Next-Generation Vehicles and Improvement of Fuel Efficiency

Japan promotes the diffusion of energy-efficient next-generation vehicles (e.g., hybrid vehicles [HV], electric vehicles [EV], plug-in hybrid vehicles [PHV], fuel cell vehicles [FCV], clean diesel

vehicles [CDV], and compressed natural gas vehicles [CNGV]). Support through subsidies and tax cuts is provided for vehicles that are new to the market and have challenges, such as high cost. It aims to increase the share of these vehicles in new car sales from 50% to 70% by 2030 by promoting measures to create initial demand, support research, and development to improve performance and build an efficient infrastructure. Special considerations are made for trucks and buses for which the market size is smaller than passenger vehicles, and the diffusion of development and mass-use is slower.

The problem of the short cruising range of electric vehicles and plug-in hybrid vehicles is the key to improve user satisfaction and to increase the use of these vehicles. Therefore, research and development will be conducted aiming to double the energy density, the performance indicator directly linked to the cruising range, by the early 2020s. Charging facilities will also be constructed to compensate for battery performance.

Support is provided systematically to put in place hydrogen stations, the necessary facility for the diffusion of fuel-cell vehicles. Research and development of technologies are conducted to lower the cost of hydrogen stations. In addition, the necessity of revising relevant regulations is examined while taking into account the improvement of the safety and reliability of relevant technologies.

The top-runner program is used to encourage automobile manufacturers to strategically accelerate technological innovations to improve fuel efficiency. Fuel efficiency will be further improved while revising preferential tax treatment whenever necessary. Technological developments are conducted for the commercial application of cellulose nanofibers and other advanced materials that can improve fuel efficiency by reducing the weight of automobile materials.

<Overall picture of policies>

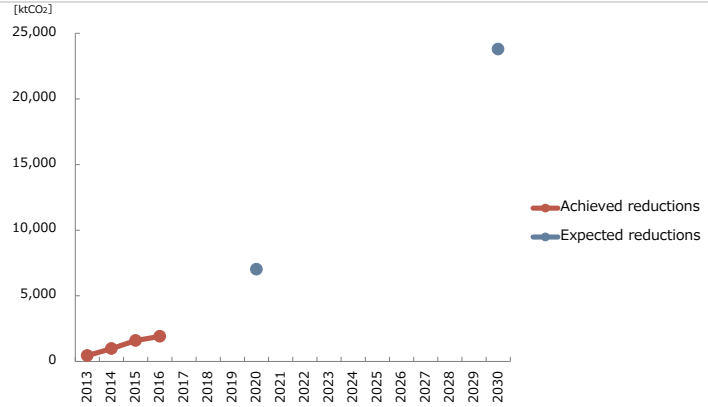
Instrument	Performance and Future Plans
Law and Standard	1. Fuel efficiency standards under the Energy Conservation Act: The final report on the fuel efficiency standards for heavy-duty vehicles for FY 2025 as the target year was released (FY 2017). The next standards following the FY 2020 fuel efficiency standards for passenger cars will be summarized in FY 2018. 2. Review of regulations for FCVs and hydrogen fueling stations
Tax	1. Special greening tax for automobiles (automobile tax, light automobile tax) and eco-car tax break (automobile tonnage tax, automobile acquisition tax): In an effort to disseminate fuel-efficient automobiles, implement the reduction/exemption of auto body tax. 2. Green investment tax breaks: Targeting businesses that have acquired facilities that promote the reduction of energy-related environmental burdens, 30% special depreciation, or 7% tax break of the acquisition price (only for small and medium-sized enterprises), was implemented (discontinued in FY 2018). 3. Special measures for the tax base pertaining to the facilities to fill low emission vehicles with fuel. 4. Gasoline tax exemption: In an effort to accelerate the introduction of bioethanol, the gasoline tax on the blended part of the bioethanol-blended gasoline is exempted. 5. Tariff exemption: In an effort to accelerate the introduction of bioethanol, tariffs pertaining to the import of ethanol manufactured from biomass and ETBE are exempted.
Subsidy	(Ministry of Economy, Trade and Industry) 1. Subsidy for the introduction of clean energy automobiles (FY 2015): Support the introduction of clean energy automobiles, such as electric vehicles and fuel cell vehicles that contribute to energy conservation and CO_2 emission reductions. 2. Project to promote the development of charging infrastructure for next-generation vehicles (FY 2012): In an effort to promote the dissemination of electric vehicles and

Instrument	Performance and Future Plans
	plug-in hybrid vehicles, subsidize the purchase cost of chargers. 3. Subsidy for the hydrogen fueling station development projects. (Ministry of Land, Infrastructure, Transport and Tourism) 1. Dissemination and promotion of next-generation vehicles toward the greening of regional transport (FY 2017): Support the promotion of the intensive introduction of and replacement to environmentally friendly vehicles (busses, trucks, and taxis). (Ministry of the Environment) 1. Project to accelerate the introduction of advanced green trucks and busses (FY 2016): Support the early introduction of advanced green trucks and busses, such as heavy-duty natural gas trucks, hybrid trucks, and buses, during the initial stage after the launch. 2. Project to accelerating the dissemination of low-carbon diesel trucks (FY 2014): Support truck transport companies with high mileage traveled for a shift from old fuel-inefficient vehicles to environmentally compliant vehicles. 3. Project to introduce regional renewable energy-derived hydrogen fueling stations (FY 2015): In an effort to realize a low carbon society, disseminate, and promote fuel-cell vehicles, support the introduction of renewable energy-derived hydrogen fueling stations.
Loan	Funds for Environmental and Energy Measures (pertaining to low-emission automobiles) (Japan Finance Corporation): Support the promotion of environmental measures by providing a loan for the acquisition of a low emission automobile, such as an electric vehicle.
Technology Development	(Ministry of Economy, Trade and Industry) 1. Project to develop advanced technology for the application and practical use of lithium-ion batteries (FY 2012). 2. Development of basic technologies for the promotion of the practical use of innovative storage batteries (FY 2016): Implement technology development for in-car storage batteries that will contribute to the dissemination of next-generation vehicles. 3. R&D project pertaining to hydrogen use technology. 4. Demonstration project for the development of fuel cell use sophistication technology. 5. Project to develop the integrated manufacturing process and member technology for sophisticated lignocellulose nanofibers (FY 2015): For lignocellulose nanofibers, build an energy-efficient, integrated manufacturing process that covers everything from raw materials to finished products and develop member technologies, such as automobile components and building materials, which enable energy conservation with weight reduction. (Ministry of the Environment) 1. Guided-type technology development and demonstration project for the reinforcement of CO_2 emission reductions measures (FY 2013): Implement the development and demonstration of technology that aims for early social implementation and that controls CO_2 emissions from energy sources. 2. Project to promote the use of next-generation materials, such as cellulose nanofibers (CNFs) (FY 2015): By leveraging CNFs that are of plant origin and that are five times as strong as and 1/5 times as light as steel, implement the evaluation and demonstration of the effect of CO_2 reduction, such as improved fuel efficiency with weight reduction, and the evaluation and demonstration of recycling technology.
Dissemination and Awareness Raising	Evaluation and public announcement of fuel efficiency and pasting of fuel efficiency stickers.

<Progress assessment of policies and measures>

(Dissemination of Next-Generation Vehicles and Improvement of Fuel Efficiency)

Progress in the emission reductions	C (Expected to be at the same level as the target level for FY 2030)

Supplement to the progress assessment and reasons	1. The percentage of the next-generation vehicles of the number of new vehicles sold, which is a measure evaluation indicator, and the average hold mode fuel economy are the indicators of passenger cars and change in proportion to the smooth replacement of vehicles. Since the next fuel economy standards for passenger cars are now being examined, the fuel economy of passenger cars is expected to improve in the future. The amount of energy conserved and emission reductions will improve for all types of vehicles. While the energy conservation and CO_2 reduction efforts have been progressing smoothly in passenger cars, the improvement of fuel economy in freight vehicles has been slow. Consequently, when they are combined, a downward trend can be found. However, since the fuel economy standards for freight vehicles will be tightened after FY 2022 and the improvement in fuel efficiency is expected to be actively promoted in the future, the energy conservation and emission reduction efforts are expected to progress smoothly toward FY 2030. 2. For estimates up to FY 2030, it is difficult to make a quantitative estimate for next-generation vehicles since they are easily influenced by external factors, such as future economic conditions, gasoline prices, subsidies, and environmental regulations. 3. Fuel economy regulations have been tightened not only in Japan but also across the world. For qualitative changes, it is expected that the percentage of next-generation vehicles and the average hold mode fuel economy, as well as the amount of energy conserved and emission reductions, will continue to increase in the future.
Emission reductions ($ktCO_2$)	

■ Promotion of Development of Biofuel Supply System

The biofuel supply system will continuously be constructed with a presumption that they ensure enough greenhouse gas emission reduction effects, stable supply, and economic feasibility by providing support for using biofuel and constructing supply infrastructures.

3) Measures for Traffic Flow Improvements

Efforts to ensure the smart use of roads are implemented when constructing roads with the recognition of the possibility of causing so-called induced and diverted traffic congestion. Such efforts include the enhancement of ring roads and other arterial road networks, which also ultimately help reduce CO_2 emissions and pinpoint measures to reduce traffic bottlenecks based on scientific data, such as the big-data gathered with ETC 2.0. The road environment is also improved to encourage the use of bicycles.

Road traffic improvements include the promotion of Intelligent Transport Systems (ITS), including the promotion of centralized signals, the improvement of traffic lights, the development of traffic safety facilities, including the promotion of LED traffic lights, the promotion of automated driving, and the improvement of traffic flows to reduce CO_2 emissions.

Necessary systems will be developed to allow automated driving on highways in 2020.

4) Development of Public Campaigns (Discussed later p.124)

- Promotion of Public Campaigns (Discussed later p.124)

5) Greening of Vehicle Transport Operators by Promoting the Environmentally Friendly Use of Vehicles

Vehicle transport operators are encouraged to use the Eco-drive Management System (EMS) to promote eco-driving of commercial vehicles, such as trucks, buses, and taxis. Four relevant government ministries and agencies take the initiative in promoting the use of EMS through the Eco-drive Promotion Liaison Council.

They also promote the use of the Green Management Certification System that certifies vehicle transport operators committed to excellent environmental practices, such as the improvement of fuel efficiency.

6) Promotion of Public Transport Utilization and Bicycles

Transportation services and convenience will continuously be improved through the development of public transportation, such as new railways, light-rail transit (LRT), bus rapid transit (BRT), enhancement of connections (modal connect) among modes of transportation through joint development by the government and the private sector, use of existing public transportations, acceleration of digitalization using integrated circuit (IC) cards for transportation, improvement of transit systems, and the use of park and ride services. Seamless public transportation networks are also constructed at the same time.

The environment for using bicycles is also developed by building a network of bicycle lanes, constructing bicycle parking lots, and increasing the use of community bicycles while coordinating the necessary safety measures.

Businesses also engage in relevant voluntary initiatives through commuter transport management and publicity to raise the awareness of citizens to guide people to shift from traveling in private cars to public transportation, such as trains and buses, or the use of bicycles. The government workers also actively use public transportation and bicycles for official work.

Excessive dependency on private cars is also reduced to build environmentally sustainable transport (EST).

7) Measures for Utilization of Railways, Vessels, and Aviation

- Energy Efficiency Improvement of Railways

The introduction of energy-efficient railway cars, such as lightweight cars and cars with VVVF devices, has recently started in the railway sector and will be further accelerated. The energy efficiency of railways will be further improved through the promotion of the eco rail line project that supports the introduction of advanced energy conservative devices.

- Energy Efficiency Improvement in Vessels

The vessel sector has promoted the use of vessels that reduce energy consumption by experimenting with innovative energy conservation technologies. It will continue to further

diffuse energy-saving vessels.

- Low Carbonization in Aviation

The aircraft sector has introduced energy-efficient aircraft materials and advanced air traffic control systems and promoted carbon reduction in airport facilities. The industry will continue to promote these policies, increase the use of alternative jet fuels, and improve the efficiency of airfreight transportation.

8) Promotion of Low-Carbonized Logistics Systems

- Promotion to Improve Truck Transport Efficiency and Cooperative Transport and Delivery

<Outline of policies and measures>

Efforts to promote activities against global warming and to push forward the greening of the entire logistics system by improved transportation efficiency and load efficiency shall be achieved through the promotion of shared transportation and delivery of clients who order deliveries and logistics service providers who carry the goods of such clients.

Thus, the clients and distributors continue to cooperate with each other in energy management under the Act on the Rational Use of Energy. In addition, the Green Logistics Partnership Conference recognizes and awards the activities with outstanding outcomes, such as (1) the reduction of environmental load from logistics, such as a modal shift achieved through the joint efforts of shippers and logistics providers, as well as improvement of truck transportation efficiencies, and (2) the establishment of sustainable logistics systems, including the improvement of logistics productivity. The awards motivate businesses to voluntarily engage in environmentally friendly operations and to expand green logistics. An integrated method or guideline is elaborated for the calculation of CO_2 emissions from the distribution so that both the clients and distributors can use it to streamline cooperation among them. A system to objectively evaluate the effects of individual efforts is also established.

In addition, the number of home deliveries has been steadily increasing in recent years due to the rapid expansion of e-commerce (EC). Yet, about 20% of deliveries are ending up being redelivered. The increasing number of redeliveries is expected to result in increased CO_2 emissions as well as the shortage of truck drivers. Therefore, measures are being implemented to reduce the number of redeliveries by diversifying ways to receive packages, such as picking them up at train stations and convenience stores, through the development of delivery boxes and other tools.

Transportation efficiency is also improved through the easing the regulations to increase the length of full trailers for transportation on arterial roads, improvement of accessibility by building direct connections between highways and private facilities, simplification of permission for driving special vehicles using ETC 2.0, and support for operational management.

In addition, based on the Act on the Advancement of Integration and Streamlining of the Distribution Business (2005, Act No. 85), measures are implemented to streamline transportation systems through the construction of truck stations adjacent to logistics facilities where cargos are stored, sorted, and processed for distribution, as well as the implementation of measures to rationalize transport through the introduction of truck reservation systems. The delivery networks are thereby integrated and rationalized. At the same time, carbon emission

reduction in logistics is accelerated by providing support for businesses engaging in truck transportation without standby time and the promotion of shared transportation and delivery.

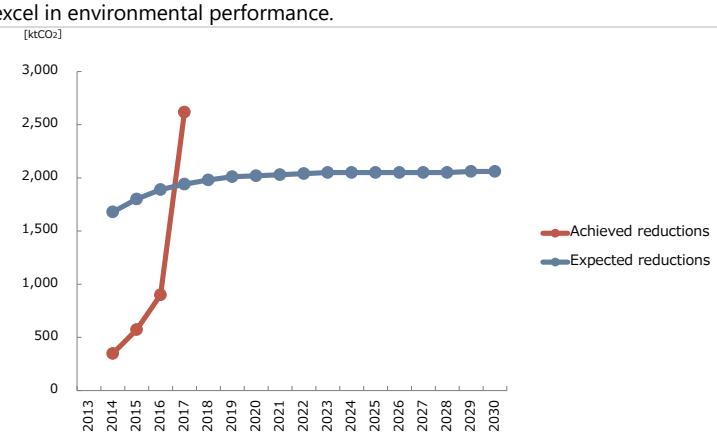
<Overall picture of policies>

(Promotion to Improve Truck Transport Efficiency)

Instrument	Performance and Future Plans
Law and Standard	Act on the Rational Use of Energy: Requires all freight companies to implement energy conservation efforts and the freight companies with a transportation capability greater than the specified level to develop an energy conservation plan and report energy consumption on a regular basis. (It was enforced in April 2006 and partially revised in June 2018.)
Tax	Provide support with the SME investment promotion tax system.
Subsidy	In the project to promote low carbon among small and medium-sized truck transport companies, implement the support project to introduce environmentally compliant diesel trucks.
Dissemination and Awareness Raising	Promotion of efforts through the Green Logistics Partnership Conference: Promote efforts that contribute to the streamlining of truck transport based on the collaboration between cargo owner companies and logistics providers (to be implemented in April 2005).

<Progress assessment of policies and measures>

(Promotion to Improve Truck Transport Efficiency)

Progress in the emission reductions	A (Expected to exceed the target level for FY 2030. In fact, the performance values for FY 2017 have already exceeded the target level for FY 2030.)
Supplement to the progress assessment and reasons	While the performance value has already exceeded the forecast for FY 2017, the value is influenced by an increase in the business-private conversion rate. Therefore, the values may fluctuate depending on future changes in the business-private conversion rate. In the future, efforts to achieve the targets will continue to be made through the development of a system to accelerate efforts related to environmental measures by truck transport companies, such as the enhancement of support for the introduction of heavy-duty trucks that excel in environmental performance.
Emission reductions ($ktCO_2$)	

- General Measures for the Greening of Marine Transport and Promotion of Modal Shift to Rail Freight Transport

Stakeholders are encouraged to shift from truck transportation to coastal shipping and/or railway transportation that will emit lower amounts of CO_2 for the greening of the entire logistics system.

Domestic terminals that accommodate combined and integrated transportation will be constructed to increase the competitiveness of coastal shipping that is to take over some of

the load from vehicle transportation. Transportation costs are thereby reduced while improving the quality of service. The use of energy-efficient coastal vessels is also increased and expanded. The modal shift to coastal shipping is also accelerated through the introduction of the truck with separable trailers and the Eco-Ship Mark, as well as the improvement in the efficiency of transport using refrigerated containers.

The competitiveness of rail freight transport also needs to be improved. Thus, the modal shift to rail freight transport is accelerated through the following measures: the increased volume of rail freight transport, the use of innovative time schedules; the improvement of transport equipment, such as refrigerated containers with advanced features to keep the contents fresh because they are effective when switching from trucks; the cost reduction of user-end transport; and the promotion of the use of the Eco-Rail Mark.

In addition, a modal shift will be promoted through its support based on the Act on the Advancement of Integration and Streamlining of the Distribution Business.

The efficiency of truck transport will be further promoted. This initiative includes the shift from private trucks to commercial trucks, as well as the use of larger trucks and trailers. Other initiatives include the promotion of load efficiency by carrying loads on return trips.

- Improvement of Energy Conservation at Facilities of Distribution Bases

Distribution warehouses are functioning as the core facility of distribution. The carbon footprints of distribution bases are reduced by supporting efforts to integrate the energy conservation of distribution facilities, such as the use of solar energy generation systems and energy conservative lighting devices with the improvement in the efficiency of distribution operations.

- Initiatives at Harbors

Harbors are crowded with freight ships and passenger ships and function as the base of industrial activities where marine and land distribution systems intersect each other. Since ports and harbors emit large amounts of greenhouse gases, the emissions can be effectively reduced. The emission reduction efforts are conducted from the perspective of maintaining the necessary functions in emergencies, such as large-scale natural disasters, and remaining resilient during the tight supply of electricity.

Specific initiatives include the construction of international marine container terminals, international distribution terminals, and domestic distribution bases that can accommodate combined and integrated transport systems. These facilities enable marine transport to the nearest ports and shorten the driving distance of truck transport.

Other efforts include supporting the introduction of energy-efficient equipment, promotion of modal shifts and improved transportation efficiency using marine transport for reverse logistics systems, examination of the development of onshore power supply systems for vessels in ports, facilitation of renewable energy introduction and its use, development of green areas in harbors and seaweed beds to absorb CO_2, and the examination of technological development to reduce CO_2 emissions in harbors.

9) Other Policies and Measures

- Schematic Promotion of Joint Measures Implemented by Multiple Government Ministries and Agencies

Cooperation among the relevant government ministries and agencies is established on the basis of plans to effectively and efficiently implement initiatives in all fields in order to ensure the reduction targets for 2030 in the transportation sector, including carbon reduction in individual modes of transportation and the promotion of modal shifts.

The initiatives also include special regulatory measures implemented through the Special Zone System for Structural Reform.

(e) Initiatives in the Energy Conversion Sector

1) Promotion and Enhancement of Voluntary Action Plans of Industry (Reprinted p.56)

- Steady Implementation of the Industry's Action Plans for a Low-Carbon Society and Evaluation and Verification of Progress (Reprinted p.56)

2) Maximum Introduction of Renewable Energy

<Outline of policies and measures>

[Renewable Energy Generation]

Renewable energy does not emit greenhouse gases when generating electricity. Thus, promoting the further introduction of renewable energy is vital for conducting measures in the energy conversion sector. In addition, renewable energy is promising, diversified, and important because low-carbon domestic energy sources in Japan contribute to energy security. Therefore, renewable energy will be expanding their introduction to the maximum extent in accordance with their characteristics while reducing the burden on the people by properly responding to the issues of stable supply, cost, and environmental aspects.

- Appropriate Operation and Revision of the Feed-in Tariff Scheme

The feed-in tariff scheme implemented under the Act on Special Measures Concerning the Procurement of Electricity from Renewable Energy Sources by Electric utilities (2011, Act No. 108) is accelerating renewable energy. The proper operation of the system will be continued. The system is also revised when necessary in order to expand to the maximum of renewable energy in a good balance while reducing the burdens on people, as well as based on a mid-to-long-term perspective of maintaining autonomous energy sources.

- Development of the Business Environment for the Expansion of the Introduction and Long-Term Stable Power Generation

The business environment is established to gain an understanding of people toward renewable energy and to realize the long-term stable use of renewable energy. The development includes the establishment of systems and rules for system operations, efficiency improvement and cost reduction of power generation facilities, and the rationalization of relevant regulations as necessary.

The following initiatives are going to be implemented, taking into consideration the characteristic of fuel type.

-Solar energy generation

The solar energy generation is expected to reduce the loads on systems and function as emergency power supplies by mid-to-small scale power generation at abutting area of energy users. Still, it faces challenges, such as the high cost of power generation and problems in stable supply, because it is associated with unstable output.

When the cost of solar energy is lowered from a mid-to-long-term perspective, it can fill the gap for peak demand of the afternoon using a decentralized energy system and contribute to the realization of consumer participatory energy management. Technological developments and other efforts are conducted to achieve these visions by improved efficiency, lower cost of power generation facilities, and advanced system operations.

-Wind energy generation

Economic feasibility may become achievable if large-scale wind energy generation systems can be developed. The technological development is thus conducted to improve efficiency and to reduce the cost of wind energy generation facilities. The speed of environmental impact assessments is increased so that wind energy generation facilities can be more quickly and smoothly installed and used while maintaining a good balance with the environment and local communities. The government and local governments work together to select areas for installing wind energy facilities so as to reduce the uncertainties of the project while ensuring environmental conservation.

In addition, electricity grid capacity is not necessarily sufficient in appropriate land for wind energy generation, such as Hokkaido. Technological developments are conducted to develop systems and to sophisticate system operations.

From the mid-to-long-term perspective, the expansion of floating offshore wind energy generation systems is essential because Japan has limited availability of the land-based installation of wind energy systems. The Act of Promoting Utilization of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources was enforced in April 2019 and Japan has developed a uniform rule for using ocean area. The installation of bottom-mounted wind energy is accelerated in harbor areas. In addition, trial research will be conducted to realize the world's first full-scale business operation of floating offshore wind energy.

-Geothermal power generation

Japan has the third-largest geothermal heat resources in the world. Geothermal power is an energy source that can become the baseload power supply for realizing low-cost and stable power generation. On the other hand, geothermal power development requires time and costs. Measures will be implemented to more quickly and smoothly introduce geothermal power facilities by reducing investment risks, promoting understanding of the people at the local level, streamlining the procedure for environmental impact assessments, and rationalizing regulations and institutions as necessary. Sustainable development that coexists with regional features is thereby conducted while protecting the natural environment and local communities.

-Hydropower generation

Hydropower is an energy source that offers excellent stability as a power supply, except when a drought occurs. Hydropower generation facilities will be installed in dams where no hydropower generation is conducted. Existing hydropower generation facilities in dams will also be replaced with new ones. Meanwhile, medium to small-scale hydropower generation is often installed in undeveloped locations. These facilities are going to be utilized as the energy source to become the foundation of regionally distributed energy supply-demand structures while facing challenges in the business environment, such as the use of high-cost structures.

-Biomass energy generation

Biomass energy is an energy source that can deliver a stable power supply and support the regional economy. However, it uses various materials, such as wood and waste, in various forms, and such variations create challenges, such as high cost. Thus, conflicts with existing businesses need to be arranged, and the stable supply of raw materials needs to be secured. Based on these measures, including measures in the forestry industry, such as pursuing the advantage of the expansion of industry size and the use of mixed combustion in existing thermal power generation plants, the long-term and steady expansion of the introduction of biomass energy generation can be achieved.

Individually, measures, such as support to ensure a stable and efficient supply of unused materials and the recovery of energy from waste heat, such as the methane fermentation of waste biomass and/or combustion heat, will be implemented.

[Renewable Heat Energy]

Regarding renewable heat energy sources that are specific to particular regions, such as solar heat, biomass heat, geo-heat, snow and ice heat, hot springs heat, river heat, and sewage heat; it is important to increase the use of renewable heat energy; biomass heat from sewage, sludge, waste, unused materials; biofuels that can replace some oil products used as fuel in the transport sector; and waste heat generated in the process of waste disposal depending on economic efficiencies and regional characteristics. Support will be provided for the introduction of renewable heat energy supply systems. The use of renewable heat energy is also going to be expanded by testing and creating models for the effective use of various thermal energies in different regions.

<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	1. Feed-in Tariff system (FY 2012): Establish the Feed-in Tariff system under the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electric utilities. 2. Act on Promoting the Generation of Electricity from Renewable Energy Sources Harmonized with Sound Development of Agriculture, Forestry, and Fisheries (Agricultural, Mountain, and Fishing Villages Renewable Energy Act) (FY 2013): In an effort to promote the generation of electricity from renewable energy sources

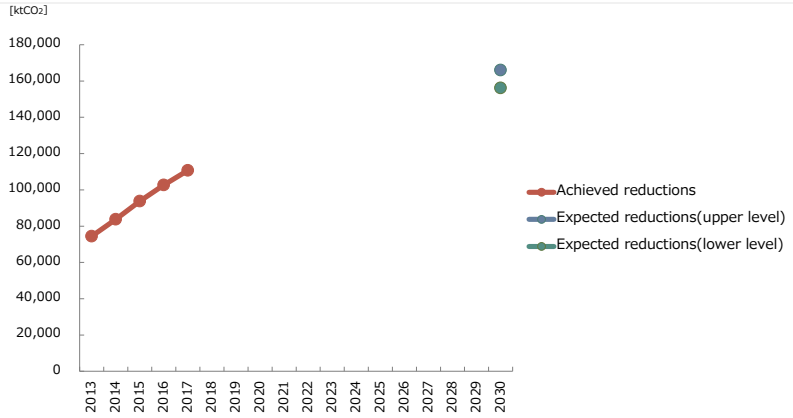
Instrument	Performance and Future Plans
	harmonized with the sound development of agriculture, forestry, and fisheries in agricultural, mountain, and fishing villages, coordinate the use of farmland and forestland in an appropriate manner and promote efforts that contribute to the sound development of regional agriculture, forestry, and fisheries while introducing power generation from renewable energy sources. 3. The Act of Promoting Utilization of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources (FY 2019) : The government identifies the promotional zone, selects the most appropriate business operator, and gives permission of long-term occupancy (30 years).
Tax	1. Special tax measures for the tax base pertaining to the facilities of power generation from renewable sources (from FY 2009 onwards): Implementation of a property tax cut on facilities of power generation from renewable energy sources 2. Tax reduction for green investment (FY 2011 to FY 2017): A tax incentive for newly acquired energy facilities that are used for business operations within one year after the acquisition of the facilities 3. Investment promotion tax for energy saving and renewable energy (from FY 2018 onwards): Support by tax system in case the business operators introduce renewable energy facilities and actually use them
Subsidy	1. Support for the introduction of facilities for power generation from renewable energy sources (for personal consumption) (from FY 2012 onwards): Support systems for power generation from renewable energy sources, including storage batteries, for personal consumption. 2. Support for the introduction of facilities that leverage renewable heat (from FY 2011 onwards): Support projects for the introduction of facilities that leverage renewable heat, such as heat produced from biomass and underground heat. 3. Cross-sectoral policies that support the introduction of renewable energy: In an effort to expedite the introduction of renewable energy, promote investment in the development of an independent/diversified low-carbon energy society in regions, and investment in the low-carbon projects to which enough private funds have not been provided. 4. Comprehensive renewable energy promotion project to revitalize agricultural, mountain, and fishing villages (FY 2013 to FY 2017): For renewable energy projects led by workers in agriculture, forestry, and fisheries, comprehensive support is provided for various procedures and efforts, which are required in the entire process from the development of a design to the start of operation and utilization. 5. Use and expansion of regional resource support project (from FY 2018 onwards): For the efforts promoted by municipalities and agricultural, forestry, and fisheries groups to achieve sustainable development of agricultural, mountain, and fishing villages by leveraging recyclable regional resources, provide support, including the development of project plans, matching related businesses, individual consultation, and nationwide efforts and dissemination activities. 6. Project to support the initiatives for local production for renewable energy for local consumption in agricultural, mountain, and fishing villages (FY 2016 to FY 2018): Support feasibility studies on the introduction of an energy demand balance adjustment system in the region that focuses on agriculture, forestry, and/or fisheries, consideration of the introduction of renewable energy facilities, and consideration of the establishment of a community-owned retail electricity business. 7. Renewable energy introduction support project, including small hydroelectric generation facilities (FY 2017 to FY 2018): Support investigations and design pertaining to small hydroelectric generation facilities that leverage irrigation facilities. 8. Survey and events for geothermal energy resources: Government supports the research of geothermal resources with high risks, and energy potential at promising development site. Actions and events for promising local residents' understanding of geothermal energy generation are also supported by the government.
Loan	1. Low-interest loans for the introduction of renewable energy: Targeting SMEs and small-scale businesses, provide low-interest loans for the expenses to introduce renewable energy power generation and heat utilization facilities through the Japan Finance Corporation.
Technology Development	1. Renewable Heat Utilization Technology Development Project (from FY 2014 onwards): Contribute to the dissemination and expansion of heat utilization by developing renewable heat element technology, including underground heat, and high-efficiency systems with an eye toward cost reductions.

Instrument	Performance and Future Plans
	2. Research and development of offshore wind power generation technology (from FY 2008 onwards): Achieve further cost reductions for offshore wind power generation by developing and verifying lightweight floating body and windmill technologies. Moreover, conduct a basic survey for bottom-mounted offshore wind project and develop maintenance technology that enables the advance prediction of windmill component failures. 3. Cellulosic ethanol production system comprehensive development and demonstration project (from FY 2014 onwards): Do long-term stability research for consistent manufacturing process from material to production of ethanol. 4. Ocean energy technology research and development project (from FY 2011 onwards): Implement the demonstration of ocean current generation in the sea that selected as the technology expected to be able to implement on an early stage. 5. New energy venture technology innovation project (from FY 2007 onwards): Support technology development, efforts to put the developed technologies into practical use, and demonstration research in the new energy field by SMEs and ventures. 6. Research and development project on the technology to deal with output fluctuations in electric power systems (FY 2014 onwards): Implement the development of prediction and control technologies that receive maximum renewable energy with a minimum response to output fluctuations. 7. Research and development of technology to reduce power generation costs of high performance and high-reliability solar power generation (from FY 2015 onwards): Implement the development of technologies with a high potential for reducing power generation costs and low cost recycle technology. 8. Measures to accelerate the introduction of renewable energy sources: Promote pioneering technology development, demonstration, and model projects for technology to generate power from renewable energy sources, such as wind power, small waterpower, biomass, floating offshore winds, and tidal currents, and technology related to the social integration of renewable energy, such as storage batteries and energy interchanges within a region.
Other	1. Development of an infrastructure toward the expansion of the introduction of renewable energy: Aim to perform high-quality, efficient environmental impact assessments by developing a database for basic environmental information that can be used for environmental assessments and creating community-driven methods to extract appropriate candidate sites and expand renewable energy use in a smooth manner while giving due consideration to the natural environment and local communities. Moreover, by providing natural environment information that is required for the selection of a renewable energy site, make the site selection by businesses appropriate and efficient, contribute to reaching a smooth agreement with local people, and promote environment-friendly renewable energy.

<Progress assessment of policies and measures>

(Expansion of the Use of Renewable Energy Electricity)

Progress in the emission reductions	C (Expected to reach the same levels as the target level for FY 2030)
Supplement to the progress assessment and reasons	1. Based on the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electric utilities, the Feed-in Tariff (FIT) system was launched in July FY 2012. Consequently, the use of renewable energy significantly increased compared to that before the launch of the FIT. In the future, the use of renewable energy is expected to increase steadily toward the achievement of targets by continuing to promote the expansion of the use of electricity obtained from renewable energy sources. 2. For the energy mix, since the annual target ratio is not set, it is difficult to assess the status of achievement of targets appropriately from the figures of one year alone. However, as a result of the launch of the FIT system in July FY 2012 under the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electric utilities, the use of renewable energy has significantly increased compared to that before the launch of the FIT system. 3. While it is difficult to predict how the use of renewable energy will increase in the

	future, in light of the measure evaluation indicators (the amount of power generated was 170.4 billion kWh and the emission reductions was 110.76 $MtCO_2$ in FY 2017) and changes in the number of businesses certified under the FIT system, it is currently evaluated as C. In the future, efforts to expand the use of electricity from renewable energy sources will be further promoted.
Emission reductions ($ktCO_2$)	

- Initiatives in Water Supply and Sewage System (Reprinted p.80)
- Initiatives in Waste Management (Reprinted p.80)

[Full Use of Electricity and Heat from Regional Renewable Energy Source and Unused Heat]

- Expansion of Holistic and Efficient Use of Energy (Reprinted p.77)

3) Reduction of CO_2 Emission Intensity in Power Sectors

<Outline of policies and measures>

[Persuasion of High Efficiency of Thermal Power Generation]

- Initiatives of the Power Sectors to Low Carbonization

The voluntary framework of the power sectors in which major businesses participate and the Industry's Action Plans Toward a Low-Carbon Society was announced in July 2015. (The Action Plans Toward a Low-Carbon Society aims to achieve about 0.37 kg-CO_2/kWh as the emission factor that matches the national energy mix and the CO_2 reduction target.) The Electric Power Council for a Low-Carbon Society was launched in February 2016. The Council established individual reduction plans and announced the mechanisms and rules of the entire industry to implement PDCA.

Policies are going to be established to accelerate activities to achieve the targets of the voluntary framework based on the Act on the Rational Use of Energy and the Act on the Promotion of Use of Non-fossil Energy Sources and Effective Use of Fossil Energy Materials by Energy Suppliers (2009, Act No. 72, hereinafter referred to as "the Advancement Act"). The effectiveness of the efforts of the entire power sector is ensured under energy deregulation.

Specifically, the policies include the following categories. Effective activities will be continued based on the Summary of the Director-Level Meeting on the Bid on the Thermal Power Supply of the Tokyo Electric Power Company (April 25, 2013, Ministry of Economy, Trade and Industry and Ministry of the Environment).

<Voluntary framework>

- Continuous improvement of effectiveness and transparency is promoted. Participating businesses are also expected to sincerely achieve the listed targets.
- The national council (Natural Resources and Energy WG, Global Environment Subcommittee, Committee on Industrial Science and Technology Policy and Environment, Industrial Structure Council) also follows up on activities conducted under the voluntary framework of the power industry.

<Policy responses>

- Power suppliers are required to satisfy the standard of expected power generation efficiency in the energy mix set for individual power generation facilities when they install and use new power generation facilities (42.0% or more for coal, 50.5% or more for LNG, and 39.0% or more for oil).
  Individual power suppliers are also required to satisfy the actual power generation efficiency expected in the energy mix when they use currently installed power generation facilities. (The presumed standard to achieve in index A of thermal power generation efficiency is 1.00 or more (target of power generation efficiency: 41% for coal, 48% for LNG, and 39% for oil) (all at the power generation end, HHV). The standard expected to achieve in index B of the thermal power generation efficiency is 44.3% or more (at the power generation end, HHV).)
- Electricity retailers are required to ensure that the ratio of energy generated from non-fossil energy sources is 44% or more of all the electricity they sell based on the Advancement Act.
- Guidelines for electricity retail operations regard the labeling of the post-adjustment emission factor as a desirable practice.
- The Ministerial Ordinance under the Act on the Promotion of Global Warming Countermeasures requests all electricity retailers to report actual emission factors for the greenhouse gas emission accounting, reporting, and disclosure system. Reported emission factors are released to the public. (Actual emission factors over the past two fiscal years and other data are added to the reporting requirement to enrich the contents of the reports.)

The effectiveness and transparency of efforts in the entire power sector will be secured through these activities and measures. The progress of these activities and measures is evaluated every year to see whether they remain effective in reaching the emission factor target of 0.37 $kgCO_2$/kWh in FY 2030 that matches the reduction target and energy mix set for FY 2030.

Emissions and emission factors from the power sector are evaluated. Revision of policies and other measures are considered if the evaluation finds that the goal of 0.37 $kgCO_2$/kWh cannot be achieved.

- Promotion to Introduce the Latest Power Generation Technologies to Thermal Power

Generation Facilities

An important point of introducing power generation facilities is to constantly encourage the advancement of power generation technologies through competition, to maintain and improve the technological superiority of Japan in the power generation business, to improve Japan's competitiveness on the international stage, and to contribute to environmental protection. Based on this idea, Japan promotes the use of BAT while taking into account the trend of the development of power generation technologies in the future.

■ Carbon Dioxide Capture and Storage (CCS)

Japan works on CCS based on decisions that include the Summary of the Director-Level Meeting on the Bid on Thermal Power Supply of the Tokyo Electric Power Company, the Strategic Energy Plan and The Long-term Strategy under the Paris Agreement in looking ahead to after 2030.

■ Responses to Small-Scale Thermal Power Generation

The number of plans is increasing to construct small-scale thermal power plants that are smaller, especially ones that are only slightly smaller than the minimum size covered in the regulation of the Environmental Impact Assessment Act (1997, Act No. 81). The Act on the Rational Use of Energy will become applicable to power suppliers that are planning to construct such plants to require them to satisfy high standards of power generation efficiency that contribute to the energy mix.

<Overall picture of policies>

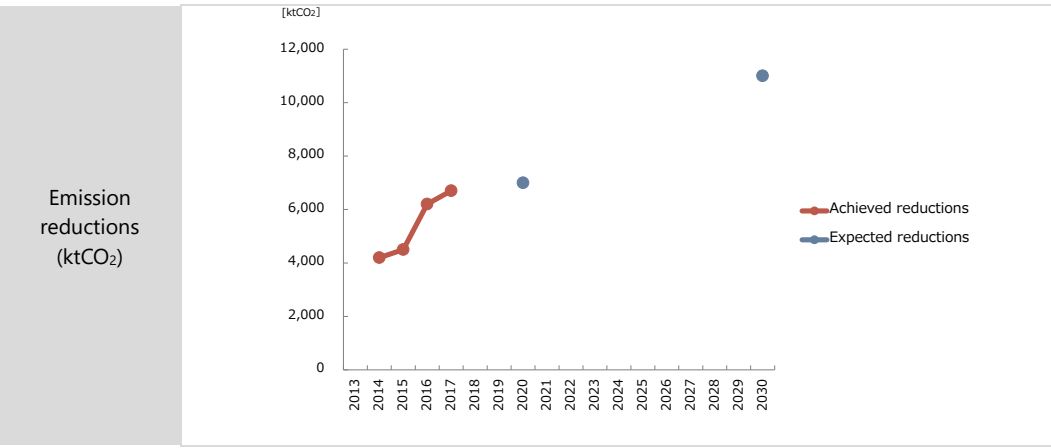
Instrument	Performance and Future Plans
Law and Standard	1. Benchmark indicators based on the Energy Conservation Act: Targeting power generation businesses, power generation efficiency criteria pertaining to thermal power generation were set (put into effect in FY 2016): In April FY 2016, the Energy Conservation Act Standards of Judgment were revised, and the power generation efficiency criteria pertaining to thermal power generation were set for power generation businesses. In the future, progress in power generation efficiency will be followed based on the regular reports (to start in FY 2017) by businesses, and the review and institutional design will be performed in alignment with the energy mix. 2. Non-fossil fuel ratio criteria based on the Sophisticated Methods of Energy Supply Structures (started in FY 2016): The non-fossil fuel ratio in electric power sold was set for retail electricity businesses: In April FY 2016, related ministerial ordinances and notices were revised, and the non-fossil fuel ratio in electric power sold was set for retail electricity businesses. In the future, progress in power generation efficiency will be followed based on the regular reports by businesses (to start in FY 2017), and the review and institutional design will be performed in alignment with the energy mix. 3. System for the calculation, reporting, and announcement of greenhouse gas emissions under the Act on the Promotion of Global Warming Countermeasures (started in FY 2006): Require retail electricity businesses to report on the performance of an emission factor required for the calculation of greenhouse gas emissions. Since the system for the calculation, reporting, and announcement of greenhouse gas emissions under the Act on the Promotion of Global Warming Countermeasures requires the Minister of Economy, Trade and Industry and the Minister of the Environment to announce the basic emission factor and adjusted emission factor of electricity pertaining to the supply of electricity by electric utilities each year, electric utilities are required to report on emission factors. Along with the revision of the Electricity Business Act in FY 2017, electric utilities (retail electricity businesses and general electricity transmission and distribution businesses) are required to report on the actual performance of emission factors. This effort summarizes emission factor reports by electric utilities for the

Instrument	Performance and Future Plans
	following purposes and appropriately reflects the CO_2 reduction efforts by electric utilities even after the deregulation of electric power: (1) To ensure that the calculation of CO_2 emissions arising from the use of electricity by specified emitters (persons who report on calculated greenhouse gas emissions in accordance with Article 26, Act on the Promotion of Global Warming Countermeasures), which was supplied by other persons, and thereby contribute to voluntary CO_2 emission control, and, (2) To promote efforts by business operators, which contribute to controlling greenhouse gas emissions by other people.
Technology Development	Next-Generation Thermal Power Generation Technology Research and Development Project (started in FY 2016): In an effort to achieve the early establishment of next-generation thermal power generation technology based on the Technology Roadmap for Next-Generation Power Generation, efforts to enhance the efficiency of thermal power generation and develop CO_2 reduction technology were implemented. Implement the development of technologies for the enhancement of efficiency of thermal power generation, such as the IGFC (integrated coal gasification fuel cell combined cycle) and for high-efficiency gas turbines. In the future stage of commercialization based on the development results, the IGFC aims to achieve the power generation efficiency of about 55%, and 1,700°C gas turbines aim to achieve that of about 57%.
Other	1. Global warming countermeasure progress evaluation in the electricity business field (started in FY 2016): According to the agreement made between the Minister of the Environment and the Minister of Economy, Trade and Industry in February 2016, the evaluation of progress in global warming countermeasures in the electricity business field for FY 2017 was announced in March 2018. In the future, the evaluation will be performed each year. 2. Environmental conservation related to small-scale thermal power generation

<Progress assessment of policies and measures>

(Persuasion of High Efficiency of Thermal Power Generation)

Progress in the emission reductions	C (Expected to reach the same levels as the target level for FY 2030)
Supplement to the progress assessment and reasons	For the persuasion of high efficiency of thermal power generation, it is necessary to replace old thermal power generation facilities with high efficiency facilities or to introduce high efficiency facilities when a thermal power generation plant is newly built. The lead-time to do so is not continuous since its period and timing vary depending on businesses in light of a stable supply of power and the understanding of local people. Therefore, it is difficult to appropriately evaluate the probability of achieving the target level based on the figures for only one year. However, since the single-year progress rate toward the achievement of the target for FY 2020 in the voluntary efforts of the electric power industry is 80%, it can be evaluated that measures are progressing. Since it is necessary to continue making improvements in the future, efforts for the replacement of old thermal power facilities with high efficiency facilities and the introduction of high efficiency facilities when a new thermal power generation plant is built will continue and the appropriate maintenance, operation, and management of existing facilities will be conducted in a thorough manner to maintain heat efficiency at the highest level possible.



[Utilizing Nuclear Power Generation Where Safety is Approved]

■ Initiatives of the Power Sectors to Low Carbonization (Reprinted p.96)

■ Utilizing Nuclear Power Generation Where Safety is Approved

Nuclear power is a low-carbon baseload power source that does not emit greenhouse gases during operation. Judgment as to whether nuclear power plants meet the new regulatory requirements will be left to the Nuclear Regulation Authority (NRA) and in case that the NRA confirms the conformity of nuclear power plants with the new regulatory requirements, the Government will follow NRA's judgment and will proceed with the restart of the nuclear power plants. In that case, the Government will make best efforts to obtain the understanding and cooperation of the host municipalities and other relevant parties.

[Maximum Introduction of Renewable Energy]

■ Initiatives of the Power Sectors to Low Carbonization (Reprinted p.96)

■ Maximum Introduction of Renewable Energy (Reprinted p.91)

4) Promotion of Energy Conservation Policies in the Oil Product Manufacturing Sector

■ Initiatives in the Oil Refinery Industry

Japan promotes a reduction of one million kiloliters of energy in crude oil equivalent from business as usual (BAU) by oil refiners in the oil product manufacturing field based on the Industry's Action Plan for a Low-Carbon Society through the following initiatives: (i) effective use of heat, (ii) introduction of advanced control and high efficient devices, (iii) improvement of the motor system operation, and (iv) major improvement and advancement of processes.

● Non-Energy-Related CO_2

■ Increasing the Use of Blended Cement

The production proportion and use of blended cement, which is made by mixing blast furnace slag with clinker as an intermediate cement product will be increased.

In public works administrated by the government, the use of blended cement will be promoted in accordance with the Act on the Promotion of Procurement of Eco-Friendly Goods and

Services by the State and Other Entities (2000, Act No. 100, hereinafter referred to as "Act on Green Purchasing").

■ Diffusion of Biomass Plastics

<Outline of policies and measures>

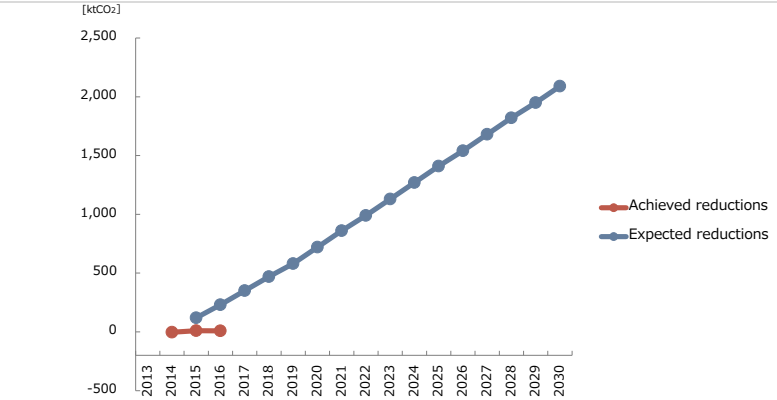
CO_2 emissions from the combustion of waste plastics are reduced by increasing the use of plastics made from biomass as replacements for plastics made from oil (intended to reduce CO_2 from the oil-originated carbon in waste plastics).

<Overall picture of policies>

Instrument	Performance and Future Plans
Technological development	1. Demonstration project for plastics resource circulation system for decarbonized society: Support the development and the manufacturing of biomass plastics in order to be put into practical use in society 2. Project to promote the use of next-generation materials, such as cellulose nanofiber (CNF) (started in FY 2016): Starting from materials, which are the foundation of various products, use next-generation materials, such as CNF and bio-plastics, which are expected to bring great advances in mitigating global warming by reducing the weight of automotive parts through fuel improvements. By cooperating with manufacturers, verify the effect of reducing carbon during the product consumption/usage phase, examine ways to reduce carbon in the production process, examine recycling problems and solutions, and promote the early realization of actual uses in society. Support the development of advanced-function biomass plastics, which has great heat resistance, incombustibility, and dimensional stability. 3. Technological development and verification project to reduce CO_2 emissions and reinforce preventive measures (started in FY 2017): Present details and requirements of the necessary performance of technologies and systems in fields that will require policy-based reinforcement in the future, whereas current measures are not enough yet, or additional measures can be enriched. Develop and verify technologies to be swiftly put into practical use in society. Support the development of advanced-function biomass plastic with excellent heat resistance, incombustibility, and dimensional stability.
Other	Project to realize crosscutting advancement and efficiency improvement of recycling process among the project to promote the advanced use of recycled resources through the integration and reinforcement of the recycling system: Investigate the distribution of biomass materials including biomass plastics and the recycling status and explore ways to use resources effectively.

<Progress assessment of policies and measures>

Progress in the emission reductions	D (Expected to fall below the target levels for FY 2030)
Supplement to the progress assessment and reasons	The use of biomass plastic currently depends on voluntary action by businesses. The spread of use is limited, however, because the price of the biomass plastic is higher than petroleum-based plastic. Both the amount of biomass plastic shipped and the amount of the reduction of CO_2 emissions are below expectations. Ways to reduce the price of biomass plastic will be explored to increase use. Other matters to be examined include the advancement of its functions to set it apart from petroleum-based plastic.

Emission reductions ($ktCO_2$)	

■ Reduction in the Amount of Waste Incineration

Through the promotion of the 3Rs initiatives for achieving the targets set out in the Basic Plan for Establishing a Recycling-Based Society (Cabinet Decision on May 31, 2013, 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 in line with the target set in Basic Recycling Law. (1970, Law No. 137, hereinafter referred to as "the Waste Management Law"), the incineration of waste plastics made from oil is thereby reduced. Specific measures to reduce the amount of waste, promote reuse, and reduce CO_2 emissions from the incinerated waste plastics include thorough waste sorting and collection, as well as the imposition of charges for waste collection by municipal governments, and actions complying with individual recycling laws.

■ Promotion of Public Campaigns (Discussed later p.124)

● Methane (CH_4)

■ Measures to Reduce Greenhouse Gas Emissions in Relation to Agricultural Soil

<Outline of policies and measures>

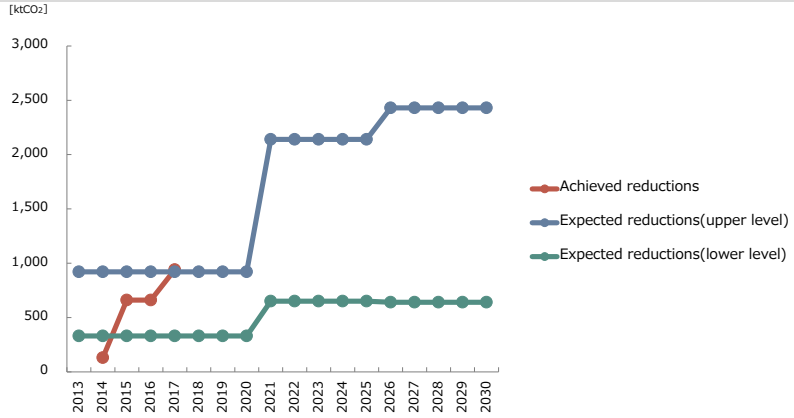
Methane emissions associated with rice cultivation can be reduced by changing the farming practices including replacing the conventional approach of plowing in rice straw with the application of compost in line with local conditions.

<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	1. Act on Multi-Functionality of Agriculture (Act number 78, 2014) 2. The national government, in cooperation with prefectures and municipalities, intensively and effectively supports the activities to promote the fulfillment of multifunctional roles of agriculture. 3. Direct payments for environmentally friendly agriculture are provided as the project based on the Act on Multi-Functionality of Agriculture (from FY 2015).
Subsidy	Direct payments for environmentally friendly agriculture (from FY 2011): Direct payments to support activities that are effective in preventing global warming and/or conserving biodiversity in conjunction with reducing the use of synthetic fertilizers and pesticides by more than 50% from conventional farming practices in the region.
Dissemination and Awareness Raising	Inform proper water management with extended midseason drainage in paddy fields and other techniques under the Basic Policy on Agricultural Technology (revised in 2018).

Instrument	Performance and Future Plans
Other	To gather the necessary data for the report to the UN on greenhouse gas emissions and removals on croplands and grasslands, investigate the amount of carbon storage in agricultural soils, and examine agricultural land management technologies to reduce greenhouse gas emissions.

<Progress assessment of policies and measures>

Progress in the emission reductions	B (Expected to exceed the target level for FY 2030)
Supplement to the progress assessment and reasons	Compared to FY 2016, the amount of reduction is increasing by about 280 $ktCO_2$, which is higher than the expected reduction. One of the factors in the reduction is the reduced acreage of rice cultivation. The acreage of rice cultivation has been declining in recent years, and this trend is expected to continue in the future. Thus, the reduction is expected to exceed the target level for FY 2030.
Emission reductions ($ktCO_2$)	

■ Reduction in the Amount of Waste for Final Disposal

Initiatives are conducted 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 reduce methane emissions associated with the landfilling of waste by promoting a reduction in the amount of directly landfilled waste, such as raw garbage, through reviews of disposal methods and thorough waste sorting and collection, as well as reinforcement of disposal systems by municipal governments.

■ Adoption of Semi-Aerobic Landfill Structure in Final Waste Disposal Sites

The use of a semi-aerobic landfill structure for the installation of final waste disposal sites can reduce the biological degradation of organic waste, such as raw garbage, and lower methane emissions from waste landfills compared to anaerobic landfill structures.

● Nitrous Oxide (N_2O)

■ Measures to Reduce Greenhouse Gas Emissions in Relation to Agricultural Soil

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

■ Advancement of Combustion in Sewage Sludge Incineration Facilities

<Outline of policies and measures>

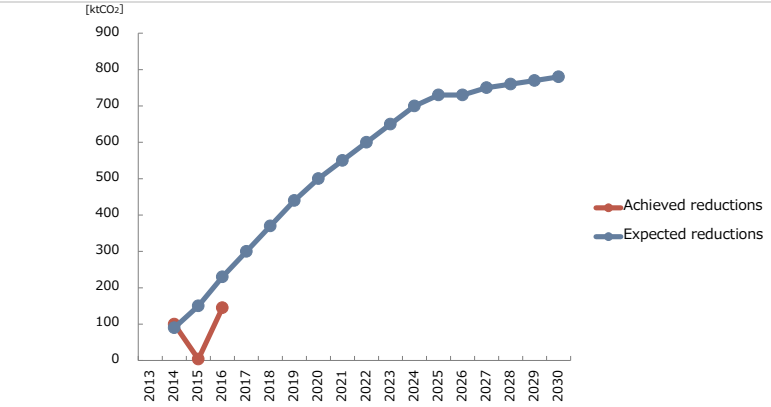
The amount of nitrous oxide emissions from incineration of sewage sludge is reduced by introducing high-temperature combustion and replacement with incinerators that emit less nitrous oxide or facilities that produce solid fuel by carbonizing sewage sludge.

<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	1. Sewerage Act (revised in 2015): Provide non-binding obligations related to the recycling of sludge as fuel and fertilizer applicable to managers of sewage treatment facilities. 2. Guideline for Sewage and Discharge Facilities (revised at the end of FY 2018): A provision concerning a new-type furnace to reduce N_2O emissions was added to the Guideline for Sewage and Discharge Facilities issued by the Japan Sewage Works Association.
Tax	Green Investment Tax Breaks (for storage facilities of solid fuel produced from sewage sludge) (FY 2011 to FY 2017): Abolished in FY 2018.
Subsidy	Support through a general subsidy for the development of social infrastructures (from FY 2010): Support for the construction of sewage sludge incineration facilities and solid fuel production facilities. Starting in FY 2017, the use of N_2O emission reduction technology upon the installation or updating of a sewage sludge incineration facility became mandatory.
Technology Development	Breakthrough by Dynamic Approach in Sewage High Technology Project (B-DASH Project): The Government takes the initiative in conducting technical verifications by installing practical-size facilities to create guidelines for use around the countries using the expertise and funds from private businesses.
Other	Distribution of information about N_2O emission reduction effect: Information on the effect of reducing N_2O emissions using a fluidized reactor for the high-temperature incineration of sludge dehydrated by adding polymers is distributed to sewage system administrators.

<Progress assessment of policies and measures>

Progress in the emission reductions	C (Expected to be at the same level as the target level for FY 2030)
Supplement to the progress assessment and reasons	The installed number of new-type furnaces and solid fuel production furnaces has been increasing at a faster rate than expected in 2016 and is above the target level. In terms of the ratio of the advancement of sewage sludge incineration, the number of solid fuel production furnaces and new-type furnaces is expected to increase in the future with the renovation and updating of facilities. It is because of additional reinforcement of the policy for non-binding obligations added upon the revision of the Sewerage Act in 2015 and the mandating of the installation of N_2O emission reduction technology upon the installation or updating of sewage sludge incineration facilities as a requirement for receiving the Subsidy added in FY 2017. Thanks to the above reinforcements, the amount of emissions is expected to be further reduced.

Emission reductions ($ktCO_2$)	

■ Reduction in the Amount of Municipal Waste Incinerated

The amount of waste incinerated in municipal waste incinerators is reduced by promoting the 3R initiatives to achieve the targets set in the Basic Recycling Plan formulated in accordance with the Basic Recycling Law and waste reduction target stipulated in the Waste Management Law. The combustion technology at municipal waste incineration facilities is advanced by shifting to continuous incinerators and increasing the ratio of continuous operation of waste disposal in municipal waste incineration facilities under wide-area waste disposal systems. The combustion in municipal waste incineration facilities is thereby advanced, and the amount of nitrous oxide emissions from waste incineration is reduced.

● Fluorinated Gases: HFCs, PFCs, SF_6, and NF_3

<Outline of policies and measures>

■ Practical Efforts on Phasing Down of Fluorocarbons

Gas manufacturers and relevant business operators (business operators producing and importing fluorocarbons) are encouraged to use fluorocarbons with lower GWP, to switch to gases other than fluorocarbons, including reducing their production, and to recycle them in order to increase the low recovery rate and decrease the environmental load from fluorocarbons.

Therefore, gas manufacturers are expected to set plans and reduce the amount of fluorocarbons they produce based on the projection of the use of fluorocarbons that the Government established on the basis of the Fluorocarbons Emissions Reduction Law.

■ Promotion of Eliminating Fluorocarbons and Lowering the GWP of Products

The following measures are implemented to gradually and steadily switch to non-fluorocarbons and reduce the GWP of refrigeration and air conditioners and other products containing fluorocarbons while taking into account technological progress in Japan and in the world and market trends.

(i) Business operators producing and importing fluorocarbons are required to meet standards within the target year based on proper product categories provided in the Fluorocarbons Emissions Reduction Law in order to promote switching to non-fluorocarbons and lower the global warming potential (GWP) with sufficient consideration for the actual

conditions of individual products.

(ii) Labeling of products containing fluorocarbons is improved to make labels easier to understand for users and consumers in order to increase recognition of the global warming effect of fluorocarbons and encourage consumers to select non-fluorocarbons and low-GWP products.

(iii) Measures beside the improvement of systems include technological development and measures to install and use the technologies to encourage product manufacturers and users, measures to promote the use of energy-efficient devices containing natural refrigerants, training people who install and maintain devices compatible with new alternative refrigerants, securing the quality of contractors, and measures to raise public awareness.

- Preventing Leakage of Fluorocarbons from the Use of Refrigeration and Air-Conditioning Equipment for Business Use

The leakage of fluorocarbons during the use of refrigeration and air-conditioning equipment for business use is prevented in cooperation with prefectural governments through compliance with the decision criteria for management that stipulates device inspection rules, use of systems to report and release calculated amount of leaked fluorocarbons, and compliance with proper filling procedures based on the Fluorocarbons Emissions Reduction Law.

Besides device users, contractors who maintain devices play important roles in preventing the leakage of fluorocarbons during the use of refrigeration and air-conditioning equipment. The contractors are encouraged to improve the technological levels for device maintenance and management to detect the leakage of refrigerants in the early phases, and secure and train workers who are knowledgeable in the management of refrigeration and air-conditioning equipment.

- Recovery and Proper Disposal of Fluorocarbons from Refrigeration and Air-Conditioning Equipment

Fluorocarbons are recovered from refrigeration air conditioners and properly disposed of based on the Fluorocarbons Emissions Reduction Law, the Act on Recycling etc. of End-of-Life Vehicles (2002 Act No. 87), and the Act on Recycling of Specified Kinds of Home Appliances (1998, Act No. 97).

Refrigeration and air-conditioning equipment for business use (except for automobile air conditioners) account for about 70% of HFC emissions from refrigeration and air-conditioning equipment. The rate of recovery from these devices will continuously be increased through cooperation with prefectural governments based on the Fluorocarbons Emissions Reduction Law.

- Promotion of Voluntary Initiatives in Industries

Measures that industries implement as their voluntary action plans to prevent the leakage of fluorocarbons are evaluated and verified. At the same time, business operators are assisted in emission reduction efforts by providing subsidies for installing and using devices that reduce emissions.

■ Use and Examination of Economic Approaches

Technological development of fluorocarbon-free and low-GWP products is supported, and support is provided for the introduction of such technologies.

The other economic approaches will be continued to examine as they both have benefits and challenges.

<Overall picture of policies>

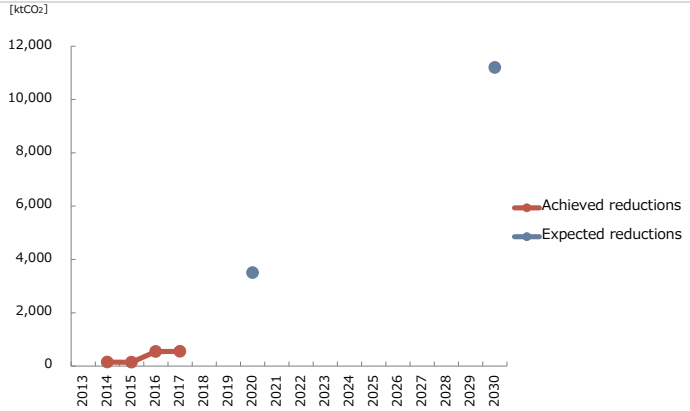
Instrument	Performance and Future Plans
Law and Standard	1. Act on Rational Use and Appropriate Management of Fluorocarbons (established in FY 2001 and revised in 2013): The Act stipulates the implementation of comprehensive measures for the entire life cycle of fluorocarbons. The Act for Securing etc. the Implementation of Recovery and Destruction of Fluorocarbons Contained in Specified Products was revised, and the Act on Rational Use and Appropriate Management of Fluorocarbons designed to implement comprehensive measures for the life cycle of fluorocarbons was established (enacted in 2015). [Upstream] ・ The release of the scope of use: The Government has been releasing the scope of future domestic use of fluorocarbons. Businesses that produce and import fluorocarbons have been creating plans under the premise of reducing the total amount of fluorocarbons based on the scope of use and have been submitting the plans to the Government. The Government has been releasing the plans and following up on efforts made by the businesses. The scope of use has been created for FY 2020 and FY 2025. ・ The use of a designated product system (currently designating seven categories): The interim report (August 29, 2014) for designated products under the Act on Rational Use and Proper Management of Fluorocarbons and selection criteria for designated product manufacturers stipulates that an examination committee etc. decide whether to revise the selection criteria and make the necessary revisions in case there is a technological development, change in domestic or international regulations, or other change in situations that may affect the selection criteria for manufacturers producing designated products as provided in Article 12, paragraph 1, of the Act on Rational Use and Appropriate Management of Fluorocarbons. The Industrial Structure Council in the Ministry of Economy, Trade and Industry is following up on activities of manufacturers every year and making the necessary revisions. [Midstream] ・ System to report and release the calculated amount of fluorocarbons leaked: Those who leak a considerable amount of fluorocarbons from industrial refrigerators or air conditioners under their management are required to calculate the amount of fluorocarbons leaked and report it to the Government. The Government then aggregates and releases the reported data. A working group consisting of intellectuals and experts has been installed to explore effective measures to prevent leakage during use based on the knowledge obtained by analyzing reported information every year. [Downstream] ・ Optimization of filling and obligation for recovery: Filling and recovery businesses are required to register with their prefectures. Also, filling and recovery businesses are required to report the amount of fluorocarbons filled and recovered in the previous year to their prefectures every year. The Government releases the data summarized based on the reports from prefectures every year. In addition, it will be prohibited to collect equipment that has not been confirmed to have been recovered of fluorocarbons. ・ Optimization of recycling and destruction: Recycling and destruction businesses must obtain permission from the Government. Recycling businesses must report the amount of fluorocarbons recycled, and destruction businesses must report

Instrument	Performance and Future Plans
	the amount of fluorocarbons destroyed to the competent minister every year. The Government releases the data summarized based on the reports every year.
Subsidy	1. Project to promote the use of energy conservation-type devices with natural refrigerants that use advanced technologies (FY 2014): Subsidizes some of the cost of purchasing/installing energy conservation type devices with natural refrigerants. 2. Project to promote the energy conservation of industrial refrigerators and air conditioners to build zero-fluorocarbon society (FY 2017): Subsidizes some of the cost of purchasing/installing energy conservation type devices with natural refrigerants. 3. Project to develop methods to evaluate next-generation refrigerants and refrigeration and air conditioning technologies that can achieve energy conservation and greenhouse effect reduction (subsidized enterprises): Applicable to the development of innovative new refrigerants that can realize both energy conservation and a reduction in the greenhouse effect and next-generation refrigerants. The subsidy is granted for some of the cost of developing technologies to improve the efficiency of refrigerators and air conditioners in fields where efficiency and applicable environment are limited due to refrigerant properties (e.g., high pressure and low critical point).
Technological development	Project to develop methods to evaluate next-generation refrigerant and refrigeration and air-conditioning technologies that can achieve energy conservation and greenhouse effect reduction (contracted enterprises): Develop the foundation of developing energy conservation type refrigerators and air conditioners that are compatible with new refrigerants by establishing risk evaluation methods for next-generation refrigerant candidates and by evaluating them using air conditioners and other devices under practical environment.
Dissemination and Awareness Raising	1. Project to promote the use of energy conservation type devices with natural refrigerants that use advanced technologies (FY 2014): Awareness-raising activities to promote the installation of energy conservation type devices with natural refrigerants. 2. Promotion of fluorocarbons reduction measures (FY 2011): Notification of relevant personnel such as businesses and prefectural offices.

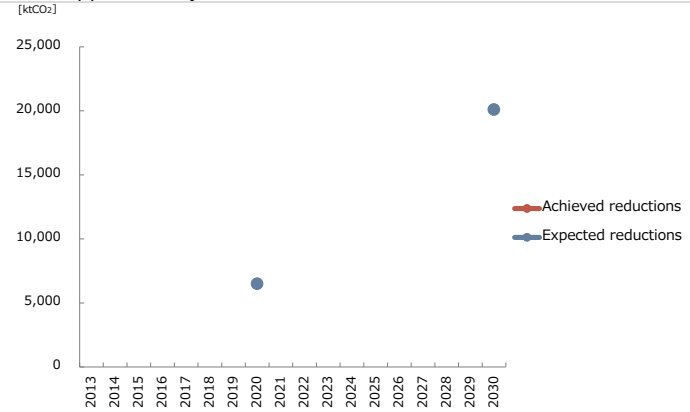
<Progress assessment of policies and measures>

(Promotion of Eliminating Fluorocarbons and Lowering the GWP of Products)

Progress in the emission reductions	C (Expected to be at the same level as the target level for FY 2030)
Supplement to the progress assessment and reasons	The Act on Rational Use and Appropriate Management of Fluorocarbons designates average GWP values as goals for individual products to achieve by specific years that are to be used as the yardstick for the production of designated products, although the values may be affected by external factors, such as changes in economic situations. Also, the Act provides non-binding obligations for manufacturers to reduce the environmental effects of fluorocarbons used in devices based on the yardstick. As of FY 2017, no target year has arrived in any of the product categories. Yet, designated products that use non-fluorocarbons and low-GWP refrigerants will be installed and increase in number as the target years arrive in the future. Therefore, steady progress is expected toward the goal in FY 2030.

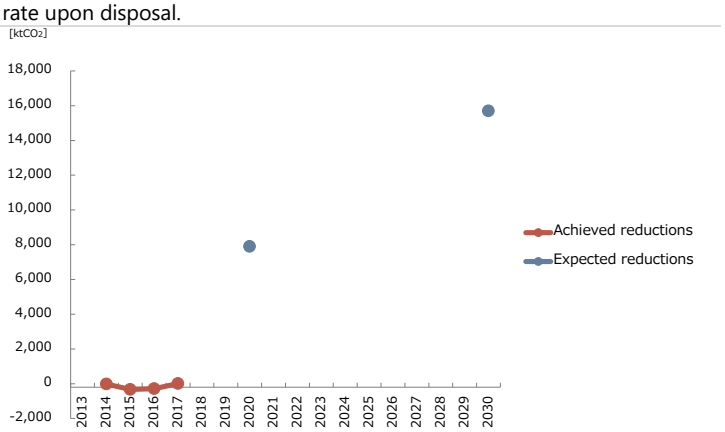
Emission reductions ($ktCO_2$)	

(Preventing Leakage of Fluorocarbons from the Use of Refrigeration and Air-Conditioning Equipment for Business Use)

Progress in the emission reductions	E (Other (Unavailable quantitative data))
Supplement to the progress assessment and reasons	The investigation of the leakage rate during use has been continuing since FY 2017. The actual data will be obtained upon completion of the investigation. The system to report and release calculated amounts of fluorocarbons leakage started in FY 2015. Businesses, where more than a certain amount of fluorocarbons has leaked, have submitted reports, and aggregated data were released. The amount of leakage in FY 2015 was 2.36 $MtCO_2$, and in FY 2016, it was 2.19 $MtCO_2$. The amount of leakage in FY 2017 was approximately 2.25 $MtCO_2$.
Emission reductions ($ktCO_2$)	

(Recovery and Proper Disposal of Fluorocarbons from Refrigeration and Air-Conditioning Equipment)

Progress in the emission reductions	D (Expected to fall below the target level for FY 2030)
Supplement to the progress assessment and reasons	The fluorocarbon recovery rate upon the disposal of industrial refrigerators and air conditioners has remained around 30% for more than a decade. It is far less than 50%, the expected rate in 2020. The amount of reduced emissions turned positive because the reduction has increased since the first year of the HFC recovery system and became higher than the BAU-based expectation. Yet, the amount of recovery upon disposal did not reach the BAU-based expectation. It is thus expected to be difficult to reach the expected amount in 2020 if the reduction speed remains as it is. Since September 2017, the joint meeting of the Fluorocarbons Countermeasures Working Group from the Industrial Structure Council and Fluorocarbons Countermeasures Subcommittee from the Central Environment Council started to follow up on fluorocarbon countermeasures,

	including measures to improve the recovery rate upon disposal. They are also investigating and analyzing factors in the low recovery rate and exploring measures to improve it. Necessary measures will be implemented based on the results to improve the recovery rate upon disposal.
Emission reductions ($ktCO_2$)	

(2) Greenhouse Gas Sink Policies and Measures

- Measures for Managing Forest Carbon Sinks

<Outline of policies and measures>

Measures, such as proper forest management and conservation designed to achieve the objectives regarding fulfillment of the multiple roles of forests, as well as the supply and use of forest products, are outlined in the Basic Plan for Forest and Forestry approved by the Cabinet in accordance with the Forest and Forestry Basic Act (1964, Act No. 161). These measures include activities under Article 3.3 of the Kyoto Protocol, namely afforestation and reforestation since 1990, and Article 3.4, namely forest management, such as proper forest management and conservation through thinning and designation of protection forests. Through the implementation of these measures, the targeted amounts of carbon sink by forests (about 38 $MtCO_2$ or more in FY 2020 and about 27.8 $MtCO_2$ in FY 2030) will be achieved. To this end, while collaborating with various entities, including local governments, forest owners, forestry and wood industries business operators, and citizens, the following measures, including cross-sectoral ones, will be comprehensively implemented. Besides, these measures addressing the promotion of activities under Articles 3.3 and 3.4 of the Kyoto Protocol contribute to promoting the conservation of forests and sustainable forest management, conservation of biodiversity, and the sustainable use of forest resources.

- Healthy Forest Management

A. Implementation of necessary thinning and the promotion of diversified forest practices aiming at multi-storied forests and/or longer rotations

B. Promotion of additional thinning through more efforts from the municipalities based on the Act on Special Measures concerning Advancement of Implementation of Forest Thinning (2008, Act No. 32)

C. Proper combination of different types of roads used for forestry operation, including forest roads and construction of road networks with due consideration for nature conservation

D. Promotion of the development of mixed conifer-broadleaf forests through thinning and introducing broad-leaved trees, depending on natural conditions

E. Promotion of reforestation after final cutting through lowering reforestation cost,

development, and securement of seeds and seedlings that grow well, as well as prevention of damage caused by wild animals

F. Ensuring reforestation through proper operation of logging and reforestation notification systems

G. Restocking of treeless lands within headwater forests in the back regions and restoration of degraded forests nearby human habitats

■ Promotion of the Proper Management and Conservation of Protection Forests

A. Proper conservation and management through regulations of the Protection Forest System, the planned designation of protection forests, and operation of the protected forest system, and promotion of conservation and restoration of natural vegetation in cooperation with NPOs

B. Planned promotion of forest conservation projects in areas vulnerable to mountain disasters and devastated forests in back regions

C. Prevention of pest and animal damage in forests and promotion of measures to prevent forest fires

D. Expansion of natural parks and nature conservation areas, and reinforcement of conservation management in these areas

■ Development of Efficient and Stable Forest Management

A. Identification of forest owners, clarification of boundaries, and integration of forestry operations

B. Gathering of information on forest owners in municipalities

C. Preparation of forest management plans and implementation of low cost and efficient practices based on the plans

D. Improvement of forest management with efficient operating systems based on the proper combination of the construction of road networks and the use of advanced forestry machinery

E. Promotion of efforts to train and secure people who will play leading roles in the forests and forestry sector

F. Promotion of entrusting forest operation and management to motivated forestry workers

■ Promotion of People's Participation in Forest Management

A. Promotion of the public relations activities for the People's Participation in Forest Management through nationwide greening events, such as the National Tree-Planting Festival

B. Promotion of afforestation programs by a variety of organizations, including the participation of private companies in growing forests, through the National Campaign for Beautiful Forest Development and other events

C. Improvement in the skills of forest volunteers and securing working conditions

D. Promotion of forest environmental education

E. Promotion of forest conservation, management, and the use of forest resources in cooperation with local residents, forest owners, and other stakeholders

F. Promotion of the Ecosystem Maintenance and Recovery Project to conserve the forest ecosystem and the Green Workers Project in national parks and reserves

G. Fostering of the awareness of citizens to recognize the rich environment as an important supporter of their lives

■ Promotion of the Use of Wood and Woody Biomass

Wood is a renewable resource and can store carbon. Encouraging the use of wood results in reducing the use of fossil fuels and CO_2 emissions. It also contributes to sustainable forest management. The following measures are thus implemented for the use of wood.

A. Promotion of wood use in housing

B. Promotion of wood use in public buildings, based on the Act for Promotion of Use of Wood in Public Buildings (2010, Act No. 36), and non-residential buildings

C. Research, development, and commercialization of new technologies for the use of forest products and new wood materials

D. Development of systems to ensure a stable log supply to respond to demand, through setting up of efficient processing and distribution facilities

E. Establishment of efficient and low-cost collection and transportation systems of woody biomass and promotion of the use of wood materials as energy and products

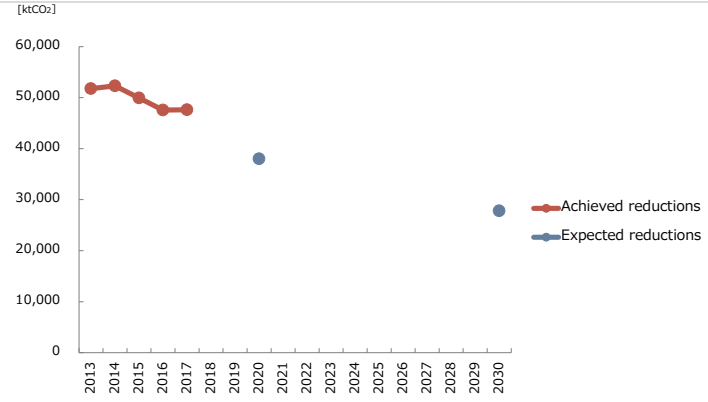
F. Promotion of initiatives to generate understandings on merits of wood to consumers and to expand the use of wood, such as the "Kizukai wood use campaign"

<Overall picture of the measure>

Instrument	Performance and Future Plans
Law and Standard	1. The Act on Special Measures Concerning the Promotion of Forest Thinning (2008 Act number 32): The Act stipulates the basic policies and measures to be established by the Minister of Agriculture, Forestry and Fisheries to promote forest thinning given the importance of conserving and enhancing the function of forests to remove carbon dioxide in Japan. The Act provided in 2008 to implement special measures for promoting forest thinning up until FY 2012 to achieve the forest removal target in the first commitment period of the Kyoto Protocol. The Act was amended in 2013, and the period to implement the measures was extended to FY 2020. 2. The Act for Promotion of Use of Wood in Public Building (2010, Act number 36): This Act stipulates that the national government takes the initiative in using wood in the public buildings they construct, and that local governments also make efforts to use wood in public buildings as in the national government. 3. The Forest Act (1951, Act number 249): The Act provides basic matters concerning forests, including forest planning and protection forests. The Forest Act was amended in April 2011 to prescribe proper forestry operations when forest owners are unknown and to establish a forest management planning system so that the public function of forests can be fully exhibited. The Act was again amended in May 2016 to mandate that forest owners report the condition of reforestation after harvesting and prescribe the establishment of a system for municipalities to organize forest owner information so

Instrument	Performance and Future Plans
Dissemination and Awareness Raising	that the public functions of forests can be maintained and enhanced through proper forestry operation. 4. The Forest Management Act (2018, Act number 35): The Act prescribes matters concerning forest management by municipalities in unmanaged forests to promote the optimization of forest management.
	1. Public campaigns to promote the development of beautiful forests: Promotion of the establishment of a recycle-oriented society with rich nature where proper forest development is promoted through the use of lumber, cultivation of energized people and regions to support forests, and the participation of businesses and NPOs in forest development under the support and cooperation of a wide range of citizens 2. To improve the recognition of the nationwide campaign, the intentions are explained through newspaper ads, TV and radio programs, and campaigns conducted in cooperation with businesses, as well as explanations to people participating in greening activities in the various regions. Businesses and NPOs are also encouraged to participate in public campaigns and forest development. Support is provided for the implementation of nationwide campaigns and the promotion organizations of private businesses by hosting national meetings to promote the development of beautiful forests where representatives of various industries participate to promote nationwide activities and widely provide information through Forest Supporter registration. 3. Wood use campaign: Promoting "Kizukai wood use campaign", as a public campaign, targeting general consumers to disseminate the meaning of wood use and to expand its uses.

<Progress assessment of policies and measures>

Progress of removals	C (Expected to be at the same level as the target level for FY 2030)
Supplement to the progress assessment and reasons	The measures evaluation index (area of forestry operation) remains below the target level for the following reasons: Forests with maintenance difficulties have been increasing due to problems such as unmotivated forest owners and unclear ownership and boundaries. Meanwhile, forest management is expected to be enhanced because of the efforts to reduce the cost of forest management and the introduction of the Forest Management System after FY 2019, and the measures evaluation index can reach the same level as the target level in FY 2030. Also, the amount of removals by forests in FY 2030 is expected to reach the same level as the target level.
Removals ($ktCO_2$)	

- Measures to Increase Carbon Sinks in Agricultural Soils

<Outline of policies and measures>

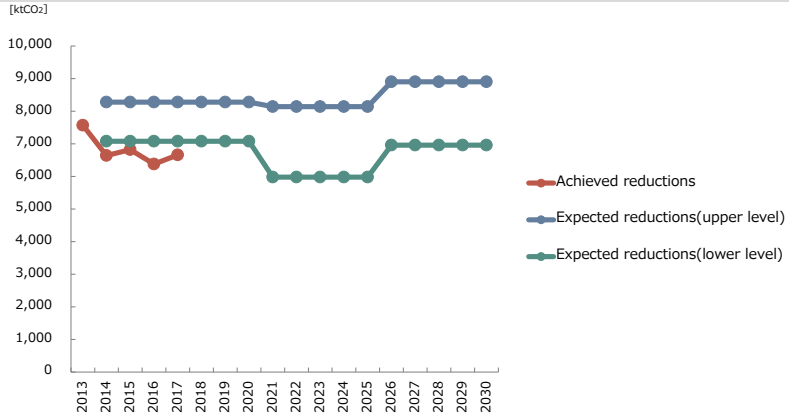
It is proven that the carbon storage in cropland and grassland soils in Japan can be increased by continuous use of organic matter, such as compost and green manure. Thus, the carbon stock in the soil of croplands and grasslands is increased by promoting soil development by

applying organic matter, such as compost and green manure. The activities contribute to the LULUCF activities under Article 3, Paragraph 4, of the Kyoto Protocol (cropland management and grazing land management).

<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	1. Act on Multi-Functionality of Agriculture (Act number 78, 2014) 2. The national government, in cooperation with prefectures and municipalities, intensively and effectively supports the activities to promote the fulfillment of multifunctional roles of agriculture. 3. Direct payments for environmentally friendly agriculture are provided as the project based on the Act on Multi-Functionality of Agriculture (from FY 2015).
Subsidy	Direct payments for environmentally friendly agriculture (from FY 2011): Direct payments to support activities that are effective in preventing global warming and/or conserving biodiversity in conjunction with reducing the use of synthetic fertilizers and pesticides by more than 50% from conventional farming practices in the region.
Dissemination and Awareness Raising	Dissemination of information on soil development by applying organic matter, such as compost, based on the Basic Policy on Agricultural Technology (revised in 2018).
Other	To gather the necessary data for the report to the UN on greenhouse gas emissions and removals from croplands and grasslands (Greenhouse Gas Inventory), investigate the amount of carbon storage in agricultural soils, and examine agricultural land management technologies to reduce greenhouse gas emissions.

<Progress assessment of policies and measures>

Progress of removals	C (Expected to reach at the same level as the target level in FY 2030)
Supplement to the progress assessment and reasons	The measures evaluation index (amount of carbon storage in agricultural soils) in FY 2017 increased by about 270 $ktCO_2$ compared to FY 2016. After FY 2013, the amount of carbon storage in agricultural soils has remained at the same level, although it has fluctuated with changes in weather conditions, including temperature. The amount of storage is expected to reach the same level as the target level in FY 2030.
Removals ($ktCO_2$)	

- Promotion of Urban Greening

Urban greening is the closest carbon sink improvement measure in the daily lives of the public, including revegetation as LULUCF activities under Article 3, Paragraph 4 of the Kyoto Protocol. The promotion of urban greening is highly effective in raising public awareness of global warming mitigation rather than the actual effects of increasing carbon sinks.

Therefore, the actions will be continuously promoted, such as urban park maintenance and greening along roads, rivers, sand control facilities, bays, sewage treatment facilities, public

housing, and government buildings, along with the increase in new green spaces on the rooftops of buildings. These initiatives are conducted based on general plans to maintain and increase green spaces established by the national government and local governments, such as the Outline of Green Policies and the Basic Plan of Greening established by municipalities.

The meaning and effects of urban greening are widely publicized for all types of the public as a part of these initiatives. Support will also be provided to create new green spaces in cities using various methods and by various organizations through urban greening projects conducted with various participants, including the public, business operators, and NPOs, as well as the use of three-dimensional urban park systems.

Improvement in the report and verification system of removals by urban greening will also be strategically carried out.

Cross-sectoral measures

(1) Cross-Sectoral Measures to Achieve Targets

1) Promotion of J-Credit Scheme

Promotion of J-Credit Scheme

<Outline of policies and measures>

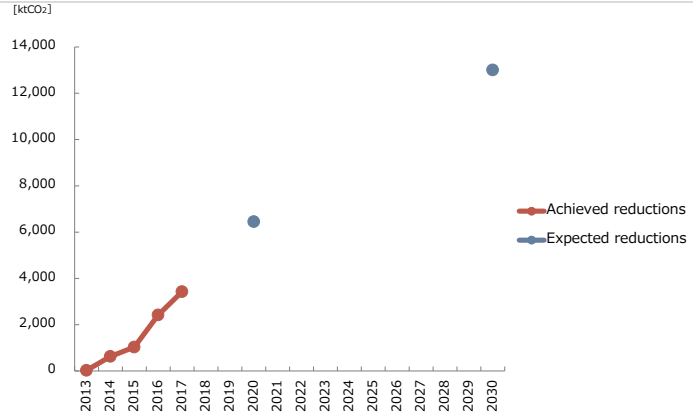
Active promotions are needed to reduce emissions through the introduction of energy conservation facilities and the use of renewable energy by various parties in Japan, as well as to increase carbon sinks through appropriate forest management. Therefore, the J-Credit Scheme will be steadily implemented to certify credits that can be used to achieve the Industry's Action Plans for a Low-Carbon Society and carbon offsets.

<Overall picture of policies>

Instrument	Performance and Future Plans
Law and Standard	Article 3, Paragraph 2, of the Act on the Promotion of Global Warming Countermeasures
Dissemination and Awareness Raising	1. Raise the awareness and recognition of the J-credit system through cooperation with the private sector. 2. The spread and use of the J-credit system were increased by properly operating the J-credit system. In FY 2018, 52 new projects were registered, and credit for 280 tCO_2 was issued (as of the end of October 2018). 3. Credits were sold through bidding to increase the demand for J-credits. 4. Future plans to raise awareness of carbon offsets to increase demand for J-credits will include a carbon offset campaign to be implemented on the Mountain Day holiday and using travel, market surveys, and dialog sessions to check the attitudes of consumers and businesses toward carbon offset products and services to advocate carbon offset plans that will create businesses.
Other	Operation of J-credit system (from FY 2013) Support to promote the use of J-credit

<Progress assessment of policies and measures>

Progress in the emission reductions	C (Expected to be at the same level as the target level for FY 2030)

Supplement to the progress assessment and reasons	The cumulative amount of the certified J-credit system, which is the measures evaluation index, and the reduced emissions are 3.43 Mt CO_2, which has been increasing greatly (increase by 1.01 Mt CO_2). The "C" is given as the evaluation for FY 2017 because progress is expected to reach the same level as the FY 2020 target (6.45 Mt CO_2) and the FY 2030 target (13 Mt CO_2) thanks to currently registered projects and ones to be conducted in the future by continuously implementing relevant activities to stimulate demand for the credits.
Emission reductions (ktCO2)	

2) Development of Public Campaigns (Discussed later p.124)

■ Promotion of Public Campaigns (Discussed later p.124)

3) Formulation of Low-Carbon Urban/Regional Structures and Socioeconomic Systems

■ Formulation of Low-Carbon Urban/Regional Structures and Transportation Systems

Urban/regional structures and transportation systems will continue to influence CO_2 emissions in the mid- and long-term periods through increases/decreases in traffic and commercial floor areas. Therefore, low-carbon urban/regional development needs to be promoted through compact city planning, rebuilding of public transportation networks, and efficiency improvement of the urban energy system in order to transform from an existing diffusion city system.

Support is thus provided to encourage the establishment of urban functions based on appropriate location plans and low-carbon city development based on the Low-Carbon City Act. Measures and enterprises are also promoted based on integrated urban/regional transportation strategies and shared use of energy at the district level. Green areas that remove greenhouse gases are also preserved and expanded. Local government action plans are implemented while coordinating with urban planning and agricultural development area planning and compatibility with low carbon urban development plans. Other promotional measures are also considered to increase the use of public transportations linked to land use measures, as well as the optimization of retail floor areas and the promotion of the area-wide use of natural resources. The decarbonization of housing, buildings, and infrastructures is also promoted.

Advanced low-carbon urban/regional developments are also accelerated for projects to build the *Future City* and the *Eco-Model City*. The experience and know-how gained through these projects are applied to other cases throughout Japan.

- Development of Innovative Energy Management Systems by Effectively Using Distributed Energy Resources on the Electricity Consumer Side

Demand response is expected to provide energy resources to balance the energy supply and demand in the energy system through the electricity consumers save. In order for electric power utilities to purchase the amount of electricity that consumers saved upon request from them, which are called "negawatts," the negawatt trading market had been inaugurated in April 2017.

In addition to this, the national demonstration project has developed a regulation system using IoT technologies, as if they form one power plant, which collectively manages and controls electricity utilization in distributed energy resources on the consumer side, such as solar photovoltaic systems, storage batteries, and demand responses. The project will create a new type of energy business (energy resource aggregation business) so as to accelerate the introduction of renewable energy and promote additional energy conservation.

- Expansion of Holistic and Efficient Use of Energy (Reprinted p. 77)

- Development of Low-Carbon Cities Through the Improvement of the Thermal Environment by Preventing Heat Island Effects (Reprinted p. 77)

(2) Other Relevant Cross-Section Measures

1) Realization of a Hydrogen Society

Hydrogen is associated with many excellent features, such as being convenient and energy efficient, no emission of greenhouse gases during the consumption phase, useful in an emergency, and produced from various energies, including renewable energy. Hydrogen energy will be the trump card for energy security and measures to address global warming.

Many entities have conducted research, development, and experiments in the elemental technologies to expand the use of hydrogen. Still, there are many challenges in regard to the technology, cost, system, and infrastructure to realize the so-called hydrogen society in which people use hydrogen in their daily lives and industrial activities. To integrally overcome these challenges, Japan promotes various technological developments and cost reduction efforts while strategically creating systems and infrastructures to start the social applications of technologies starting with the feasible ones.

Necessary technological developments will specifically be conducted in regard to Ene-Farm and fuel cell vehicles (FCVs) to lower costs and improve performance. In addition, hydrogen stations, the necessary infrastructure for the diffusion of FCVs, will be installed while expecting the use of hydrogen derived from renewable energy in the future. Technological developments are also conducted to lower the costs related to hydrogen stations. Relevant regulations will be streamlined, if necessary, in preparation for the improvement of safety and the reliability of relevant technologies.

Technological developments and experiments are also conducted in regard to the other uses of hydrogen and fuel cells, such as fuel cells for business use and industrial power generation.

Technological developments will be conducted to realize low cost and stable hydrogen production and transportation so that the demand for hydrogen will be further expanded in

the future. Development and experiments will also cover hydrogen production, transport, and storage technologies with the lowest possible CO_2 emissions, such as the production of hydrogen from renewable energy and the conversion of unused energy into hydrogen.

2) Initiatives Based on the Guidelines for Controlling Greenhouse Gas Emissions

In regard to the emission reduction guidelines for controlling greenhouse gas emissions based on the Act on the Promotion of Global Warming Countermeasures, menus of measures will be expanded for selecting energies with lower carbon footprints based on technological trends, such as BAT. Guidelines will be established and released as soon as possible for areas without guidelines. Business operators are encouraged to voluntarily and actively practice environmentally friendly business activities by providing assistance and distributing information to drive them to implement the measures stipulated in the applicable guidelines.

3) GHG Emissions Accounting, Reporting, and Disclosure Program

Greenhouse gas emitters compute the amount of greenhouse gases they emit. The foundation of voluntary initiatives for global warming countermeasures is thereby established, and the amounts of emissions are made visible to the public. In addition, emitters that exceed a given threshold of emissions are to report their emission quantities to the government on an annual basis, which are collected and disclosed to the public in order to increase the incentive and motivation for the public and business operators to engage in voluntary efforts. The implementation of these initiatives will be continued. At the same time, business operators are expected to actively reduce greenhouse gas emissions by properly reevaluating their initiatives based on IPCC Guidelines, as well as through accurate reports, prompt collection, and disclosure of emission information.

4) Promotion of Environmental Considerations in Business Initiatives

Japan properly includes the perspective of committing to environmental friendliness in economic activities and promotes investments and technological developments in business activities to reduce greenhouse gas emissions.

Specifically, Japan develops a foundation where businesses engaging in environmentally friendly practices can enjoy benefits through the following series of actions: (i) The value of the environment is recognized in products, services, and the financial market, and business operators adopt attitudes to pursue environmental friendliness. (ii) Suppliers engage in environmentally friendly business activities while distributing information to improve their understanding of customers. (iii) Consumers who receive accurate information come to recognize the value of environmentally friendly businesses' products, and services and select them as a consequence.

Therefore, Japan encourages business operators to implement environmentally conscious business activities on a voluntary and active basis by formulating and publishing the Guidelines. By releasing stakeholder environmental reports in accordance with the Act Concerning the Promotion of Business Activities with Environmental Consideration by Specified Corporations etc. by Facilitating Access to Environmental Information and Other Measures (Law No. 77, 2004), Japan encourages the use of environmental information by stakeholders and by the general public and provides the conditions for business activities with environmental

consideration to be highly valued by society and by the markets. To realize such conditions, Japan develops the foundation for identifying and managing the amount of greenhouse gas emissions throughout the entire supply chain, supports the development and implementation of corporate's target consistent with the Paris 2-degree target (Science-Based Target, SBT), promulgates and encourages the use of the idea of the carbon footprint, develops the foundation to release information using ICT, and improves the comparability and reliability of environmental information.

Japan also diffuses the use of environmental management systems equipped with the PDCA cycle, including ISO 14001 and Eco-Action 21 designed for small and medium-sized businesses to improve the effectiveness of environmental business practices. At the same time, Japan promotes even more environmentally friendly business practices by promoting employee education in companies.

5) Joint Crediting Mechanism (JCM)

Implementing of emission reductions or removals through the diffusion of advanced low carbon technologies can contribute to mutual low carbon development of both the recipient countries and Japan.

Thus, Japan establishes and implements the JCM in order to both appropriately evaluate contributions from Japan to GHG emission reductions or removals in a quantitative manner achieved through the diffusion of low carbon technologies, products, systems, services, and infrastructure, as well as implementation of mitigation actions in developing countries, and to use them to achieve Japan's emission reduction target. Apart from contributions achieved through private sector-based projects, accumulated emission reductions or removals by FY 2030 through governmental JCM programs to be undertaken within the government's annual budget are estimated to be ranging from 50 to 100 $MtCO_2$. The JCM is not included as a basis for the bottom-up calculation of Japan's emission reduction target, but the amount of emission reductions and removals acquired by Japan under the JCM will be appropriately counted as Japan's reduction.

Japan will, for the purpose of further implementation of actual emission reductions or removal projects, support the further formulation of projects through measures, including appropriate operation of the JCM. These include the development of measurements, reporting, and verification methodologies; formation of projects and feasibility studies through the utilization of city-to-city cooperation and the JCM Special Financing Scheme (JSF) in collaboration with the Japan Bank for International Cooperation (JBIC) and Nippon Export and Investment Insurance (NEXI); appropriate operation of internal institutional arrangements in order to promote utilization of the JCM; and collaboration with relevant organizations, such as the New Energy and Industrial Technology Development Organization (NEDO), Japan International Cooperation Agency (JICA), and Asian Development Bank (ADB).

6) Measures for Greening Tax Scheme and Effective Utilization of Tax for Climate Change Mitigation

Strengthening the "Green" aspect of environmentally related taxes proposed in the plan is an important policy for global warming countermeasures, including promoting a low-carbon society. The Government advances with the global warming countermeasures by carrying out

comprehensive and systemic research and analysis of the environmental effectiveness of environmentally related taxes while investigating the policies and measures in other countries.

Utilizing revenues from the Tax for Climate Change Mitigation, which was introduced in October 2012, the government of Japan will steadily implement measures to curb energy-oriented CO_2, including the promotion of energy savings, diffusion of renewable energy, and utilization of cleaner and more efficient fossil fuels.

7) Green Finance

The proper supply of private finance for necessary greenhouse gas emission reduction measures is essential to drastically cut greenhouse gas emissions and create a low-carbon society. In addition, an increasing number of institutional investors around the world are adopting the environmental friendliness of companies as one of their decision-making criteria. Therefore, Japan uses financial measures, or greening finance, to promote initiatives to develop the green economy by providing proper incentives for being environmentally friendly.

Specifically, Japan provides financial support to mobilize private funds into low-carbon projects. More specifically, it provides equity financing for low-carbon projects where private financial resources are not sufficient, encourages the leasing of low-carbon equipment to reduce the burden of up-front costs, and spurs issuance of and investment in Green Bonds in Japan.

Japan also promotes environmentally friendly actions to reduce greenhouse gas emissions, such as loans based on environmental responsibility ratings that incentivize the environmentally friendly actions of investment candidate companies by evaluating corporate activities based on their financial aspects and environmental aspects to reflect the findings in investment activities; ESG investment that takes into account environmental contributions, social contributions, and governance of companies; and releases of the policies on ESG activities of institutional investors.

8) Domestic Emissions Trading Scheme

Japan considers an emission trading scheme carefully, taking into consideration the burden on the domestic industries 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.

■ Fundamental measures

(1) Development of National System for Estimating Greenhouse Gas Emissions and Removals Based on the United Nations Framework Convention on Climate Change (UNFCCC)

Government ministries and agencies, mainly the Ministry of the Environment, have been closely working for the development of a national system to aggregate, estimate, and disclose statistics concerning emissions and removals; quality assurance and quality control of data; and responding to reviews implemented by expert review teams dispatched on the basis of the Kyoto Protocol in order to estimate greenhouse gas emissions and removals based on the UNFCCC and the Kyoto Protocol and submit data to the Secretariat of the UNFCCC. Japan

continues to improve and elaborate estimation methods and the process of emission factors and activity data to estimate emissions and removals taking into account global trends in reinforcing MRV.

More accurate identification of emissions by sectors and refined methods to evaluate the implementation of measures by individual entities is needed. Thus, Japan promotes investigations and research concerning the development of statistics to measure activity data, the estimation of energy consumption intensity and CO_2 emission intensity, and methods to monitor greenhouse gas emissions. Japan also additionally refines methods to estimate greenhouse gas emissions and removals. Specifically, Japan develops the necessary statistics for estimating detailed CO_2 emissions in the residential sector.

Japan also responds to the submission of biennial reports required based on decisions at COP 17, as well as international assessment and reviews.

Meanwhile, Japan is estimating emissions and removals when measuring, monitoring, and reporting removals (or emissions) by sinks under the 2006 IPCC Guidelines and the 2013 Revised Supplementary Methods and Good Practice Guidance arising from the Kyoto Protocol. Necessary data for MRV concerning the activity data and changes in land uses will be gathered to improve data precision. Research and study projects on greenhouse gas emission and removal mechanisms in forests are also conducted.

(2) Technology Development for Global Warming Countermeasures and Application of These Technologies in Society

Research, development and demonstration of the 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 reducing costs and thereby widely diffusing them throughout society. Therefore, Japan promotes the research, development and demonstration in order to realize lower costs, higher efficiency, and longer life of renewable energy and energy conservation from the early phases and assists in the social application of these technologies based on the Environmental Energy Technology Innovation Plan (September 13, 2013, Council for Science and Technology Policy) for solar power, wind power, geothermal power, hydropower, biomass energy, ocean energy, the use of other renewable heat energy, and energy conservation technologies.

(3) Strengthening Promotion, Observation, and Monitoring System of Climate Change

The accumulation of the latest scientific information from research projects inside and outside of Japan is necessary to promote global warming countermeasures in the future from the long-term and global perspectives. The research, observation, and monitoring of climate change are extremely important initiatives that build on the foundation of such knowledge. Japan conducts global warming research based on past research initiatives and through international cooperation to clarify the mechanisms of climate change, identify current conditions of global warming, forecast global warming, promote the necessary technological developments, implement measures to reduce greenhouse gas emissions and adapt to global warming, and assess the effects of global warming on the environment, society, and the economy.

Initiatives by public organizations

Initiative of the National Government

The national government takes the initiative in purchasing and using building construction and management, financial services, and other administration and projects based on the national government action plan established under the Act on the Promotion of Global Warming Countermeasures and ministerial action plans established based on the national government action plan.

Specifically, the national government implements the following:

- Improvement of operations based on results of energy conservation diagnosis and the development of cost-effective and rational infrastructures
- Visualization of energy consumption and thorough energy management (e.g., the introduction of BEMS)
- Taking the initiative in the introduction of LED lamps when replacing currently installed lighting devices
- Taking the initiative in the introduction and use of energy-efficient devices
- Establishment of work systems to reduce CO_2 emissions such as the reduction of overtime work
- Carbon reductions in using energies
- Taking the initiative in the introduction of next-generation vehicles
- Aiming to realize ZEBs in buildings
- Using recycled products such as recycled paper and lumber
- Active utilization of bicycles in daily communication work

The national government action plan is designed to firmly implement measures specified in the Plan. The Plan targets a reduction of 40% in the total amount of greenhouse gases directly and indirectly emitted from the administration and projects of the national government by FY 2030 from the level of FY 2013. An interim target is to cut the emissions from the entire government by 10% by FY 2020.

The Central Environment Council evaluates and verifies the progress of the national government action plan. The executive meeting of the Global Warming Prevention Headquarters then inspects the progress every year and releases the outcome of the inspection to the public. To ensure transparency and the diffusion of the effects of the initiatives, the inspection outcomes are released along with evaluations of the indexes specified in the national government action plan, such as the total emission of greenhouse gases and the progress of individual categories in comparison to target values and past data, in addition to cross-section comparative evaluations of the planned actions and the progress of individual actions.

The national government also signs contracts for reducing greenhouse gas emissions from their undertakings mainly in six sectors, including electricity, automobiles, ships, ESCO, construction, and industrial waste, based on the Act on the Promotion of Contracts of the State and Other Entities, Which Show Consideration for Reduction of Emissions of Greenhouse Gases, etc. (2007, Act No. 56, hereinafter referred to as "the Environmental Friendliness Contract Act") and basic policies specified in the Act. The national government thereby ensures the

achievement of targets specified in the national government action plan and realizes additional reductions.

In regard to the national government buildings, the national government continues to promote the visualization of energy consumption and proper energy operation and management, including environmental load reduction and construction of government buildings in a way to protect the nearby environment (green government buildings) along with the use of life cycle energy management (LCEM) for air-conditioning devices. In order to spur demand for products that contribute to greenhouse gas emission reduction and other eco-friendly goods and services, the national government takes the initiative in procuring such goods and services based on the Act on Green Purchasing. Furthermore, the national government promotes wood use in public buildings based on the Act for the Promotion of the Use of Wood in Public Buildings.

- Actions Led by Local Governments and Promotions by the National Government

Local governments establish and implement the Local Government Action Plan, Administration, and Projects in regard to their own administration and projects based on the Plan for Global Warming Countermeasures. They are expected to take the initiative in becoming role models for business operators and residents in their regions.

Local government agencies are to establish and use so-called PDCA systems with responsible participation of the bureaus assigned to individual undertakings targeting all administration and projects in principle. They thereby engage in an effective and lasting reduction of greenhouse gases.

Upon the establishment of the PDCA system, the local governments pay special attention to the following points while referring to manuals for establishing local government action plans that the national government has prepared.

Additionally, the national government promotes wood use in public buildings, many of which are not currently built with wood based on the Act for the Promotion of the Use of Wood in Public Buildings.

- Promotion of the Initiatives of Public Organizations Besides the National Government and Local Governments

The national government and local governments provide information concerning effective global warming mitigation measures to public organizations, such as independent administrative institutions. The public organizations thereby promote the establishment of action plans to reduce greenhouse gas emissions from their administration and projects in accordance with the national government action plan and local government action plans. They promote the initiative in taking action based on their action plans. The national government regularly grasps the state of its initiatives whenever possible.

Public organizations, such as independent administrative institutions, special corporations, and national university corporations, use environmental friendliness contracts to reduce greenhouse gas emissions.

Development of public campaigns

Promotion of Public Campaigns

The government provides clear and useful information to the public associating their generation and lifestyles with the critical conditions of global warming and its effects on society using reliable domestic and international information based on the latest scientific knowledge presented in the IPCC Assessment Reports, Climate Change Adaptation Plans, and other documents to reform consciousness and instill crisis awareness against global warming on the public.

Specifically, information is continuously distributed through various media or by word-of-mouth about future effects that serious, extended, and irreversible effects will occur to people and to the ecosystem in the future if global warming mitigation initiatives are not strengthened. Such information is expected to improve the understanding of the problem of climate change and drive people to act voluntarily to mitigate global warming.

Also, relevant government ministries and agencies work as a team and cooperate with the industry, labor circles, local governments, NPOs, and other entities to encourage the public to act for the mitigation of global warming, foster momentum in understanding and cooperation towards global warming countermeasures, and boost consumer behaviors. Through these initiatives, government ministries and agencies promote the public campaign named Cool Choice that is intended to encourage the public to choose all possible smart choices to contribute to global warming prevention, such as replacement of products, services, and lifestyles that are energy conservative and low carbon. The public is encouraged to actively and voluntarily change their behaviors. These will result in the development of markets for energy-efficient, low-carbon products and will change their lifestyles toward ones appropriate for suitable low-carbon social systems and innovations in lifestyles.

Specifically, relevant government ministries and agencies work together and implement the public campaign Cool Choice with the support of private organizations associated with energy consumption in various categories, such as consumer electronics, housing and buildings, automobiles, energy services, and transportation and traffic services. Mass media, such as television, newspapers, and the Internet, are actively used to distribute proper information through various means to strongly affect the awareness of the public. The public is thus steered toward voluntary efforts to mitigate global warming and make active choices.

The government recruits and trains communicators who are close to the public to transmit information about global warming in scenes close to the public to motivate them.

Promotion of Environmental Education

Providing knowledge alone is not enough to drive people to take action to solve the problem of global warming. Specialized viewpoints of environmental education become important for learners to gain a scientific understanding of the mechanism of global warming and make them think and come up with specific solutions, including what they and their regions can do.

Environmental education is already being provided in schools and other educational facilities so that the public can deepen their understanding of environmental conservation through all types of opportunities, depending on their growth stages from childhood. In addition to that, Regional Environmental Partnership Offices and other organizations are utilized to more effectively provide environmental education in schools, as well as workplaces, households, and

all scenes of regions to support the training of instructors who teach the problem of global warming and develop educational programs.

Table 3-2 Progress in the achievement of the quantified economy-wide emission reduction target: Information on mitigation actions and their effects (CTF Table 3)

Name of mitigation action	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief Description	Start year of implementation	Implementing entity of entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)						
									2013	2014	2015	2016	2017	2020	2030
Industrial Sector/Commercial and other Sector															
Steady implementation of Industry's action plans for a low-carbon society and evaluation and verification of progress	Energy	CO_2	Steady implementation of Industry's action plans for a low-carbon society and evaluation and verification of progress	Voluntary Agreement	Implemented	Individual industries set reduction targets and work to reduce the emission of greenhouse gases through the emission reduction measures by the improvement of energy efficiency, development and spread of low-carbon products, and the transfer of technologies for international contributions.	Since 1997 (Depends on a group)	METI	-	-	-	-	-	-	-
Industry Sector															
Promotion of introduction of highly energy-efficient equipment and devices (cross industrial)	Energy	CO_2	Introduction of highly energy-efficient air conditioners	Budget / Subsidy, Financing	Implemented	Promote the introduction and use of energy-efficient facilities and devices across industries. Try to spread the use of these devices by achieving targets for top-runner standards and providing support for their Introduction and use.	2008	METI	46	93	147	205	260	480	890
			Introduction of industrial heat pump （Heating and drying)	Budget / Subsidy, Financing	Implemented		2008	METI	2	19	36	51	90	150	1,350
			Introduction of industrial lighting devices	Budget / Subsidy, Financing	Implemented		2008	METI	670	1,259	1,881	2,552	3,252	3,490	4,300
			Introduction of low-carbon industrial furnaces	Budget / Subsidy, Financing	Implemented		2008	METI	2,650	4,594	6,329	9,710	12,744	22,810	30,930
			Introduction of industrial motors	Budget / Subsidy, Financing	Implemented		2008	METI	5	29	228	495	594	3,760	6,610
			Introduction of highly energy-efficient boilers	Budget / Subsidy, Financing	Implemented		2008	METI	292	618	934	1,277	1,534	2,306	4,679
			Introduction of cogeneration systems	Budget / Subsidy, Financing	Implemented		2008	METI	410	630	970	1,273	1,490	2,940	10,200
Promotion of introduction of highly energy-efficient equipment and devices (Iron and steel industry)	Energy	CO_2	Energy efficiency improvements of power demand facilities	Budget / Subsidy, Financing, Awareness rising	Implemented	Update and replace electricity-consuming facilities in ironworks with more energy-efficient facilities (e.g. replacement of oxygen plants with ones with higher efficiency, changing millmotor to AC systems, reduction of the power of air blowers and fan pumps, introduction of energy efficient lighting devices, and updating motors and transformers to models with higher efficiency).	2008	METI	390	320	-180	290	130	800	650
			Expanding the chemical recycling of waste plastics at ironworks	Budget / Subsidy, Financing, Awareness rising	Implemented	Reduce the use of coal by effectively using the waste plastics collected on the basis of the Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging (Act #112, 1995) by decomposing them in coke ovens.	2008	METI	-70	110	70	110	180	2,120	2,120
			Introduction of next generation coke production technology	Budget / Subsidy, Financing, Awareness rising	Implemented	Reduce energy consumption from coke production by installing a pretreatment process for coal in coke production processes.	2008	METI	170	170	170	170	170	170	1,300
			Improvement of power generation efficiency	Budget / Subsidy, Financing, Awareness rising	Implemented	Update power generating systems for private power generators and joint thermal power plants to more efficient facilities.	2008	METI	430	480	740	890	960	840	1,100
			Enhancement of energy-efficient equipment	Budget / Subsidy, Financing, Awareness rising	Implemented	Increase systems to use waste heat, such as the top pressure recovery turbine (TRT) and Coke Dry Quenching(CDQ) and strengthen energy-conservation facilities.	2008	METI	20	50	90	50	70	990	1,220
			Introduction of innovative steel processing (ferrocoke)	Budget / Subsidy, Financing, Awareness rising	Implemented	Introduce innovative iron-making processes with using innovative coke alternative (ferrocoke) .	2013	METI	0	0	0	0	0	-	820
			Introduction of environmentally friendly steel processing	Budget / Subsidy, Financing, Awareness rising	Implemented	Introduce innovative iron-making processes with technologies to reduce CO2 emissions from blast furnace and CO2 capture.	2008	METI	0	0	0	0	0	-	110

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									2013	2014	2015	2016	2017	2020	2030
Promotion of introduction of highly energy-efficient equipment and devices (Chemical industry)	Energy,Waste Management/ Waste	CO_2	Introduction of energy-efficient processing technology for petrochemical industry	Budget / Subsidy, Financing	Implemented	Promote the use of Best Practice Technologies (BPT) that the International Energy Agency (IEA) organizes as the advanced technology used in commercial scale in the field of petrochemical and caustic soda. Reduce energy use and improve energy efficiency through exhaust energy recovery and rationalization of processes. Promote the development and introduction of new and innovative energy conservation technologies. Establish energy-efficient material production technology with high production efficiency using botanical functions to reduce CO_2 emissions from material production processes. Develop technologies to directly use recycled plastic flakes to reduce the thermal processes for producing pellet materials.	2008	METI			72	82	112	192	192
			Introduction of energy-efficient processing technology for other chemical products	Budget / Subsidy, Financing	Implemented		2008	METI			251	281	311	851	1,612
			Introduction of energy-efficient distillation processing technology by membrane	Budget / Subsidy, Financing	Implemented		2009	METI		0	0	0	0	5.7	335
			Introduction of CO2 using technology for material	Budget / Subsidy, Financing	Implemented		2013	METI		0	0	0	0	-	800
			Introduction of chemical manufacturing technology by inedible plant-derived raw material	Budget / Subsidy, Financing	Implemented		2013	METI		0	0	0	0	-	136
			Introduction of waste water treatment technology with electric power generation by microbial catalyst	Budget / Subsidy, Financing	Implemented		2013	METI		0	0	0	0	-	55
			Introduction of enclosed plant factory	Budget / Subsidy, Financing	Implemented		2011	METI		0	0	0	0	-	215
			Utilization of recycled plastic flakes	Budget / Subsidy, Financing	Implemented		2014	METI	0	0	0	0	0	11	59
Promotion of introduction of highly energy-efficient equipment and devices (Ceramic, stone and clay manufacturing industry)	Energy	CO_2	Existing energy-efficient technology	Budget / Subsidy, Financing	Implemented	Improve the energy efficiency of the cement production processes by promoting the introduction and use of facilities to effectively use thermal energy and electricity.	2008	METI	5	10	19	22	24	26	57
			Waste utilization technology as alternate of heat energy	Budget / Subsidy, Financing	Implemented	Promote the use of waste as an alternative to thermal energy to improve the energy efficiency of the cement production process.	2008	METI	-81	-59	121	504	140	-	35
			Relevant technology of low-temperature calcination in cement production process	Budget / Subsidy, Financing	Implemented	Improve the energy efficiency of cement production processes through the practical application of the cutting-edge technologies while maintaining the same level of quality as conventional products.	2010	METI	0	0	0	0	0	16	408
			Glass fusing processing technology	Budget / Subsidy, Financing	Implemented	Improve the energy efficiency of glass production processes through the practical application of the cutting-edge technologies while maintaining the same level of quality as conventional products.	2008	METI	0	0	0	0	0	26	134
Promotion of introduction of highly energy-efficient equipment and devices (Pulp, paper, and paper products industry)	Energy	CO_2	Introduction of highly energy-efficient manufacturing technology for de-inked pulp	Budget / Subsidy, Financing	Implemented	The installation of pulpers that allow more efficient pulping of recovered paper than existing ones in deinked pulp manufacturing process will be supported in order to reduce enegy consumption.	2008	METI	4	15	25	25	28	100	100
			Introduction of black liquor recovery boilers that operate with higher temperatures and higher pressures	Budget / Subsidy, Financing	Implemented	At the renewal timing of recovery boilers used to generate steam by incinerating concentrated black liquor (pulp waste liquor), the installation of the ones with more elevated features in temperature ,pressure and energy efficiency will be supported.	2008	METI	0	0	0	0	0	110	160
Promotion of introduction of highly energy-efficient equipment and devices (Construction and construction and fields that use special motor vehicles)	Energy	CO_2	Promotion of introduction of highly energy-efficient equipment and devices (Construction sector)	Budget / Subsidy, Financing, Other	Implemented	Certify fuel-efficient construction machinery to make it easier for contractors to select energy efficient construction machinery for construction projects. Also support the Introduction and use of such machinery.	2010	METI	367	411	466	43	59	130	440
Promotion of introduction of highly energy-efficient equipment and devices (Greenhouse horticulture, agricultural machinery, and fishery sector)	Energy	CO_2	Introduction of energy-efficient equipment and devices in greenhouse horticulture	Budget / Subsidy, Awareness Raising	Implemented	Install and use energy efficient heating facilities for greenhouse horticulture to reduce the consumption of fuel oil and CO_2 emissions from the combustion of fuel oil (mainly A heavy oil) in heating facilities.	2007	MAFF		130	230	320	410	590	1,240
			Introduction of energy-efficient agricultural machinery	Budget / Subsidy, Awareness Raising	Implemented	Reduce the consumption of fuel oil in agricultural machinery.	2007	MAFF		0	0	0		0.5	1.3
			Switch to energy-efficient fishing vessels	Budget / Subsidy, Awareness Raising, Technology Development	Implemented	Switch to energy efficient fishing vessels.	2007	MAFF		10	21	31	41	67	162
Implementation of thorough energy management using FEMS	Energy	CO_2	Implementation of thorough energy management using FEMS	Budget / Subsidy, Awareness Raising	Implemented	Start using factory energy management system (FEMS) and reduce energy consumption through energy management based on the FEMS.	2013	METI	150	213	274	318	319	1,230	2,300
Promotion of energy conservation initiatives through alliance between industry groups	Energy	CO_2	Promotion of energy conservation initiatives through alliance between different industry groups	Budget / Subsidy, Awareness Raising	Implemented	Promote energy conservation activities through the cooperation among multiple businesses.	2013	METI	0	0	53	92	194	210	370

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									2013	2014	2015	2016	2017	2020	2030
Commercial and Other Sector															
Improvement of the energy efficiency of buildings	Energy	CO_2	Promotion of mandatory compliance with energy conservation standards targeting new construction	Law / Standard, Budget / Subsidy, Other	Implemented	Increase the ratio of building stocks that satisfy the energy conservation standards to reduce CO_2 emissions from the energy consumed in the buildings. Require buildings to comply with energy conservation standards based on the Act on the Improvement of Energy Consumption Performance of Buildings (issued on July 8, 2015). Also accelerate the construction of energy efficient buildings by mandating the notification of energy efficiency of buildings.	2003 (When the reporting period of energy-saving performance started, based on the Energy Saving Law)	MLIT	125	540	960	1,611		-	10,350
			Improvement of energy efficiency of existing buildings (renovation)	Law / Standard, Budget / Subsidy, Other	Implemented	Increase the ratio of building stocks that satisfy the energy conservation standards to reduce CO_2 emissions from the energy consumed in buildings. Provide tax incentives and financial support promoting investment in energy conservation to accelerate the energy conservation renovation in already constructed buildings.	2003 (When the reporting period of energy-saving performance started, based on the Energy Saving Law)	MLIT	91	179	325	438		-	1,220
Diffusion of highly energy-efficient equipment and devices (Commercial and Other Sector)	Energy	CO_2	Introduction of highly energy-efficient water heating systems	Budget / Subsidy, Financing	Implemented	Reduce energy consumption by increasing the use of energy efficient water heaters.	2008	METI	50	139	227	319	411	640	1,550
			Introduction of highly energy-efficient lighting devices	Budget / Subsidy, Financing	Implemented	Reduce energy consumption by increasing the use of energy efficient lighting devices such as LED lamps.	2008	METI	980	2389	3877	5115	6594	8,030	9,910
			Introduction of coolant management technologies	Law / Standard	Implemented	Increase energy efficiency by implementing refrigerant leak prevention measures through the spread of proper management technologies.	2014	METI	235	256	269	288	299	416	24
Improvement of energy efficiency of equipment and devices through Top Runner Programs (Commercial and Other Sector)	Energy	CO_2	Improvement of energy efficiency of equipment and devices through top runner programs (Commercial and Other Sector)	Law / Standard, Budget / Subsidy	Implemented	Reduce energy consumption of devices used in industries by increasing the energy efficiency of top-running devices.	1998	METI	520	820	1,122	1,439	1,753	5,640	17,060
Thorough energy management through the use of BEMS and consultation on energy conservation	Energy	CO_2	Thorough energy management through the use of BEMS and consultation on energy conservation	Taxation, Budget / Subsidy, Other	Implemented	Reduce energy consumption through the introduction of BEMS and detailed identification of energy consumption in industrial facilities (such as buildings) using energy conservation diagnosis, as well as the control of devices based on the diagnosis.	1998 (Energy Use Rationalization Business support Program) 2012 (Subsidy to promote innovative energy conservation technology implementation in housing and buildings)	METI	560	950	1,283	1,618	2,015	4,450	10,050
Expansion of holistic and efficient use of energy	Energy	CO_2	Expansion of holistic and efficient use of energy	Budget / Subsidy, Awareness Raising	Implemented	Support the construction of systems for holistic use of energy.	2008	METI	–					73	164
Development of low-carbon cities through the improvement of the thermal environment by Preventing Heat Island Effects	Other	CO_2	Development of low-carbon cities through the improvement of thermal environment by preventing heat island effects	Other	Implemented	Promote low-carbon cities through the improvement of the thermal environment by mitigating the urban heat island such as through roof-top greening.	2008	MLIT		1.6～7.4	2.8～13.1	4.3～20.1	5.4～25.4	4.4 ～ 20.2	4.1 ～ 19.1
Introduction of renewable energy and energy-saving in water supply and sewage system	Energy	CO_2	Promotion of energy saving and energy creation measures in sewage system	Budget / Subsidy	Implemented	Reduce CO_2 emissions by promoting energy saving in sewage treatment plants. Also reduce CO_2 emissions by generating power using biogas from sewage sludge and submitting fossil fuel to solid fuel made from sewage sludge.	2016	MLIT		160	250	347		900	1,340
			Promotion of energy saving and renewable energy measures in water service business	Budget / Subsidy	Implemented	Reduce CO_2 emissions from the use of electricity as water service companies all around Japan and water suppliers implement energy conservation activities and start using renewable energies.	2016	MHLW		31	18	49		284	336
Initiatives in waste management	Waste Management / Waste, Energy	CO_2	Promotion of sorting, collection and recycling of waste plastic containers and packaging	Law/ Standard, Budget /Subsidy, Awareness raising	Implemented	Promote sorted collection and recycling (recycling of materials and chemical recycling) of plastic containers and packaging materials based on the Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging.	2000	MOE		62	62	61	59	25	62
			Introduction of waste power generation at municipal solid waste incineration facilities	Budget / Subsidy, Other	Implemented	Reduce CO_2 emissions from energy uses associated with electricity consumption by installing the proper sizes of high-efficient power generation facilities when constructing new waste incineration facilities or updating or renovating currently operating facilities.	2016 (National Plan for Adaptation to the Impacts of Climate Change)	MOE		16	151	467		860 ～ 1,360	1,350 ～ 2,140
			Introduction of waste power generation at industrial waste incineration facilities	Budget / Subsidy	Implemented	Reduce CO_2 emissions from energy uses associated with electricity consumption by installing proper sizes of high-efficient power generation facilities when constructing new waste incineration facilities or updating or renovating currently operating facilities.	2003	MOE		256	188	180		25	28
			Promotion of producing fuels from waste and energy-efficiency measures in waste disposal business	Budget / Subsidy	Implemented	Produce fuels from waste, such as waste plastics and paper scraps, and use the fuel as the alternative to fossil fuel in manufacturing industries to reduce CO_2 emissions from energy associated with the combustion of fuel. Promote energy conservation measures, such as the Introduction of fuel efficient waste collection and transportation vehicles and treatment facilities and energy conservation activities to reduce CO_2 emissions from energy associated with fuel uses.	2016	MOE		-51	-3	174		77	230
Actions led by local governments and promotions by the national government	Cross-Cutting	CO_2,CH_4,N_2O, HFCs,PFCs,SF_6,NF_3	Actions led by local governments and promotions by the national government	Law / Standard	Implemented	Reduce greenhouse gas emissions by establishing local municipality action plans (office work version) based on the Global Warming Mitigation Plan and promote the implementation of activities based on the action plans.	2001	MOE	–	–	–			-	-
Initiatives of the national government	Cross-Cutting	CO_2,CH_4,N_2O, HFCs,PFCs,SF_6,NF_3	Initiatives of the national government	Law / Standard	Implemented	Implement and inspect the National Government Action Plan. Implement and inspect implementation plans at relevant government agencies.	2001	MOE	–			111	(133)	115	461

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									2013	2014	2015	2016	2017	2020	2030
Residential Sector															
Improvement of energy efficiency of equipment and devices through top runner programs(Residential Sector)	Energy	CO_2	Improvement of energy efficiency of equipment and devices through top runner programs(Residential Sector)	Law / Standard, Budget / Subsidy	Implemented	Reduce energy consumption from devices at household sector by improving the energy efficiency of top-running devices.	1998	METI	150	370	620	716	878	3,000	4,830
Improvement of energy efficiency of housing	Energy	CO_2	Promotion of compliance with energy conservation standards targeting new housing	Law / Standard, Taxation, Budget / Subsidy, Financing, Technology Development, Awareness Raising, Other	Implemented	Reduce CO_2 emissions from energy consumed in households by increasing the ratio of household devices that satisfy energy conservation standards. Promote the supply of energy efficient houses by mandating the notification of energy efficiency of houses based on the Act on the Improvement of Energy Consumption Performance of Buildings (issued on July 8, 2015).	2003 (When the reporting period of energy-saving performance started, based on the Energy Saving Law)	MLIT		207	337	601		-	8,720
			Promotion of renovation of thermal insulation for existing housing	Law / Standard, Taxation, Budget / Subsidy, Financing, Technology Development, Awareness Raising, Other	Implemented	Reduce CO_2 emissions from energy consumed in households by increasing the ratio of houses that satisfy energy conservation standards. Support the promotion of energy conservation renovation of already constructed houses through tax incentives, subsidies, and loans.	2003 (When the reporting period of energy-saving performance started, based on the Energy Saving Law)	MLIT		39	112	178		-	1,190
Diffusion of highly energy-efficient equipment and devices (Residential Sector)	Energy	CO_2	Introduction of highly energy-efficient water heating systems	Budget / Subsidy, Awareness Raising	Implemented	Reduce energy consumption through the Introduction of high-efficient water heaters.	2013	METI	180	507	837	1,181	1,549	2,260	6,170
			Introduction of highly energy-efficient lighting devices	Budget / Subsidy, Awareness Raising	Implemented	Reduce energy consumption through the Introduction of high-efficient lighting devices such as LED lamps.	2013	METI	730	2,052	3,312	4,990	6,516	7,110	9,070
			Energy efficiency improvement of septic tanks	Budget / Subsidy, Awareness Raising	Implemented	Reduce CO_2 emissions from electricity uses by reducing the electricity consumption of blowers through the Introduction of septic tanks with 10% lower electricity consumption compared to the current low-carbon septic tanks when installing a new purification tank or when updating a current one.	2013	MOE	−	2	5	8	(11)	19	39
Implementation of thorough energy management using HEMS and smart meters in the residential sector	Energy	CO_2	Implementation of thorough energy management using HEMS and smart meters in the residential sector	Budget	Implemented	Identify detailed household energy consumption using HEMS or smart meters and reduce electricity consumption through the control of devices based on identified data.	2010	METI	24	30	40	50	50	2,020	7,100

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									2013	2014	2015	2016	2017	2020	2030
Transport Sector															
Diffusion of next-generation vehicles and improvement of fuel efficiency	Transport	CO_2	Diffusion of next-generation vehicles and improvement of fuel efficiency	Law / Standard, Taxation, Budget / Subsidy, Technology Development	Implemented	Reduce CO_2 emissions by reducing energy consumption through the diffusion of next-generation automobiles and improved fuel efficiency.	1979 (When the Fuel Efficiency Standards were determined based on the Energy Saving Law)	METI	438	970	1,593	1,913		7,025	23,790
Measures for traffic flow improvements	Transport	CO_2	Promotion of the measures to traffic flow improvements	Budget / Subsidy, Awareness Raising	Implemented	Build the network of arterial roads, including ring roads, to increase driving speed and implement measures to promote the smart use of roads by promoting the use of ETC2.0.	2012 (Priority Plan for Social Infrastructure Development)	MLIT			1,000			-	Approx. 1,000
			Promotion of the use of Intelligent Transport Systems (the promotion of centrally controlled signals)	Budget / Subsidy, Awareness Raising	Implemented	Realize not congested traffic flows with centralized control of traffic lights to improve fuel efficiency and reduce CO_2 emissions from automobiles.	2012 (Priority Plan for Social Infrastructure Development)	NPA	1,300	1,370	1,400	1,400	1,410	1,400	1,500
			Development of traffic safety facilities (Improvement of traffic lights)	Budget / Subsidy, Awareness Raising	Implemented	Realize not congested traffic flows by improving of traffic lights to improve fuel efficiency and reduce CO_2 emissions from automobiles.	2012 (Priority Plan for Social Infrastructure Development)	NPA	400	490	500	500	500	520	560
			Development of traffic safety facilities (Promotion of the use of LED traffic lights)	Budget / Subsidy, Awareness Raising	Implemented	Switch from light bulbs to LED lights in traffic lights to reduce energy consumption and CO_2 emissions.	2012 (Priority Plan for Social Infrastructure Development)	NPA	65	98	103	110	114	155	160
			Promotion of automated driving	Budget / Subsidy, Awareness Raising	Implemented	Improve energy efficiency in the transport sector using automatic driving technologies such as ACC/CACC technologies.	2012 (Priority Plan for Social Infrastructure Development)	METI	56	72	96	129	170	270	1,400
Greening of vehicle transport operators by promoting the environmentally friendly usage of Vehicles	Transport	CO_2	Greening of vehicle transport operators by promoting the environmentally friendly usage of Vehicles	Budget / Subsidy, Awareness Raising	Implemented	Reduce CO_2 emissions by promoting the use of environmentally friendly automobiles.	2012 (Priority Plan for Social Infrastructure Development)	MLIT	0	8	42	249	492	300	660
Promotion of public transport utilization and bicycles	Transport	CO_2	Promotion of public transport utilization	Taxation, Budget / Subsidy, Awareness Raising	Implemented	Reduce CO_2 emissions from the use of private cars by providing subsidies and tax incentives for the construction of new rail roads, promotion for the use of current train services (e.g. improved convenience of railroad stations), promotion for the use of buses (e.g. the introduction of BRT and bus location system), promotion of the spread of eco-commute, as well as by reconstructing regional public transportation networks and improving the convenience for users.	1992	MLIT		235	1,037	796		980	1,780
Energy efficiency improvement of Railways	Transport	CO_2	Improvement of energy efficiency of railways	Taxation, Budget / Subsidy, Financing, Technology Development	Implemented	Promote the use of energy-efficient vehicles, such as vehicles with VVVF systems, vehicles with storage batteries, and hybrid vehicles. Also promote the introduction and use of energy conservation systems in railroad facilities.	2005	MLIT		172	387	670	1,007	768	1,776
Energy efficiency improvement in Vessels	Transport	CO_2	Promotion of the use of vessels that reduce energy consumption	Taxation, Budget / Subsidy, Financing, Technology Development	Implemented	Reduce CO_2 emissions associated with fuel combustion in vessels by promoting the use of energy efficient vessels.	2005	MLIT		-76	289	227	387	648	1,574
Low carbonization in Aviation	Transport	CO_2	Promotion of low carbonization in Aviation	Taxation, Budget / Subsidy, Financing, Technology Development	Implemented	Promote of low carbonization in social infrastructures of the airline industry by promoting the introduction and use of new devices with better energy efficiency, advancement of airline traffic systems, energy conservation and CO_2 reduction measures at airports, and increasing the use of alternative jet fuels.	2005	MLIT		468	880	807	816	395	1,012
Promotion to improve truck transport efficiency and cooperative transport and delivery	Transport	CO_2	Improvement of the efficiency of truck transportation	Taxation, Budget / Subsidy, Financing, Awareness Raising	Implemented	Reduce CO_2 emissions by improving the efficiency of truck transportation.	2001	MLIT		348	573	900	2,619	2,020	2,060
			Promotion of cooperative transport and delivery	Budget / Subsidy, Awareness Raising	Implemented	Reduce CO_2 emissions and labor shortages by promoting cooperative transport and delivery through the cooperation among owners and distributors involved with the truck transport that accounts for the majority of land transport to improve transport efficiency and load efficiency.	2001	MLIT		12	13	15		-	21
General measures for the greening of marine transportation and promotion of modal shifts to rail freight transport	Transport	CO_2	General measures for the greening of marine transportation	Taxation, Budget / Subsidy, Awareness Raising	Implemented	Modal shift to costal shipping will be promoted through support for business based on Act on Advancement of Integration and Streamlining of Distribution Business, as well as by introduction of facilities which supports shipping and promotion of "Eco-Ship Mark".	2001	MLIT		33	225	615	-	788	1,724
			Promotion of modal shifts to railfreight transport	Taxation, Budget / Subsidy, Awareness Raising	Implemented	Modal shift to costal shipping will be promoted through support for business based on Act on Advancement of Integration and Streamlining of Distribution Business, as well as by introduction of facilities which supports rail freight and promotion of "Eco-Rail Mark".	2001	MLIT		28	141	96	-	589	1,334
Initiatives at Harbors	Transport	CO_2	Reduction in the total distance of land transport through the optimum ports selection	Budget / Subsidy	Implemented	The construction and improvement of ports where vessels can touch at would enable coastal transport to the nearest ports, which can reduce the driving distance of truck transport.	2016	MLIT		168	192	249	301	960	960
			Promotion of introduction of energy-efficient cargo handling machinery	Budget / Subsidy	Implemented	Promote the introduction and use of energy efficient cargo handling machinery.	2016	MLIT, MOE		3	4	6	7	7.3	7.3
			Promotion of modal shifts and the improvement of transportation efficiency in the reverse logistics	Other	Implemented	Promote modal shift and the improvement of transport efficiency related to the reverse logistics.	2016	MLIT, MOE		6	12	15	22	15.2	15.2
Schematic promotion of joint measures implemented by multiple Government Ministries and Agencies (Transport Sector)	Transport	CO_2	Use of Special Zone System for Structural Reform regarding global warming mitigation measures	Law / Standard	Implemented	Reduce CO_2 emissions by decreasing the number of vehicles transporting steel products to public wharfs under special measures on regulations (port and harbor distribution streamlining project using special large transportation vehicles). Also reduce CO_2 emissions using special measures on regulations for special project using pipelines for the transport of industrial wastes requiring special management.	2016	CAO	53	53	53	53	53	53	53

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									2013	2014	2015	2016	2017	2020	2030
Energy Conversion Sector															
Maximum introduction of renewable energy	Energy	CO_2	Expanded use of electricity generated by renewable energy	Law, Budget / Subsidy, Taxation, Technology Development	Implemented	Reduce CO_2 emissions from the combustion of fossil fuels by increasing the use of renewable energies as the source of energy for power generation and heat uses to replace fossil fuels.	n/a	METI	74,403	83,727	93,744	102,656	110,760	-	156,160 ～ 165,990
			Expanded use of heat generated by renewable energy	Law, Budget / Subsidy, Taxation, Technology Development	Implemented		n/a	METI	29,800	31,265	32,027	31,286	31,236	-	36,180
Reduction of CO2 emission intensity in the Power Sectors	Energy	CO_2	Persuasion of High Efficiency in Thermal Power Generation	Law / Standard, Budget / Subsidy, Technology Development	Implemented	The voluntary framework of the electricity industry (aiming to achieve the emission coefficient of about 0.37 kg-CO_2/kWh, which is consistent with the energy mix and CO_2 reduction targets of the national government) was announced in July 2015 with the participation of main electricity companies. The Electric Power Council for a Low Carbon Society was then established in February 2016. The Council established reduction targets of individual companies and announced systems and rules for the entire industry to implement PDCA. The effectiveness of the activities of the entire electricity industry is going to be ensured under the deregulation of electricity systems by establishing policies under the Act on the Rational Use of Energy and the Act on the Advancement of Energy Supply Structures to promote activities to achieve targets set in the voluntary framework.	n/a	METI		4,200	4,500	6,200	6,700	7,000	11,000
			Improvement of the efficiency of thermal power generation, use of nuclear power generations where safety is approved and full use of renewable energy	Law / Standard, Budget / Subsidy, Technology Development	Implemented		n/a	METI		4,000	29,000	41,000	54,000	-	188,000
Promotion of introduction of highly energy-efficient equipment and devices (Oil Product Manufacturing sector)	Energy	CO_2	Promotion of introduction of highly energy-efficient equipment and devices (Oil Product Manufacturing sector)	Awareness Raising	Implemented	Japan promotes a reduction of one million kiloliters of energy in crude oil equivalent from business as usual (BAU) by oil refiners in the oil product manufacturing field, based on the Industry's Action Plan for a Low Carbon Society through the following initiatives: (i) effective use of heat, (ii) introduction of advanced control and high efficient devices, (iii) improvement of the motors system operation, and (iv) major improvement and advancement of processes.	2013	METI	161	357	619	780	1,068	810	2,080
Non-energy related CO_2															
Increasing the use of blended cements	Industry/Industrial Processes	CO_2	Increasing the use of blended cements	Law / Standard, Awareness Raising	Implemented	Reduce CO_2 emitted from decarbonation of limestone in the clinker production process by increasing the use of blended cements. It leads to decrease the production of clinker as an intermediate product of cement.	Year 2001 (Based on Act on Green Purchasing, blended cements is are designated as the eco-friendly goods.)	METI, MLIT, MOE		-234	-334	-354	-470	44	388
Diffusion of biomass plastics	Waste Management/ Waste	CO_2	Diffusion of biomass plastics	Other	Implemented	Reduce non-energy oriented CO_2 emissions from the combustion of plastics that are nonindustrial and industrial waste by increasing the use of biomass plastic, a carbon-neutral product, to replace the plastic made from petroleum used in products.	2016	MOE		-3	10	9		720	2,090
Reduction in the amount of waste incineration	Waste Management/ Waste	CO_2	Reduction of the amount of waste incineration.	Law / Standard, Awareness Raising, Other	Implemented	Reduce the amount of incineration and non-energy oriented CO_2 emissions from the combustion of plastics by reducing the emission of plastics of municipal solid waste and by promoting the recycled uses through the sorted collection and recycling of plastic containers and wrapping products based on the Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging. Also reduce non-energy oriented CO_2 emissions from the incineration of industrial plastic waste by decreasing its amount through the promotion of 3R activities.	2016 (National Plan for Adaptation to the Impacts of Climate Change)	MOE		659	587	557		320	440
Methane (CH_4)															
Measures to reduce greenhouse gas emissions from agricultural soil	Agriculture	CH_4	Reduction of methane emissions associated with rice cultivation	Law / Standard, Budget / Subsidy	Implemented	Reduce methane emission from paddy fields by promoting soil preparation based on the conversion from the plowing-in of rice straw of which the methane emission factor is relatively large to the application of compost of which the emission factor is lower.	2007	MAFF		130	660	660	940	330～920	640～2,430
Reduction in the amount of wastes for final disposal	Waste Manageme	CH_4	Reduction of the amount of wastes in final disposal	Law / Standard, Other	Implemented	Reduce the direct landfilling of organic municipal solid waste by banning the direct landfilling of such waste. Reduce methane emissions associated with the biological decomposition of organic municipal solid waste in landfill sites. Continuously reduce the final disposal of industrial wastes through the promotion of the 3R activities.	2016 (National Plan for Adaptation to the Impacts of Climate Change)	MOE		9	31	62		180	520
Adoption of semi-aerobic landfill structure in final waste disposal sites	Waste Management/ Waste	CH_4	Adoption of semi-aerobic landfill structure in final waste disposal sites	Law / Standard, Other	Implemented	Reduce methane emissions associated with the biological decomposition of organic waste to realize lower emissions from anaerobic landfill structure by selecting semi-aerobic landfill structures for the new construction of landfill sites and managing the ends of wastewater pipes in open systems.	2016 (National Plan for Adaptation to the Impacts of Climate Change)	MOE		-23	-14	-13		10	30
Nitrous Oxide (N_2O)															
Measures to reduce greenhouse gas emissions from agricultural soil	Agriculture	N_2O	Emissions reduction of nitrous oxide associated with the application of inorganic fertilizers	Law / Standard, Budget / Subsidy	Implemented	Reduce N_2O emissions from the application of inorganic fertilizers by reducing the use of fertilizers, practicing divided fertilization, and using slow-acting fertilizers.	2007	MAFF		51	123			70	100
Advancement of combustion in sewage sludge incineration facilities	Waste Management/ Waste	N_2O	Advancement of combustion in sewage sludge incineration facilities	Taxation, Budget / Subsidy, Technology Development	Implemented	Reduce N_2O emissions from the incineration of sludge generated from wastewater treatment by advancement of incineration systems.	2001 (the level of sophistication of combusting sewage sludge at sewage treatment facilitie was standardized)	MLIT		100	4	145		500	780

Name of mitigation action	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief Description	Start year of implementation	Implementing entity of entities	Estimate of mitigation impact (not cumulative, in kt CO2 eq)						
									2013	2014	2015	2016	2017	2020	2030
Fluorinated Gases (HFCs, PFCs, SF_6, and NF_3)															
Measures for fluorinated gases	Other	HFCs,PFCs,SF_6,NF_3	Promote eliminating fluorocarbons and lowering the GWP in gases and products manufacture	Law / Standard, Budget / Subsidy, Technology Development, Awareness Raising	Implemented	Promote eliminating fluorocarbons and lowering the GWP by following up on target achievement status for designated products and supporting the use of energy efficient devices with natural refrigerant.	2015 (Act on Rational Use and Proper Management of Fluorocarbons came into force)	MOE, METI		148	141	547	551	3,500	11,200
			Preventing leakage of fluorocarbons from the use of refrigeration and air conditioning equipment for business use	Law / Standard	Implemented	Reduce leaks of fluorocarbons while using products through the effective use of fluorocarbons leakage report system and public announcement system, the support for prefectures to instruct and supervise relevant activities and to implement awareness-raising activities.	2015 (Act on Rational Use and Proper Management of Fluorocarbons came into force)	MOE, METI						6,500	20,100
			Promotion of recovery of fluorocarbons from refrigeration and air conditioning equipment for business use in disposal	Law / Standard, Budget / Subsidy, Awareness Raising	Implemented	Achieve a high recover rate by supporting prefectures to give instructions, supervise, and raise awareness for relevant activities.	2001 (Fluorocarbons Recovery and Destruction Law was adopted)	MOE, METI		-19	-327	-288	12	7,900	15,700
			Promotion of voluntary initiatives in industries	Voluntary Agreement	Implemented	Reduce the emissions of HFCs and other three gases from various fields by following up on the progress of autonomous action plans.	1998	MOE, METI		244	179	193	221	550	1,220
Carbon Sink															
Forest Sink Strategies	LULUCF	CO_2	Forest Sink Strategies	Law / Standard, Awareness Raising	Implemented	Maintain the CO_2 removals in forests by promotion of healthy forest management through proper thinning and reforestation, promotion of the proper management and conservation pf protection forests, development of efficient forest management, promotion of people's participation in forest management, and promotion of the use of wood biomass, using various measures based on the Basic Plan for Forest and Forestry.	2007	MAFF	51,760	52,300	49,930	47,550	47,610	Approx. 38,000	Approx. 27,800
Measures for Sinks in Agricultural Soils	LULUCF	CO_2	Measures for Sinks in Agricultural Soils	Law / Standard, Budget / Subsidy, Technology Development, Awareness Raising	Implemented	Promote carbon storage in cropland and grassland soils by promoting soil development using organic matter such as compost and green manure.	2008	MAFF	7,600	6,670	6,860	6,430	6,700	7,080 ~ 8,280	6,960 ~ 8,900
Promotion of Urban Greening	LULUCF	CO_2	Promotion of Urban Greening	Law / Standard, Budget / Subsidy, Technology Development, Awareness Raising	Implemented	Build parks in cities and increase green areas around roads, harbors, etc.	2006	MLIT	1,100	1,146	1,180	1,200	1,210	1,190	1,240
Cross-sectional Strategies															
Promotion of J-Credit Scheme	Cross-Cutting	CO_2,CH_4,N_2O, HFCs,PFCs,SF_6,NF_3	Promotion of J-Credit Scheme	Budget / Subsidy	Implemented	Certify credits for the reduction of greenhouse gas emissions and the removals of greenhouse gas which are achieved by reduction measures, such as the use of energy efficient facilities and the use of renewable energies, and removal measures implementing proper forest management. Also promote the use of the credit to achieve the Industry's Action Plan for a Low-Carbon Society and carbon offset.	2013	MOE, METI, MAFF	30	630	1,030	2,420	3,430	3,210	6,510
Development of public campaigns	Energy	CO_2	Promotion of thorough implementation of Cool Biz (Commercial Sector)	Budget / Subsidy, Awareness Raising	Implemented	Among the energy conservation measures implemented to achieve the INDC of Japan, CO_2 emissions reduction measures in the public and consumer sector are extremely important as the emission is increasing in this sector. The CO_2 emissions need to be reduced by about 40% in the household and commercial sector and about 30% in the transport sector. In order to achieve these goals, the public needs to improve their understanding on the critical conditions of global climate change and its negative effects on the society. In addition, energy-efficient attires, shift to energy efficient devices, Home CO_2 advisor service, and efficient use of lighting devices are also promoted. The practice of eco-driving and car sharing is also encouraged to reduce environmental load.	2005	MOE	-32	-59	-21	-31	-7	73	145
			Promotion of thorough implementation of Cool Biz (Residential Sector)	Budget / Subsidy, Awareness Raising	Implemented		2005	MOE	-31	-65	-79	-77	-97	77	150
			Promotion of thorough implementation of Warm Biz(Commercial Sector)	Budget / Subsidy, Awareness Raising	Implemented		2005	MOE	5	-23	-9	-43	-64	77	116
			Promotion of thorough implementation of Warm Biz(Residential Sector)	Budget / Subsidy, Awareness Raising	Implemented		2005	MOE	4	-50	-48	-62	-138	158	291
			Promotion of equipment replacement (electric dehumidifier(compression type) and full automatic washing with drying machine)	Budget / Subsidy, Awareness Raising	Implemented		2005	MOE	2	0	10			110	112
			Home CO2 advisor service	Budget / Subsidy, Awareness Raising	Implemented		2005	MOE	1	2	2	3	3	11	137
			Efficient use of lighting devices	Budget / Subsidy, Awareness Raising	Implemented		2005	MOE	-610	-851	-828	-868	-860	1,150	1,680
			Eco driving (private cars、private freight car)	Budget / Subsidy, Awareness Raising	Implemented		2005	MOE	241	–	–	–	–	1,930	2,440
			Car sharing	Budget / Subsidy, Awareness Raising	Implemented		2005	MOE	68	167	292	381		430	550
Promotion of measures based on Local Government Action Plan for Regional Measures	Energy, Transport, Industry / Industrial Processes, Agriculture, LULUCF, Waste Management / Waste, Other	CO_2,CH_4,N_2O, HFCs,PFCs,SF_6,NF_3	Promotion of measures based on Local Government Action Plan for Regional Measures	Law / Standard, Budget / Subsidy, Awareness Raising	Implemented	Promote the establishment of regional municipality action plans (regional measures edition) to accelerate measures to mitigate climate change at regional levels and reduce the emission of greenhouse gases.	2008	MOE	–	–	–			-	-

3.2.4 Assessment of economic and social consequences of response measures

Actions to minimize adverse impacts in accordance with Article 3, Paragraph 14

(1) Assessment of economic and social consequences of response measures

Japan takes actions while taking into account the importance of making efforts to minimize adverse impacts in accordance with Article 3, Paragraph 14 of the Kyoto Protocol. On the other hand, it should be noted that we have difficulty in accurately assessing specific adverse impacts due to the implementation of response measures to address climate change issues. For example, the fluctuations in crude oil prices are caused by the balance between supply and demand, as well as various other factors (e.g., trends in crude oil futures market or economic fluctuations), and direct causality and its extent between climate change measures and adverse impacts thereof remain uncertain.

Furthermore, for the genuine resolution of climate change problems, it is essential to change the perception related to response measures, and in such a light sustainable growth may become a key. For instance, it should be underlined that the introduction of renewable energy has aspects not only to contribute to GHG emission reductions but also to improve energy access, disaster preparedness, benefit the job creation through the development of new industries. At the G20 Osaka Summit in 2019, we agreed on the importance of utilizing innovation to address urgent global environmental issues such as climate change, energy, and measures against marine plastic litter under the concept of "a virtuous cycle of environment and growth". Therefore, efforts as mentioned above toward the establishment of a low-carbon society should be accelerated throughout the world. From that perspective, in 2015, in order to support an agreement at COP21, Japan announced "Actions for Cool Earth 2.0 (ACE 2.0)", which consists of two pillars: (1) the implantation of support to developing countries worth of 1.3 trillion yen in 2020 and (2) innovation. Japan continues to proactively contribute to the international community in these fields.

In accordance with the above-mentioned international commitments, in June 2019, the government of Japan made a Cabinet decision on its long-term low greenhouse gas emission development strategy as requested in the Paris Agreement, which was submitted to the UNFCCC secretariat. The strategy includes (1) aiming at the realization of a decarbonized society as the ultimate goal to be accomplished ambitiously as early as possible in the second half of this century to boldly implement measures towards a reduction in GHGs emissions by 80% by 2050 and (2) realization of a virtuous cycle of environment and growth through business-led disruptive innovation.

(2) Actions to Minimize Adverse Impacts in Accordance with Article 3, Paragraph 14 of the Kyoto Protocol

Japan has as a priority taken the following measures, taking into consideration of the importance 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 added that since there is no internationally established

methodology for evaluating efforts related to the minimization of above-mentioned adverse impacts, it is impossible to carry out such evaluations.

- Technical assistance in the energy and environmental sectors

Japan has continued to contribute to the sustainable economic growth of developing countries, based on their needs, through the provision of technical assistance in the field of energy and the environment throughout the world. For example, Japan has provided assistance for the development and operation of institutions related to energy savings and renewable energy, through cooperation in human resource development, such as inviting trainees from and sending experts to developing countries, including in the Middle East region. Moreover, from the viewpoint of the utilization of renewable energy in small island nations particularly vulnerable to climate change, Japan, in collaboration with the International Renewable Energy Agency (IRENA), to an international workshops targeting island nations in the Asia-Pacific region and others, including in Maldives in January 2019,) and in Tokyo and Miyako-Jima in November 2019, with a view to support human resource development and project formulations.

- Development of carbon capture and storage (CCS) technologies

Japan will work on CCS which is an important technology for addressing global warmings based on decisions that include the Summary of the Director-Level Meeting on the Bid for Thermal Power Supply by the Tokyo Electric Power Company, and the Strategic Energy Plan and The Long-term Greenhouse Gas Emission Strategy as requested in the Paris Agreement. In particular, Japan has been implementing large-scale demonstration projects in the pursuit of aiming for its practical use by around 2020 while implementing, research and development for cost reductions and safety improvements, evaluations of environmental impacts due to the CO_2 capture process, and geological surveys to identify potential CO_2 offshore storage sites in Japan. Furthermore, Japan has actively carried out information exchanges with stakeholders of European countries and the United States regarding technologies pertaining to CCS.

3.3 Progress Towards Quantified Economy-wide Emission Reduction Targets

The information on the estimates of emissions and removals, the use of units from the market-based mechanisms, and land use, land-use change, and forestry activities between FY 2010 and FY 2017 related to the progress in the achievement of quantified economy-wide emission reduction target of Japan is the follows.

Total GHG emissions in FY 2017 (excluding LULUCF) were 1,290 $MtCO_2$ eq. They were 10.4% below compared to the emissions in the base year (FY 2005) if units from LULUCF activities (53.9 $MtCO_2$) are taken into account. The reductions of emissions from the base year are over the emission reduction target for FY 2020, which is -3.8% or more compared to FY 2005.

As for units from the market-based mechanism, 25 $ktCO_2$ eq. was acquired by the government of Japan through the Joint Crediting Mechanism (JCM) by September 2019.[19] However, any units from the market-based mechanism have not been used for the achievement of the emission reduction target for FY 2020 as of September 2019.

Table 3-3 Reporting of progress (CTF Table 4)

	Year	Base year/period (FY2005)	2010	2011	2012	2013	2014	2015	2016	2017
Total emissions excluding LULUCF	*(kt CO_2 eq)*	1,382,144.50	1,305,137.18	1,356,111.13	1,398,842.61	1,410,297.94	1,362,236.88	1,323,617.68	1,307,853.92	1,291,748.43
Contribution from LULUCF	*(kt CO_2 eq)*	NA	NA	NA	NA	-59,557.44	-58,981.49	-56,640.92	-53,702.80	-53,933.93
Quantity of units from market based mechanisms under the Convention	*(number of units)*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(kt CO_2 eq)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Quantity of units from other market based mechanisms	*(number of units)*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(kt CO_2 eq)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[19] JCM website (https://www.jcm.go.jp/projects/issues)

Table 3-4 Further information on mitigation actions relevant to the counting of emissions and removals from the LULUCF sector in relation to activities under Article 3, Paragraphs 3 and 4, of the Kyoto Protocol (CTF Table 4(a)II)

GREENHOUSE GAS SOURCE AND SINK ACTIVITIES	Base year	Net emissions/removals						Accounting Parameters	Accounting Quantity
		2013	2014	2015	2016	2017	Total		
	(kt CO_2 eq)								
A. Article 3.3 activities									
A.1. Afforestation/reforestation		-1,607.20	-1,610.25	-1,603.91	-1,598.37	-1,568.98	-7,988.71		-7,988.71
Excluded emissions from natural disturbances		NA	NA	NA	NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		NA	NA	NA	NA	NA	NA		NA
A.2. Deforestation		2,029.02	2,032.14	2,140.82	2,136.71	1,846.26	10,184.95		10,184.95
B. Article 3.4 activities									
B.1. Forest management									-252,679.34
Net emissions/removals		-51,065.19	-51,393.96	-49,002.28	-46,463.20	-46,135.04	-244,059.67		
Excluded emissions from natural disturbances		NA	NA	NA	NA	NA	NA		NA
Excluded subsequent removals from land subject to natural disturbances		NA	NA	NA	NA	NA	NA		NA
Any debits from newly established forest (CEF-ne)		NA	NA	NA	NA	NA	NA		NA
Forest management reference level (FMRL)								0.00	
Technical corrections to FMRL								1,723.93	
Forest management cap								0.00	
B.2. Cropland management	10,281.38	3,625.43	4,370.46	4,290.52	4,764.12	4,514.68	21,565.20		-29,841.72
B.3. Grazing land management	841.27	-273.16	-95.06	-160.54	-218.83	-257.35	-1,004.94		-5,211.28
B.4. Revegetation	-79.00	-1,222.70	-1,241.17	-1,261.87	-1,279.58	-1,289.85	-6,295.18		-5,900.16
B.5. Wetland drainage and rewetting (not elected)	NA	NA	NA	NA	NA	NA	NA		NA

Table 3-5 Information on the use of units from the market-based mechanisms (CTF Table 4(b))

Units of market based mechanisms			*Year*	
			2017	2018
Kyoto Protocol units	*Kyoto Protocol units*	*(number of units)*	0.00	0.00
		(kt CO_2 eq)	0.00	0.00
	AAUs	*(number of units)*	0.00	0.00
		(kt CO_2 eq)	0.00	0.00
	ERUs	*(number of units)*	0.00	0.00
		(kt CO_2 eq)	0.00	0.00
	CERs	*(number of units)*	0.00	0.00
		(kt CO_2 eq)	0.00	0.00
	tCERs	*(number of units)*	0.00	0.00
		(kt CO_2 eq)	0.00	0.00
	lCERs	*(number of units)*	0.00	0.00
		(kt CO_2 eq)	0.00	0.00
Other units	*Units from market-based mechanisms under the*	*(number of units)*	0.00	0.00
		(kt CO_2 eq)	0.00	0.00
	Units from other market-based mechanisms	*(number of units)*	0.00	0.00
		(kt CO_2 eq)	0.00	0.00
	JCM	*(number of units)*	0.00	0.00
		(kt CO2eq)	0.00	0.00
Total		*(number of units)*	0.00	0.00
		(kt CO_2 eq)	0.00	0.00

Chapter 4

Projections

4.1 Projections

4.1.1 Projected Scenarios

The future level of the emissions and removals of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6) and nitrogen trifluoride (NF_3) for FY 2020 and FY 2030 are estimated as follows.

Based on the outlook of the macro frame shown in 4.3.1, the projections for FY 2020 and FY 2030 are estimated under a *with measures* scenario taking into account future emission reduction by each policy and measure described in 3.1.2. This *with measures* scenario is taking into account the policies and measures that have already been implemented at the time of FY 2013, and the policies and measures adopted and will be implemented by FY 2030 in the future.

The *without measures* scenario is not estimated because the energy supply structure satisfying the energy demand (primary energy supply) if emission reduction measures are not implemented was not estimated in Japan. Moreover, the *additional measures* scenario is not estimated as well because, first of all, Japan believes that it is most important to steadily implement the Global Warming Countermeasure Plan to achieve the reduction targets for FY 2030 with certainty, and any policies and measures that are not included in the Global Warming Countermeasure Plan are not planned at the present.

The projection of the forestry/LULUCF sector represents annual emissions and removals from the LULUCF sector consistent with the scope of the national GHG inventory in order to ensure time-series consistency with the national GHG inventory. The projection was made in each individual source and sink, carbon pool, and gas in the sector. Note, however, that the scope of the projection is partly different from the scope of the LULUCF contribution in the target described in chapter 2. This is because the contribution in the target are described as equivalent to anticipated annual emission "reductions" (not as the projected annual emissions/removals based on the national GHG inventory) and prepared with the activity-based accounting of the reductions by the policies and measures implemented in the LULUCF sector in accordance with the LULUCF rules and modalities for the second commitment period of the Kyoto Protocol (CP2 KP-LULUCF) (see section 4.3.6).

4.1.2 Overall Projections of GHG Emissions

The projected total GHG emissions (not including the net removals in the LULUCF sector) in FY 2020 under a *with measures* scenario are approximately 1,399 $MtCO_2$ eq., which is an increase of 0.2% compared to the FY 2005 level (1,397$MtCO_2$ eq.), which is the base year for the FY 2020 target. Japan aims at achieving a target of 3.8% or more in emission reductions in FY 2020 by implementing additional mitigation measures and using removals from the LULUCF sector.

The projected total GHG emissions (not including the net removals in the LULUCF

sector) in FY 2030 under a *with measures* scenario is approximately 1,079 $MtCO_2$ eq., which is a decrease of 23.4% and 22.7% from FY 2013 and FY 2005, respectively. Taking into the account the projections for the contribution of LULUCF (removals from forests [approximately 27.8 $MtCO_2$], agricultural soils [approximately 7.9 $MtCO_2$] and revegetation [approximately 1.2 $MtCO_2$]) in FY 2030, the projected total GHG emissions become a reduction of 26.0% and 25.4% from FY 2013 and FY 2005, respectively, as shown in Japan's NDC.

Moreover, the net total GHG emissions including the LULUCF sector are estimated at 1,363 $MtCO_2$ eq. in FY 2020 and 1,054 $MtCO_2$ eq. in FY 2030.

Table 4-1 Information on greenhouse gas projections under a 'with measures' scenario (CTF Table 6(a))

	GHG emissions and removals								GHG emission projections	
	(kt CO_2 eq)								(kt CO_2 eq)	
	Base year (2005)	1990	1995	2000	2005	2010	2015	2017	2020	2030
Sector										
Energy	1,009,693.34	886,933.71	920,961.46	941,030.83	987,664.88	938,356.51	962,274.55	929,988.80	1,053,578.32	784,200.00
Transport	235,977.66	205,016.19	246,405.90	256,965.63	240,841.29	224,191.89	210,704.69	207,042.27	194,840.61	165,500.00
Industry/industrial processes	84,728.60	116,542.71	141,854.37	113,384.03	90,861.74	83,544.03	95,792.14	101,412.01	93,001.43	74,800.00
Agriculture	40,015.02	37,252.76	36,899.98	35,203.96	35,152.76	35,729.88	33,574.80	33,195.51	38,723.08	37,500.00
Forestry/LULUCF	-89,643.58	-62,475.25	-77,269.65	-87,907.43	-91,339.53	-70,546.63	-59,573.77	-57,457.81	-36,404.03	-25,900.00
Waste management/waste	26,095.94	29,731.99	33,056.87	32,482.50	27,623.82	23,314.87	21,271.51	20,109.84	19,321.96	17,300.00
Gas										
CO_2 emissions including net CO_2 from LULUCF	1,214,416.17	1,101,210.36	1,167,120.02	1,181,012.87	1,201,889.17	1,146,029.55	1,166,858.43	1,132,504.87	1,261,710.51	971,600.00
CO_2 emissions excluding net CO_2 from LULUCF	1,304,375.96	1,163,988.65	1,244,680.60	1,269,198.24	1,293,497.30	1,216,829.45	1,226,689.66	1,190,240.32	1,298,375.21	997,800.00
CH_4 emissions including CH_4 from LULUCF	39,029.18	44,432.08	41,948.52	38,030.55	35,745.38	34,569.32	30,903.58	30,153.50	33,988.76	31,700.00
CH_4 emissions excluding CH_4 from LULUCF	38,962.32	44,346.65	41,865.41	37,950.87	35,665.64	34,496.99	30,830.42	30,064.37	33,932.91	31,600.00
N_2O emissions including N_2O from LULUCF	25,760.31	32,005.38	33,368.65	30,073.86	25,238.29	22,462.68	20,989.44	20,649.80	21,762.11	21,300.00
N_2O emissions excluding N_2O from LULUCF	25,510.95	31,787.78	33,160.84	29,875.59	25,049.43	22,281.75	20,805.14	20,461.29	21,557.28	21,100.00
HFCs	12,724.24	15,932.31	25,213.19	22,852.00	12,784.02	23,315.84	39,260.61	44,885.37	38,300.00	21,600.00
PFCs	8,623.35	6,539.30	17,609.92	11,873.11	8,623.35	4,249.54	3,308.10	3,512.15	4,000.00	4,200.00
SF_6	5,063.86	12,850.07	16,447.52	7,031.36	5,053.01	2,423.87	2,152.71	2,135.15	2,400.00	2,700.00
NF_3	1,249.87	32.61	201.09	285.77	1,471.75	1,539.74	571.03	449.78	1,000.00	500.00
Total with LULUCF	1,306,866.97	1,213,002.11	1,301,908.93	1,291,159.52	1,290,804.96	1,234,590.56	1,264,043.91	1,234,290.62	1,363,061.37	1,054,000.00
Total without LULUCF	1,396,510.56	1,275,477.36	1,379,178.58	1,379,066.94	1,382,144.50	1,305,137.18	1,323,617.68	1,291,748.43	1,399,465.40	1,079,000.00

- Projected emissions of the transport sector for FY 2020 and FY 2030 include CO_2 emissions from electricity consumption from railways that should be included in the energy sector in the national GHG inventory under the UNFCCC.
- For FY 2020, the total does not match the sum of the gases because of rounding.
- For FY 2030, the total does not match the sum of the sectors because of rounding.
- Base year (2005) shows the values when the reduction target was decided (the values in the national GHG inventory submitted in FY 2015).
- Some projections in FY 2020 and FY 2030 in Forestry/LULUCF are different from the estimation scope of the national GHG inventory. See 4.3.6 for details.

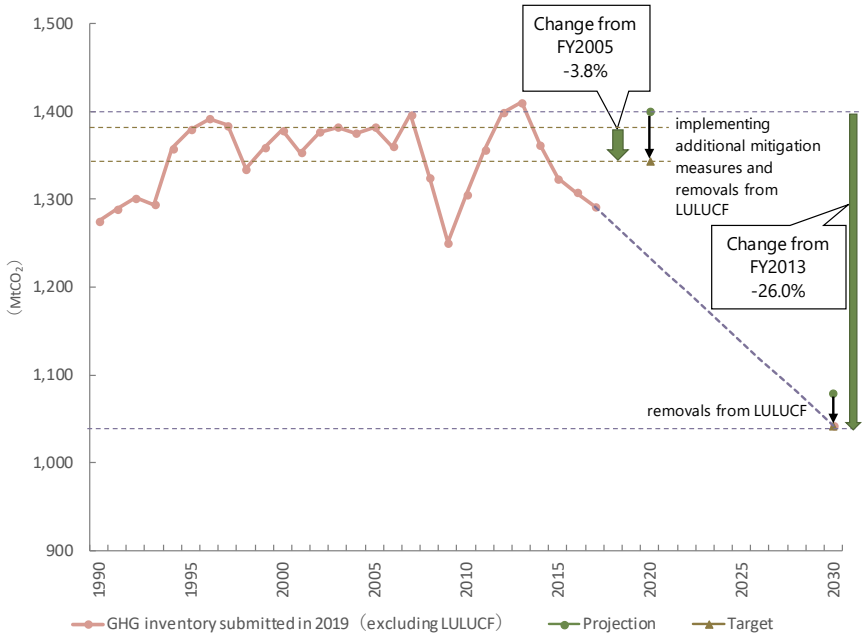

Figure 4-1 Greenhouse gas projections under a 'with measures' scenario

4.1.3 Projections by gas

Energy-related CO_2

Energy-related CO_2 covers approximately 90% of Japan's GHG emissions. Based on the energy statistics of Japan, it can be broken down into the following five sectors: Industry, commercial and other, residential, transport, and energy conversion. The reduction effects of policies and measures can be observed by each sector as well. Table 4-2 shows projections of emissions for each sector. The projection for energy-related CO_2 emissions by each sector is estimated on the basis of the CO_2 emissions with electricity generation and heat production allocated to the consuming sectors taking into account national circumstances for the planning and implementation of domestic policies and measures in Japan. In addition, CO_2 emissions from the energy use of waste are not included.

The estimated emissions in FY 2020 increase by 0.4% (approximately 1,224 $MtCO_2$) compared to the emissions in FY 2005. A significant reduction is expected in the transport sector, meanwhile, the estimated emissions increase in the industry, as well as the commercial and other sectors, due to the vitalization of economic activities. However, actual emissions in FY 2017 show a reduction of 7.5% (approximately 1,111 $MtCO_2$) compared to the emissions in FY 2005. It is especially contributed by the reduction in the industry and the commercial and other sectors.

In FY 2030, a significant reduction is estimated in the commercial and other, residential, energy conversion and transport sectors. A decrease of 25.0% (approximately 924 $MtCO_2$) is estimated compared to the emissions in FY 2013.

Table 4-2 Estimated emissions of energy-related CO_2 by sector

	Base year emissions		Actual emissions			Estimated emissions			
	FY2005 (Base year of FY2020 target)	FY2013 (Base year of FY2030 target)	FY2005	FY2013	FY2017	FY2020		FY2030	
	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	(Changes from FY2005)	($Mt\text{-}CO_2$)	(Changes from FY2013)
Industry	457	429	467	465	413	490	+7.3%	401	-6.6%
Commercial and Other	239	279	220	236	207	267	+11.6%	168	-39.7%
Residential	180	201	170	208	186	178	-0.9%	122	-39.4%
Transport	240	225	9	12	10	193	-19.7%	163	-27.4%
Energy conversion	104	101	98	102	92	96	-7.1%	73	-27.5%
Total	**1,219**	**1,235**	**1,201**	**1,235**	**1,111**	**1,224**	**+0.4%**	**927**	**-25.0%**

- Base year emissions are emissions for FY 2005 (the base year for the FY 2020 target) and FY 2013 (the base year for the FY 2030 target) in the annual GHG inventory when the reduction target was decided. Actual emissions are emissions in the latest annual GHG inventory, and because of the recalculation with the change in estimation methods, these values are different from the base year emissions when the reduction target was decided. In addition, estimated emissions and the change ratio from the base year of FY 2020 and FY 2030 show that the estimated values at the reduction target were decided.

Non-energy-related CO_2

The estimated emissions of non-energy-related CO_2 in FY 2020 decrease by 13.0% compared to FY 2005 (approximately 74.3 $MtCO_2$).

The estimated emissions in FY 2030 decrease by 6.7% compared to FY 2013 (by 17.0% from FY 2005) (approximately 70.8 $MtCO_2$). In the projection for non-energy-related CO_2 emissions by sector, CO_2 emissions from the waste sector include CO_2 emissions from the energy use of waste taking into account the national circumstances for the planning and implementation of domestic policies and measures in Japan.

The main emission sources in FY 2013 are cement production (the Industrial Processes and Product Use sector [IPPU]) and waste incineration (the waste sector). The reduction rate in the IPPU sector is the largest in FY 2020, followed by the waste sector (excluding 'the other sector'). Conversely, the largest reduction rate in FY 2030 is in the waste sector, followed by the IPPU sector.

Table 4-3 Estimated emissions of Non -energy-related CO_2 by sector

	Base year emissions		Actual emissions			Estimated emissions			
	FY2005 (Base year of FY2020 target)	FY2013 (Base year of FY2030 target)	FY2005	FY2013	FY2017	FY2020		FY2030	
	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	(Changes from FY2005)	($Mt\text{-}CO_2$)	(Changes from FY2013)
Fugitive emissions from fuels	0.5	0.5	0.5	0.4	0.4	0.7	+31.9%	0.9	+96.4%
Industrial Processes and Product Use	53.9	46.6	56.8	49.2	47.1	45.6	-15.4%	44.0	-5.5%
Agriculture	0.4	0.5	0.4	0.6	0.6	0.6	+39.1%	0.6	+13.3%
Waste	30.1	28.1	31.7	29.4	29.0	27.2	-9.6%	25.0	-11.1%
Other	0.5	0.3	0.5	0.3	0.2	0.3	-36.2%	0.3	+16.3%
Indirect CO_2	-	-	3.2	2.2	2.2	-	-	-	-
Total	**85.4**	**75.9**	**93.0**	**82.1**	**79.4**	**74.3**	**-13.0%**	**70.8**	**-6.7%**

- Base year emissions are emissions for FY 2005 (the base year for the FY 2020 target) and FY 2013 (the base year for the FY 2030 target) in the annual GHG inventory when the reduction target was decided. Actual emissions are emissions in the latest annual GHG inventory, and because of the recalculation with the change in estimation methods, these values are different from the base year emissions when the reduction target was decided. In addition, estimated emissions and the change ratio from the base year of FY 2020 and FY 2030 show that the estimated values at the reduction target were decided.
- Indirect CO_2 was not estimated at the time of the decision of the emission reduction target.

Methane

The estimated emissions for methane in FY 2020 decrease by 12.9% compared to FY 2005 (approximately 33.9 $MtCO_2$ eq.).

The estimated emissions in FY 2030 decrease by 12.3% compared to FY 2013 (by 18.8% from FY 2005) (approximately 31.6 $MtCO_2$ eq.). In the projection for methane emissions by sector, methane emissions from the waste sector include emissions from the energy use of waste taking into account the national circumstances for the planning and implementation of domestic policies and measures in Japan.

The main emission sources in FY 2013 are rice cultivation, enteric fermentation of livestock (the agriculture sector), and waste landfill (the waste sector). The largest reduction rate is in the waste sector, followed by the fugitive emission from fuels sector in both FY 2020 and FY 2030.

Table 4-4 Estimated emissions of methane by sector

	Base year emissions		Actual emissions			Estimated emissions			
	FY2005 (Base year of FY2020 target)	FY2013 (Base year of FY2030 target)	FY2005	FY2013	FY2017	FY2020		FY2030	
	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	(Changes from FY2005)	($Mt\text{-}CO_2$)	(Changes from FY2013)
Fuel combustion	1.4	1.6	1.4	1.0	0.9	1.5	+9.3%	1.5	-2.1%
Fugitive emissions from fuels	1.0	0.9	1.0	0.8	0.8	0.8	-21.0%	0.7	-10.9%
Industrial Processes and Product Use	0.1	0.0	0.1	0.0	0.0	0.0	-15.6%	0.0	-4.5%
Agriculture	28.4	28.1	24.8	24.6	23.7	27.1	-4.3%	26.0	-7.1%
Waste	8.1	5.9	8.5	5.9	5.4	4.4	-45.6%	3.4	-40.7%
Total	**39.0**	**36.4**	**35.7**	**32.3**	**30.8**	**33.9**	**-12.9%**	**31.6**	**-12.3%**

- Base year emissions are emissions for FY 2005 (the base year for the FY 2020 target) and FY 2013 (the base year for the FY 2030 target) in the annual GHG inventory when the reduction target was decided. Actual emissions are emissions in the latest annual GHG inventory, and because of the recalculation with the change in estimation methods, these values are different from the base year emissions when the reduction target was decided. In addition, estimated emissions and the change ratio from the base year of FY 2020 and FY 2030 show that the estimated values at the reduction target were decided.

Nitrous oxide

The estimated emissions of nitrous oxide in FY 2020 decrease by 15.5% compared to FY 2005 (approximately 21.6 $MtCO_2$ eq.).

The estimated emissions in FY 2030 decrease by 6.1% compared to FY 2013 (by 17.4% from FY 2005) (approximately 21.1 $MtCO_2$ eq.). In the projection for nitrous oxide emissions by sector, nitrous oxide emissions from the waste sector include emissions from the energy use of waste taking into account the national circumstances for the planning and implementation of domestic policies and measures in Japan.

The main emission sources in FY 2013 are agricultural soils, manure management (the agriculture sector) and the fuel combustion sector. The reduction rate in the IPPU sector is the largest, followed by the waste sector in FY 2020. The largest reduction rate in FY 2030 is in the waste sector, followed by the fuel combustion sector.

Table 4-5 Estimated emissions of nitrous oxide by sector

	Base year emissions		Actual emissions			Estimated emissions			
	FY2005 (Base year of FY2020 target)	FY2013 (Base year of FY2030 target)	FY2005	FY2013	FY2017	FY2020		FY2030	
	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	(Changes from FY2005)	($Mt\text{-}CO_2$)	(Changes from FY2013)
Fuel combustion	7.4	6.3	7.2	6.2	6.1	6.2	-16.2%	5.9	-7.1%
Fugitive emissions from fuels	0.0	0.0	0.0	0.0	0.0	0.0	-20.2%	0.0	+0.0%
Industrial Processes and Product Use	3.1	1.7	2.9	1.6	1.2	1.8	-42.9%	1.9	+7.0%
Agriculture	11.2	11.1	10.0	9.5	9.4	11.0	-2.0%	10.9	-0.9%
Waste	3.8	3.3	5.0	4.3	4.2	2.6	-31.8%	2.3	-28.9%
Total	**25.5**	**22.5**	**25.0**	**21.6**	**20.8**	**21.6**	**-15.5%**	**21.1**	**-6.1%**

- Base year emissions are emissions for FY 2005 (the base year for the FY 2020 target) and FY 2013 (the base year for the FY 2030 target) in the annual GHG inventory when the reduction target was decided. Actual emissions are emissions in the latest annual GHG inventory, and because of the recalculation with the change in estimation methods, these values are different from the base year emissions when the reduction target was decided. In addition, estimated emissions and the change ratio from the base year of FY 2020 and FY 2030 show that the estimated values at the reduction target were decided.

Table 4-6 Estimated emissions of non-energy-related CO_2, methane and nitrous oxide

	Base year emissions		Actual emissions			Estimated emissions			
	FY2005 (Base year of FY2020 target)	FY2013 (Base year of FY2030 target)	FY2005	FY2013	FY2017	FY2020		FY2030	
	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	(Changes from FY2005)	($Mt\text{-}CO_2$)	(Changes from FY2013)
Non-energy-related CO2	85.4	75.9	93.0	82.1	79.4	74.3	-13.0%	70.8	-6.7%
Methane	39.0	36.0	35.7	32.3	30.8	33.9	-12.9%	31.6	-12.3%
Nitrous oxide	25.5	22.5	25.0	21.6	20.8	21.6	-15.5%	21.1	-6.1%

- Base year emissions are emissions for FY 2005 (the base year for the FY 2020 target) and FY 2013 (the base year for the FY2030 target) in the annual GHG inventory when the reduction target was decided. Actual emissions are emissions in the latest annual GHG inventory, and because of the recalculation with the change in estimation methods, these values are different from the base year emissions when the reduction target was decided. In addition, estimated emissions and the change ratio from the base year of FY 2020 and FY 2030 show that the estimated values at the reduction target were decided.

Fluorinated gases

The estimated emissions of fluorinated gases (HFCs, PFCs, SF_6, and NF_3) in CY 2020 increase by 64.6% from CY 2005 (approximately 45.6 $MtCO_2$ eq.). The estimated emissions in CY 2030 decrease by 25.1% from CY 2013 (increase by 4.5% from CY 2005) (approximately 28.9 $MtCO_2$ eq.).

The main emission sources in CY 2013 are fugitive emissions during production, use and disposal of HFCs used as refrigerants in refrigerators and air conditioners. Since refrigerants in refrigerators and air conditioners have shifted from hydrochlorofluorocarbons (HCFCs), which are ozone-depleting substances, to HFCs, it is expected that the emissions of fluorinated gases are projected to increase. The estimated emissions of HFCs in CY 2020 increase approximately threefold compared to the emissions in CY 2005 while they will fall below compared to the actual emissions in CY 2017. The estimated emissions of HFCs in CY 2030 decrease by 32.1% compared to CY 2013 with measures such as eliminating fluorocarbons, lowering of the GWP, and leakage prevention.

Table 4-7 Estimated emissions of fluorinated gases and each gas

	Base year emissions		Actual emissions			Estimated emissions			
	FY2005 (Base year of FY2020 target)	FY2013 (Base year of FY2030 target)	FY2005	FY2013	FY2017	FY2020		FY2030	
	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	(Changes from FY2005)	($Mt\text{-}CO_2$)	(Changes from FY2013)
HFCs	12.7	31.8	12.8	32.1	39.3	38.3	+201.6%	21.6	-32.1%
PFCs	8.6	3.3	8.6	3.3	3.3	4.0	-53.5%	4.2	+27.2%
SF_6	5.1	2.2	5.1	2.1	2.2	2.4	-52.9%	2.7	+23.5%
NF_3	1.2	1.4	1.5	1.6	0.6	1.0	-16.7%	0.5	-64.8%
Total	**27.7**	**38.6**	**27.9**	**39.1**	**45.3**	**45.6**	**+64.6%**	**28.9**	**-25.1%**

- Base year emissions are emissions for FY 2005 (the base year for the FY 2020 target) and FY 2013 (the base year for the FY 2030 target) in the annual GHG inventory when the reduction target was decided. Actual emissions are emissions in the latest annual GHG inventory, and because of the recalculation with the change in estimation methods, these values are different from the base year emissions when the reduction target was decided. In addition, estimated emissions and the change ratio from the base year of FY 2020 and FY 2030 show that the estimated values at the reduction target were decided.

4.1.4 Projections by Sector

Energy

The estimated emissions of the energy sector in FY 2020 are an increase of approximately 0.2% compared to FY 2005 (approximately 1,248.4 $MtCO_2$ eq.). In FY 2030, it is a decrease of approximately 24.6% compared to FY 2013 and a decrease of 23.8% compared to FY 2005 (approximately 949.7 $MtCO_2$ eq.).

Almost all emissions in the energy sector are CO_2 derived from fuel combustion. See "Energy-related CO_2" for the increase and decrease of future estimated emissions.

Industrial Processes and Product Use (IPPU)

The estimated emissions of the industrial processes and product Use (IPPU) sector in FY 2020 (approximately 93.0 $MtCO_2$ eq.) are an increase of approximately 9.8% compared to FY 2005. In FY 2030 (approximately 74.8 $MtCO_2$ eq.), it is a decrease of approximately 14.0% level as compared to FY 2013 and a decrease of 11.7% compared to FY 2005.

The main emission sources in FY 2013 are the mineral industry (CO_2), refrigerants (HFCs), chemical industry (CO_2, CH_4, and N_2O) and metal production (CO_2, CH_4). The main driver is an increase of emissions in the refrigerants sector since refrigerants have shifted from hydrochlorofluorocarbons (HCFCs), which are ozone-depleting substances, to HFCs. The main factor in the emission decrease in FY 2030 is an emission reduction in the refrigerants sector by leakage prevention of fluorocarbons from the use of refrigerators and air conditioners, promotion of recovery of fluorocarbons in disposal and promotion of eliminating fluorocarbons, and the lowering of the GWP.

Agriculture

The estimated emissions from the agriculture sector in FY 2020 are a decrease of approximately 3.2% compared to FY 2005 (approximately 38.7 $MtCO_2$ eq.). In FY 2030, it is a decrease of approximately 5.1% compared to FY 2013 and a decrease of 6.3% compared to FY 2005 (approximately 37.5 $MtCO_2$ eq.).

The main emission sources in FY 2013 are rice cultivation (CH_4), enteric fermentation (CH_4),

manure management (CH_4 and N_2O) and agricultural soils (N_2O). The main driver of the emission decrease in FY 2020 and FY 2030 is an emission reduction from rice cultivation by the implementation of emission reduction measures.

LULUCF

The estimated removals of the LULUCF sector in FY 2020 are approximately 36.4 $MtCO_2$. In FY 2030, it is approximately 25.9 $MtCO_2$ [20].

The LULUCF sector covers CO_2 emissions and removals resulting from carbon stock change and non-CO_2 emissions in forest land, cropland, grassland, wetlands, settlements, and other land. Major parts of removals attribute to forest land sinks.

Waste

The estimated emissions from the waste sector in FY 2020 are a decrease of approximately 26.0% compared to FY 2005 (approximately 19.3 $MtCO_2$ eq.). In FY 2030, it is a decrease of approximately 20.7% compared to FY 2013 and a decrease of approximately 33.7% compared to FY 2005 (approximately 17.3 $MtCO_2$ eq.).

The main emission sources are waste incineration and incineration with energy recovery (CO_2, CH_4, and N_2O), wastewater treatment (CH_4 and N_2O) and final disposal (CH_4). The main drivers of the emission decrease in FY 2020 and FY 2030 are a decrease in the amount of waste incineration, final disposal and treated wastewater by depopulation and promotion of 3R, and CO_2 emission reduction in plastics incineration by the introduction of biomass plastics.

4.1.5 Indirect CO_2

Since the total emissions of GHG have come to include the emissions of indirect CO_2 in the GHG inventory submitted to the UNFCCC in 2017, the future projected value is not estimated yet.

Table 4-8 Estimated emissions in FY 2020 and FY 2030 by sector (without LULUCF)

	Base year emissions		Actual emissions			Estimated emissions			
	FY2005 (Base year of FY2020 target)	FY2013 (Base year of FY2030 target)	FY2005	FY2013	FY2017	FY2020		FY2030	
	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	($Mt\text{-}CO_2$)	(Changes from FY2005)	($Mt\text{-}CO_2$)	(Changes from FY2013)
Energy	1,245.7	1,259.5	1,229.2	1,261.6	1,173.5	1,248.4	+0.2%	949.7	-24.6%
Industrial Processes and Product Use	84.7	86.9	90.2	91.7	95.3	93.0	+9.8%	74.8	-14.0%
Agriculture	40.0	39.5	35.2	34.6	33.6	38.7	-3.2%	37.5	-5.1%
Waste	26.1	21.8	27.6	22.4	21.3	19.3	-26.0%	17.3	-20.7%
Indirect CO_2	-	-	3.2	2.2	2.2	-	-	-	-
Total	**1,396.5**	**1,407.8**	**1,385.3**	**1,412.5**	**1,325.8**	**1,399.5**	**+0.2%**	**1,079.0**	**-23.4%**

- Base year emissions are emissions for FY 2005 (the base year for the FY 2020 target) and FY 2013 (the base year for the FY 2030 target) in the annual GHG inventory when the reduction target was decided. Actual emissions are emissions in the latest annual GHG inventory, and because of the recalculation with the change in estimation methods, these values are different from the base year emissions when the reduction target was decided. In addition, estimated emissions and the change ratio from the base year

[20] These estimated removals are not directly used for archiving reduction target in FY 2020 and FY 2030. The emission and removal sources in FY 2020 and 2030 don't completely correspond with those in FY 2005 and FY 2013.

of FY 2020 and FY 2030 show that the estimated values at the reduction target were decided.

4.1.6 International Aviation and Marine

Japan has neither conducted emissions projections related to fuel sold to ships and aircraft engaged in international transport nor included them in the national total.

4.2 Assessment of Total Effect of Policies and Measures

The total effect of the policies and measures is estimated by the sum of the estimate of the mitigation impact of each reduction measure shown in Table 3 of the CTF. The emission reductions in FY 2020 are 123.1 Mt-CO_2 eq. (CO_2: 103.4 Mt-CO_2 eq., methane: 0.8 Mt-CO_2 eq ., nitrous oxide: 0.6 Mt-CO_2 eq., and fluorinated gases: 18.5 Mt-CO_2 eq.), and the emission reductions in FY 2030 are 269.4 Mt-CO_2 eq. (CO_2: 218.8 Mt-CO_2 eq., methane: 2.1 Mt-CO_2 eq ., nitrous oxide: 0.9 Mt-CO_2 eq., and fluorinated gases: 48.2 Mt-CO_2 eq.). (Table 4-9)

For CO_2 projected emission reductions by reduction measures, since it is difficult to quantify the mitigation impact for all measures and the definition of the mitigation impact in CTF Table 3 is not the same for all measures, it needs to be noted that the total CO_2 emission reductions are just a reference value. Moreover, measures in which their emission reductions overlap with other measures are not included in the total effect of the policies and measures.

Table 4-9 Future level of reduced emissions by mitigation actions

	reduced emissions	
	FY2020	FY2030
	(Mt-CO_2)	(Mt-CO_2)
CO_2	103.4	218.8
Methane	0.8	2.1
Nitrous oxide	0.6	0.9
Fluorinated gases	18.5	48.2
Total	123.3	269.9

4.3 Methodology

4.3.1 Overview

The projections of GHG emissions are conducted by sectors, and the basic methodology is different between 'Fuel combustion (CO_2)' in the Energy sector and other sectors.

The projections in fuel combustion (CO_2) are conducted using the energy supply and demand model. The energy supply and demand model are composed of some sub-models and calculate the energy consumption and CO_2 emissions by inputting exogenous values such as the macro frame (The reduction measures in the model are set to avoid overlapping as much as possible and the amount of expected energy savings (CO_2 reductions) is calculated by reduction measures.). The strength of the energy supply and demand model is to be able to consider various factors affecting energy consumption and CO_2 emission comprehensively in one model. On the other

hand, the weakness is that the more complex the model, the more difficult it is to understand the calculation process.

The projections in other sectors than fuel combustion (CO_2) are conducted by the bottom-up model by using spreadsheets. This model is the same framework as the calculation methods and models of the annual GHG inventory, and the calculation years are extended for the future. Emissions and removals are calculated by multiplying the emission factors (removal factors) by activity data. The future emissions and removals are calculated by using future emission factors (removal factors) and future activity data. The future emission factors (removal factors) and future activity data are set to avoid double counting of the reduction measures. In addition, in the case that there are some reduction measures at one emission source, the synergistic reduction effect of measures is also taken into consideration. The strength of the bottom-up model is that it uses the same calculation methods as the GHG inventory and is highly consistent with the GHG inventory, and it is highly transparent due to the simple calculation methods. On the other hand, the weakness is that the interrelationship between parameters is not sufficiently reflected because the parameters used in each emission source and removal sink are set independently.

4.3.2 Key parameters and assumptions

The outlook on the macro frame is shown in Table 4-10. These assumptions are set based on the prospects of the economic growth rate, population, etc.

Table 4-10 Key assumptions on the macro frame (key parameters and assumptions) (CTF Table 5)

item	unit	Actual values									estimated values		
		FY1990	FY1995	FY2000	FY2005	FY2010	FY2015	FY2016	FY2017	FY2018	FY2020	FY2025	FY2030
Real GDP	trillion (2011) yen	411.71	440.97	464.18	492.53	493.03	517.42	521.98	531.89	535.59	570.33	NE	686.39
Population	thousands	123,611	125,570	126,926	127,768	128,057	127,095	126,933	126,706	126,443	124,100	NE	116,618
Household	10^3 households	40,670	43,900	46,782	49,063	51,842	53,332	NE	NE	NE	53,053	NE	51,231
Crude steel production	Mt	112	100	107	113	111	104	105	105	103	NE	NE	120
Cement production	Mt	87	92	80	70	51	54	54	55	56	NE	NE	56
Ethylene production	Mt	5.8	6.9	7.6	7.5	7.0	6.8	6.3	6.5	6.2	NE	NE	5.7
Paper and paperboard production	Mt	28	30	32	31	27	26	26	26	26	NE	NE	27
Commercial floor area	10^6m^2	1,285	1,498	1,656	1,759	1,830	1,869	1,885	1,893	NE	NE	NE	1,971
Passenger transport volume	10^9 passenger-km	1,295	1,385	1,417	1,409	1,347	1,399	1,417	1,440	NE	NE	NE	1,344
Freight transport volume	10^9 t-km	461	467	479	464	449	409	415	416	NE	NE	NE	520

- Projections compiled from "Economic and Fiscal Projections for Medium to Long Term Analysis (Cabinet Office)", "Medium projection (National Institute of Population and Social Security Research)", "Long-term Energy Supply and Demand Outlook relevant material (July 2015) (Agency for Natural Resources and Energy)", "National Accounts of Japan (Cabinet Office)" and other sources.

4.3.3 Estimation method for energy-related CO_2 emissions

Fuel combustion (CO_2)

The projected values for energy consumption and CO_2 emissions are calculated based on the energy supply and demand model as described above. The overall structure of the energy supply and demand model is shown in Figure 4-2. Table 4-11 shows a description of the primary sub-models included in the energy supply and demand model.

Table 4-11 Primary sub models included in the energy supply and demand model

Submodels	Details
Macroeconomic model	Estimates economic activity indices which influence energy demand directly and/or indirectly on the basis of calculation consistently balanced macro frames such as income distribution, production market, labor market and general prices
Secondary energy price model	Estimates energy purchase prices that influence energy demand and selection behavior using import prices of energy, such as crude oil and LNG and domestic general price index.
Optimum generation planning model	For electric power demand estimated by the energy supply and demand model, the economic and optimum generation mix (electric power generation and installed capacity) is estimated by dynamically minimizing the total system cost (equipment cost and fuel expenses) after conversion into a discounted current value within a target period. The optimum method is dynamic programming.
Elements bottom-up model	Estimates energy conservation indicators such as the efficiency of home appliances and fuel consumption of vehicles, to reflect an effect clearly based on the top-runner standard which is difficult to be dealt with in the regression macroeconomic model.
Energy supply and demand model	Estimates energy demand in each final consumption sector using economic activity indices, price indices, and energy conservation indicators, which are calculated from the above-mentioned models. Secondly, the primary energy supply is estimated through energy conversion, such as electric power generation. Finally, CO_2 emissions are calculated based on the consumption by energy sources.

Reference: Energy environment integrated strategy investigation (research about the future structure of energy supply and demand) investigation report (The Institute of Energy Economics, Japan)

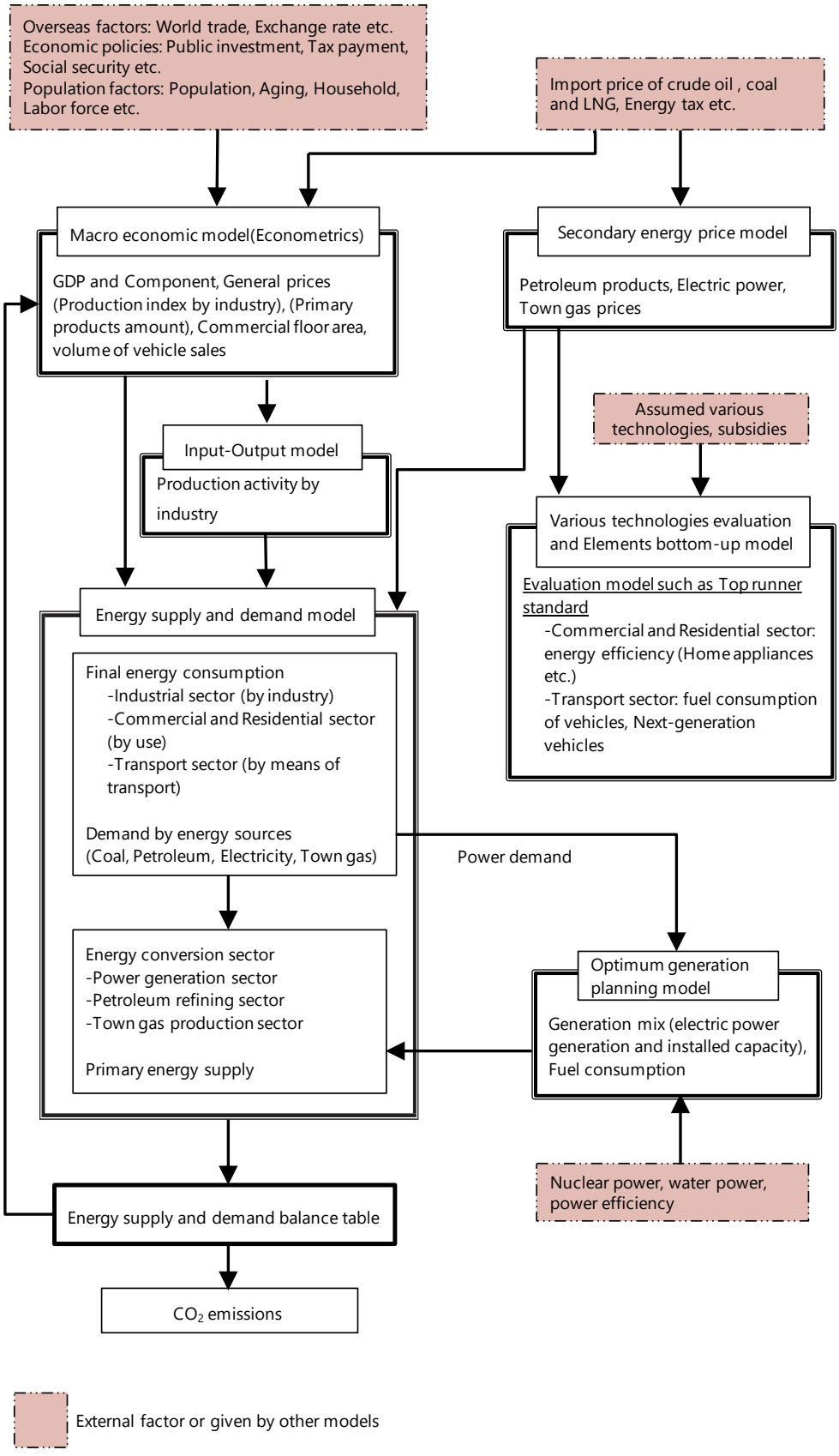

Figure 4-2 Overall structure for energy supply and demand model

Reference: Energy environment integrated strategy investigation (research about the future structure of energy supply and demand) investigation report (The Institute of Energy Economics, Japan)

Primary parameters used in the energy supply and demand models are shown in Table

4-10. The structure of power generation (Energy Mix) in the future is shown in Table 4-12. These data are entered as exogenous values. In the model, the energy consumptions and the emissions in the future are calculated based on sound policies, measures, and technologies taking into account technical constraints and cost-related issues in order to maintain consistency with the energy mix. (The reduction measures in the model are set to avoid overlapping as much as possible and expected energy savings (CO_2 reductions) are calculated by reduction measures.).

Table 4-12 Energy mix used for 2030 emission projection

	FY2030
●Final energy consumption	326 10^6 kl
(Reduction of energy saving)	50 10^6 kl
●Total electric power generation	approximately 1,065 TWh
Renewable energy	approximately 22%～24%
Nuclear	approximately 22%～20%
Coal	approximately 26%
LNG	approximately 27%
Oil	approximately 3%
(Breakdown of Renewable energy)	
Solar	approximately 7.0%
Wind	approximately 1.7%
Geothermal	approximately 1.0%～1.1%
Hydropower	approximately 8.8%～9.2%
Biomass	approximately 3.7%～4.6%

■ Fuel combustion (CH_4 and N_2O)

Based on the GHG inventory, projections of CH_4 and N_2O emissions from fuel combustion cover five sectors: industry, commercial and other, residential, transport, and energy conversion.

The projected emissions are based on calculations multiplying the projected fuel consumption for each sector by the projected emission factors in accordance with the estimation method of the GHG inventory.

The projected future activity data is established based on the future estimated indices in the associated sectors, such as the projected future Indices of Industrial Production in the industrial sector, the projected future commercial floor area in the Commercial and Other sector, and the projected future number of households in the residential sector.

The projected emission factors are the same as those used as current emission factors assuming that the present emission level is supposed to continue into the future.

■ Fugitive emissions from fuels

Based on the GHG inventory, projections of fugitive emissions from fuels cover two sub-sectors: solid fuel (CO_2 and CH_4) and fugitive emissions from oil, natural gas and other energy (CO_2, CH_4, and N_2O).

The projected future emissions are based on calculations multiplying the projected activity data (for example, coal, crude oil and natural gas outputs, crude oil refining

volume and natural gas sales) by the projected emission factor for each emission source in accordance with estimation method of the GHG inventory.

The projected future activity data is established based on the future estimated domestic energy supply and demand in the fuel combustion sector. Activity data associated with the domestic production of fossil fuels, such as the amount of production of coal, crude oil, and natural gas, is established supposing that the current activity level is supposed to continue into the future.

The projected emission factors are the same as those used as current emission factors assuming that the present emission level is supposed to continue into the future.

■ CO_2 transport and storage

The future CO_2 emissions and removals from this sector are not included in the projections.

4.3.4 IPPU

■ CO_2, CH_4, and N_2O

Based on estimations in the GHG inventory, projected emissions from IPPU sector cover five sub-sectors: mineral industry (CO_2), chemical industry (CO_2, CH_4, and N_2O), metal production (CO_2, and CH_4) non-energy products from fuels and solvent use (CO_2) and other product manufacture and use (N_2O).

The projected emissions are based on calculations multiplying the projected activity data (for example, clinker production and ethylene production) by the projected emission factor for each emission source in accordance with the estimation method of the GHG inventory.

The projected future activity data is established based on the future production of various industrial products and the projected future Indices of Industrial Production. However, activity data for the mineral Industry where the reduction measure of increasing the use of blended cement is implemented varies in accordance with the level of the measure.

The projected emission factors are the same as those used as current emission factors assuming that the present emission level is supposed to continue into the future.

■ Fluorinated gases

Based on estimation in the GHG inventory, projected future emissions from fluorinated gases cover five sectors: chemical industry (HFCs, PFCs, SF_6, and NF_3), metal production (HFCs, PFCs, and SF_6), electronic industry (HFCs, PFCs, SF_6, and NF_3), use of ozone-depleting substance alternative (HFCs and PFCs), and other product manufacture and use (PFCs and SF_6).

The projected future emissions are based on calculations multiplying the projected activity data (for example, the amount of charged refrigerant by type of refrigerant) by the projected emission factor for each emission source in accordance with the estimation method of the GHG inventory. The activity data and emission factors for emission sources

where the reduction measures, such as preventing leakage of fluorocarbons from the use of refrigeration and air conditioning equipment for business use are implemented vary in accordance with the level of the measures.

4.3.5 Agriculture

Based on estimations in the GHG inventory, projected future emissions from the agriculture sector cover seven sub-sectors: enteric fermentation (CH_4), manure management (CH_4 and N_2O), rice cultivation (CH_4), agricultural soil (N_2O), field burning of agricultural waste (CH_4 and N_2O), lime application (CO_2), and urea application (CO_2).

The projected future emissions are based on calculations multiplying the projected activity data (for example, number of domestic animals and area of cropland) by the projected emission factor for each emission source in accordance with the estimation method of the GHG inventory.

The projected future activity data is established based on the future number of livestock and area of cropland in the *Basic Plan for Food, Agriculture and Rural Areas* (Ministry of Agriculture, Forestry and Fisheries, Cabinet decision on March 31, 2015). However, the activity data for the agricultural soils where the reduction measure of 'Emissions reduction of nitrous oxide associated with the application of inorganic fertilizers' are implemented varies in accordance with the level of their measures.

The projected emission factors are the same as those used as current emission factors assuming that the present emission level is supposed to continue into the future. As for the rice cultivation where the reduction measure for the reduction of methane emissions associated with rice cultivation is implemented, emission factors are set to decrease in accordance with the level of reduction measures.

4.3.6 LULUCF

Based on the estimations in the GHG inventory, projected emissions and removals from the LULUCF sector cover CO_2 emissions and removals resulting from carbon stock change and non-CO_2 emissions on forest land, cropland, grassland, wetlands, settlements, and other lands. The emissions and removals projections of the following three activities that are 1) measures for managing forest carbon sink, 2) measures to increase carbon sinks in agricultural soils, and 3) urban greening referred in chapter 2 and 3, and other emissions and removals that are not covered in 1) to 3) are separately implemented.

1) The projection of the forest carbon sink is consistent with the target value of the forest carbon sink measures. It is estimated as net CO_2 removals resulting from carbon stock changes in the expected area of lands subject to the activities of afforestation/reforestation and deforestation under Article 3.3 and forest management under Article 3.4 of the Kyoto Protocol, when forest management and conservation will be implemented in accordance with the basic plan of forest and

forestry in Japan. The estimated net CO_2 removals are the accounted values calculated in line with the accounting rule of the CP2 KP-LULUCF and are allocated to the GHG inventory categories of forest land remaining forest land (coving only those forests meeting the definition of forest management) (living biomass pool), land converted to forest land (living biomass pool), land converted from forest land (living biomass pool) and carbon stock change in harvested wood products. Gross-net accounting is applied for afforestation/reforestation and deforestation, and narrow approach with the forest management reference level set as zero is applied for forest management, practically making it gross-net accounting. Since the accounting for those activities is gross-net accounting in practice, the projected annual net removals in FY 2020 and FY 2030 are used as the target values in FY 2020 and FY 2030. As stated above, the carbon stock changes in forests which are out of the scope of forest management activities are excluded from the estimation.

2) The target value of carbon sinks in agricultural soils is net emissions reduction from cropland management and grazing land management activities under Article 3.4 of the Kyoto protocol.

The values are estimated based on mathematical model (revised Roth-C, Rothamsted Carbon Model) taking into account future temperature and future cultivated area provided in the Basic Plan for Food, Agriculture and Rural Areas.

These are accounted values calculated in line with the rule of CP2 KP-LULUCF (= based on net-net accounting with the base year 1990) and corresponding to the carbon stock change in mineral soil of GHG inventory categories of 'cropland', 'grassland', and 'cropland/grassland converted to other land uses (forest land, wetlands, settlements and other land)'.

The future projections of net emissions in FY 2020 and FY 2030 are calculated subtracting the emissions in FY 1990 from the target value of reduction.

3) The net removals of urban greening in settlements are shown as the targets for carbon sinks due to the promotion of urban greening, including revegetation under article 3, paragraph 4 of the Kyoto Protocol. These are calculated, by estimating AD as the cumulative area of urban green space under 30 years since its establishment in FY 2020 and FY 2030, and using the estimation method of the GHG inventory. It corresponds to the removals in all carbon pools in settlements category of the GHG inventory and based on the CP2 KP-LULUCF rules. The net removals shown in the target are the accounted values under net-net accounting with the base year 1990. However, the removals in FY 1990 were practically at the ignorable level, therefore, the target estimated value for each year is used directly as the net removals in future projections.

4) The emissions and removals not contained in 1) to 3), which show approximate net emissions of 200 $ktCO_2$ as the total, are estimated in each of the most detailed categories and pool levels. Estimations related to cropland and grassland (not covered in part 2)) are calculated by using future cultivated area based on the value provided in the Basic Plan for Food, Agriculture and Rural Areas, in accordance with the estimation method of the GHG inventory. Other small sources of emissions are estimated by simple extrapolation without the assumption of scenarios, because the

contribution of these emissions and removals is not large.

Table 4-13 Future projection estimation and target removals in the LULUCF sector

Item	Unit	LULUCF contribution in the target			Annual emissions/removals			Correspondant IPCC categories of the LULUCF sector
		2020	2030	Accounting approach	1990	2020	2030	
(1) Forest sinks	$ktCO_2$	-38,000	-27,800	Gross-net accounting		-38,000	-27,800	4.A Forest land (Areas subject Forest Management and Afforestation and Reforestation), Biomass 4.B.2-4.F.2 Land converted from forest land, Biomass 4.G Harvested Wood Product
(2) Sinks in agriculture soil	$ktCO_2$	-7,680	-7,900	Net-net accounting comparing with 1990	9,043	1,363	1,143	4.B Cropland, mineral soil 4.C Grassland (Pasture), mineral soil
(3) Urban greening	$ktCO_2$	-1,283	-1,200	Net-net accounting comparing with 1990	negligible	-1,283	-1,200	4.E Settlements (Area subject to Revegetation), all carbon pools
(4) Others	$ktCO_2eq.$			Not included in the target		1,517	1,930	Categories, carbon pools, gases not included above
LULUCF Total	$ktCO_2eq.$	-46,963	-36,900			-36,404	-25,928	Overall of the LULUCF sector

4.3.7 Waste

Based on estimations in the GHG inventory, projected future emissions from the waste sector cover four sectors: solid waste disposal (CH_4), biological treatment of solid waste (CH_4 and N_2O), incineration and open burning of waste (CO_2, CH_4, and N_2O), and wastewater treatment and discharge (CH_4 and N_2O).

The projected future emissions are based on calculations multiplying the projected activity data (for example, the amount of municipal waste and industrial waste, and amount of domestic wastewater and Industrial wastewater) by the projected emission factor for each emission source in accordance with estimation method of the GHG inventory.

The future projected activity data is established based on the future population (Municipal Waste) and industrial activity (Industrial waste). However, activity data varies in accordance with the level of measures when the implementation of measures influences the activity data. The activity data for emission sources where the reduction measures for the diffusion of biomass plastics is implemented varies in accordance with the level of measures.

The projected emission factors are the same as those used as current emission factors assuming that the present emission level is supposed to continue into the future.

4.4 Sensitivity Analysis

As a sensitivity analysis, the estimation is calculated of the impact on energy-related CO_2 and cost in accordance with the changes in the generation mix. The result is shown in Table 4-14. In the case of changes in power supply resources by 1.0%, if coal-fired power generation decreases by 1.0% and nuclear power generation increases by 1.0%, for example, CO_2 emissions decrease 8.4Mt CO_2, and the power generation cost decreases by 34 billion yen.

Table 4-14 Impact on the energy-related CO_2 and cost in the case of fluctuation in the generation mix

	Coal ▲1 %	LNG ▲1 %	Nuclear ▲1%	Renewable Energy ▲1%
Coal +1%		+4.4MtCO$_2$ ▲64 billion yen	+8.4MtCO$_2$ +34 billion yen	+8.4MtCO$_2$ ▲184 billion yen
LNG +1%	▲4.4MtCO$_2$ +64 billion yen		+4.0MtCO$_2$ +98 billion yen	+4.0MtCO$_2$ ▲120 billion yen
Nuclear +1%	▲8.4MtCO$_2$ ▲34 billion yen	▲4.0MtCO$_2$ ▲98 billion yen		±0MtCO$_2$ ▲ 218 billion yen
Renewable Energy +1%	▲8.4MtCO$_2$ +184 billion yen	▲4.0MtCO$_2$ +120 billion yen	±0MtCO$_2$ +218 billion yen	

*Values are rounded numbers

Reference: Long-term Energy Supply and Demand Outlook relevant material (July 2015) (Agency for Natural Resources and Energy)

4.5 Differences from the projections reported in the BR3

No changes in projection methodologies have been made after Japan's Third Biennial Report (BR3) was submitted on December 2017. Future projected emission results in FY 2020 and FY 2030 are the same as those in BR3.

Chapter 5

Financial, Technological and Capacity-Building Support

5.1 Overview

Japan has implemented various support projects to assist developing countries, especially those making efforts to reduce GHG emissions as well as those vulnerable to the negative impacts of climate change. As reported in the second biennial report, Japan developed the Proactive Diplomatic Strategy for Countering Global Warming (ACE: Actions for Cool Earth) in November 2013 and announced to provide a total 1.6 trillion yen (approx. USD 16 billion) for developing countries by mobilizing Official Development Assistance (ODA), Other Official Flows (OOF), and Private Finance (PF) for mitigation and adaptation during the three-year period between 2013 and 2015 to strengthen "partnership" with various countries and stakeholders. This commitment was achieved in approximately one and half years.

In November 2015, at COP21, Japan announced the Actions for Cool Earth (ACE) 2.0 and committed to providing approximately 1.3 trillion yen of public and private climate finance to developing countries in 2020. Japan continues its efforts toward the achievement of ACE 2.0. In June 2019, Japan formulated the Long-term strategy under the Paris Agreement. Japan intends to generate synergy in terms of mobilizing private finance and having an impact through ODA and OOF.

Developed countries have committed to a goal of jointly mobilizing USD 100 billion a year by 2020. In 2018, at COP24, In September 2019, OECD published the report, 'Climate Finance Provided and Mobilised by Developed Countries in 2013-17'. It shows that there is continued progress towards the USD 100 billion goal.

Under these efforts, financial support from Japan in two years from 2017 to 2018 reached approximately USD 25billion (public finance amounted to approximately USD 20.5 billion, private finance amounted to approximately USD 4.5 billion).

At the G20 summit in November 2014, Japan announced contributions of USD 1.5 billion to the Green Climate Fund (GCF) for initial finance mobilization. Furthermore, in October 2019, at the High-Level Pledging Conference for the First Replenishment of the GCF, Japan announced to make contributions of up to USD 1.5 billion. As a major donor, Japan has seats as board member and alternate member at the GCF Board and has contributed to operation of the GCF actively. In July 2017, the Japan International Cooperation Agency (JICA) and MUFG Bank were accredited as implementing entities of the GCF, which were firsts for Japanese accredited entities. In July 2019, MUFG Bank's first project (pumped storage Hydroelectric with Solar PV in Chile) was approved.

5.2 National Approach to Tracking and Reporting the Provision of Support to Non-Annex Parties

The main types of climate change finance from Japan are as follows (1) grant aid; (2) loan; (3) technical assistance; (4) contribution to international organizations; (5) OOF; and (6) private finance. The Ministry of Foreign Affairs, Ministry of Finance, Ministry of Agriculture, Forestry and Fisheries, Ministry of Economy, Trade and Industry, Ministry

of the Environment and the Japan International Cooperation Agency (JICA) are implementing agencies of types (1)-(3). Type (4) is contributions to environment-related funds and development organizations such as the Global Environment Facility (GEF), Green Climate Fund (GCF), the World Bank, and the United Nations Development Programme (UNDP), which are implementing agencies of this type of assistance. Regarding type (5), the relevant Japanese ministries and Japan Bank for International Cooperation (JBIC) are the main implementing agencies and type (6) is private finance mobilized by co-finance of JBIC and trade insurance from NEXI. The Ministry of Foreign Affairs gathers the above mentioned information from the relevant ministries and institutions and compiles the Japanese climate change finance information.

Japan made a list of tangible examples of projects that contribute to climate change mitigation and adaptation in developing countries using the OECD Rio marker as one of the references. Based on the above list, Japan reports on projects contributing to climate change mitigation and adaptation. The scope of Japan's support in addressing climate change is non-Annex I parties of the UNFCCCC. Climate-specific funds are specifically those assessed to support climate change measures (mitigation, adaptation and cross-cutting). Regarding multilateral channels, the contribution for organizations that engage in climate change measures is compiled as Climate-specific. Regarding bilateral and regional channels, all projects are compiled as Climate-specific.

In this report, Japan's climate finance is newly committed or contributed during the reporting period, in 2017 and 2018, therefore, it is "new and additional". Japan defines new and additional climate finance as newly committed or disbursed finance that contributes to climate change measures in developing countries. Japan seeks new funding from the Diet on an annual basis. Climate finance reported by Japan is newly committed or disbursed finance during a given period. In other words, Japan does not include previously committed or disbursed climate finance. In addition, funds reported as committed are those that have been appropriated by Congress or cabinet decisions, or for which a commitment is made by a diplomatic agreement but not yet actually as a completed payment during the reporting period. Funds reported as disbursed are those that have actually transferred to the recipient countries.

5.3 Finance

5.3.1 Measures to Ensure the Resources to Address the Needs of non-Annex I Parties

Japan implemented projects in as many as 125 countries as of December 2018. Through Japanese embassies and JICA's overseas offices in a number of developing countries, the Japanese government has been developing projects in close consultation with the governments of developing countries and international organizations in response to the needs of the 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.

In addition, Japan has actively engaged in adaptation support for the Pacific island nations, which are especially vulnerable to the negative impacts of climate change and implemented USD 2,117 million to address climate change in those areas as of December 2018.

5.3.2 Assistance through Bilateral and Regional Frameworks and Multilateral Channels

Overview

The main components of our assistance which amount to USD 25 billion as of December 2018 are as follows. Note however, that Japan's assistance for developing countries accords importance to establishing a mechanism that not only ensures the effective use of public finance, but also facilitates the mobilization of private finance. Large-scale projects on infrastructure, such as the introduction of facilities with high energy efficiency and for renewable energy, as well as the construction of electric power transmission facilities, will require massive investments, and thus leveraging private finance will be crucially important (This is why Japanese private finance of over USD 4.5 billion had been mobilized for assistance to developing countries, as of December 2018). Japan will also assist in the capacity building to improve access to funds such as the Green Climate Fund (GCF) and Global Environment Facility (GEF) by providing study and training sessions.

(1) Mitigation: USD 22.2 billion

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

(Example)

- Geothermal power plant planning (Indonesia: USD 190 million)
- Projects for solar electricity generation system (Jordan: USD 20 million)
- Electric transmission system improvement (Uganda: USD 120 million)

(2) Adaptation: USD 2.1 billion

The purpose of these funds is to strengthen developing countries' capability to cope with natural disasters caused by climate change, and to provide the necessary equipment and facilities to implement precautionary measures against and for recovery from natural disasters including floods and droughts.

(Example)

- Water supply improvement project (India, Iraq: USD 670 million)
- Equipment provision related to disaster reduction and environment for infrastructure development (cf. Construction machines, and Water tank trucks) (Cook Islands, Kiribati, Nauru, Nepal: USD 13 million)
- Construction and rehabilitation of irrigation and agricultural land (Iraq: USD 140 million)

(3) Mitigation and Adaptation: USD 0.7 million

The purpose of these funds is to assist developing countries in multiplying to tackle

climate change issues (both mitigation and adaptation) to address climate change.

(4) REDD+: USD 117 million

The purpose of these funds is to assist developing countries in conducting surveys of forest resources, formulating forest management plan and facilitating afforestation including through the provision of equipment necessary for such activities.

(Example)

- Implementation of forest conservation and capacity building (India: USD 100 million)

Table 5-1 Provision of public financial support: summary information in 2017 (CTF Table 7)

Allocation channels	Year									
	Japanese yen - JPY					USD				
	Core/ general	Climate-specific				Core/ general	Climate-specific			
		Mitigation	Adaptation	Cross-cutting	Other		Mitigation	Adaptation	Cross-cutting	Other
Total contributions through multilateral channels:	209,919.17	2,823.76	66.00	24,716.90	0.00	1,871.50	25.17	0.59	220.36	0.00
Multilateral climate change funds	15,770.60	2,823.76	66.00	24,170.61	0.00	140.60	25.17	0.59	215.49	0.00
Other multilateral climate change funds	770.60	2,823.76	66.00	0.00	0.00	6.87	25.17	0.59	0.00	0.00
Multilateral financial institutions, including regional development banks	187,010.61	NE	NE	NE	NE	1,667.27	NE	NE	NE	NE
Specialized United Nations bodies	7,137.97	NE	NE	546.29	NE	63.64	NE	NE	4.87	NE
Total contributions through bilateral, regional and other channels		939,750.94	84,893.32	47,021.64			8,378.22	756.85	419.21	
Total	**209,919.17**	**942,574.70**	**84,959.32**	**71,738.55**		**1,871.50**	**8,403.39**	**757.44**	**639.57**	

Footnotes

The unit of JPY is "million yen" and the unit of USD is "million dollars".

The exchange rate: 112.166 JPY/USD

Table 5-2 Provision of public financial support: summary information in 2018 (CTF Table 7)

Allocation channels	Year									
	Japanese yen - JPY					USD				
	Core/ general	Climate-specific				Core/ general	Climate-specific			
		Mitigation	Adaptation	Cross-cutting	Other		Mitigation	Adaptation	Cross-cutting	Other
Total contributions through multilateral channels:	199,888.30	2,695.37	66.00	19,621.68	0.00	1,810.21	24.41	0.60	177.70	0.00
Multilateral climate change funds	213.58	2,695.37	66.00	19,095.65	0.00	1.93	24.41	0.60	172.93	0.00
Other multilateral climate change funds	213.58	2,695.37	66.00	0.00	0.00	1.93	24.41	0.60	0.00	0.00
Multilateral financial institutions, including regional development banks	192,419.51	NE	NE	NE	NE	1,742.57	NE	NE	NE	NE
Specialized United Nations bodies	7,255.21	NE	NE	526.03	NE	65.70	NE	NE	4.76	NE
Total contributions through bilateral, regional and other channels		1,017,109.28	148,958.54	28,947.12			9,211.03	1,348.98	262.15	
Total	**199,888.30**	**1,019,804.65**	**149,024.54**	**48,568.80**		**1,810.21**	**9,235.44**	**1,349.58**	**439.84**	

Footnotes

The unit of JPY is "million yen" and the unit of USD is "million dollars"

The exchange rate: 110.423 JPY/USD (2018).

■ Multilateral Channels

(1) Cooperation with International Organizations (Examples)

- Cooperation with UNDP (Adaptation)

  Through the Japan-UNDP Partnership Fund, Japan has been implementing grant aid

projects including risk analysis of tsunami, emergency responses, development of evacuation plans, education for reducing disasters, and emergency training at 115 schools in Asia-Pacific region.

- Cooperation with the Global Adaptation Network (GAN) and the Asia Pacific Adaptation Network (APAN) (Adaptation)

  Japan supports GAN and APAN, established according to proposal by UNEP, to enhance collaboration and to share knowledge on climate change adaptation among policy-makers and practitioners in the Asia-Pacific region and the world.

- Contribution to GEF (Mitigation/Adaptation)

  Japan contributed to the Global Environment Facility (GEF), which is a multilateral financial mechanism to support developing countries' efforts to preserve and improve the global environment.

- Contribution to GCF (Mitigation/Adaptation)

  Japan contributed to the Global Climate Fund (GCF), which is a fund for supporting reductions in greenhouse gases and addressing impacts of climate change in developing countries.

Table 5-3 Provision of public financial support: contribution through multilateral channels in 2017 (CTF Table 7(a))

Donor funding	Total amount				Status	Funding source	Financial instrument	Type of support	Sector
	Core/general		Climate-specific						
	Japanese yen - JPY	USD	Japanese yen - JPY	USD					
Total contributions through multilateral channels	209,919.17	1,871.50	27,606.67	246.12					
Multilateral climate change funds	15,770.60	140.60	27,060.38	241.25					
1. Global Environment Facility	15,000.00	133.73	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
2. Least Developed Countries Fund	0.00	0.00	0.00	0.00	-	-	-	-	-
3. Special Climate Change Fund	0.00	0.00	0.00	0.00	-	-	-	-	-
4. Adaptation Fund	0.00	0.00	0.00	0.00	-	-	-	-	-
5. Green Climate Fund	0.00	0.00	24,028.47	214.22	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
6. UNFCCC Trust Fund for Supplementary Activities	0.00	0.00	142.14	1.27	Disbursed	OOF	Grant	Cross-cutting	Cross-cutting
7. Other multilateral climate change funds	770.60	6.87	2,889.76	25.76					
(1) The Multilateral Fund for the Implementation of the Montreal Protocol	0.00	0.00	2,760.53	24.61	Disbursed	ODA	Grant	Mitigation	Energy
(2) Vienna Convention and the Montreal Protocol	0.00	0.00	63.23	0.56	Disbursed	ODA	Grant	Mitigation	Cross-cutting
(3) Asia Pacific Adaptation Network(APAN) and Global Adaptation Network(GAN)	0.00	0.00	66.00	0.59	Disbursed	ODA	Grant	Adaptation	Cross-cutting
(4) Asia-Pacific Network for Global Change Research(APN)	209.77	1.87	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
(5) Capacity-building Initiative for Transparency (CBIT)	560.83	5.00	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
Multilateral financial institutions, including regional development banks	187,010.61	1,667.27	NE	NE					
1. World Bank	12,762.76	113.78	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation	1,438.25	12.82	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
3. African Development Bank	3,303.86	29.46	NE	NE	Disbursed	ODA	Other (Grant/Equity)	Cross-cutting	Cross-cutting
4. Asian Development Bank	5,008.04	44.65	NE	NE	Disbursed	ODA	Other (Concessional Loan/Non-Concessional Loan/Equity)	Cross-cutting	Cross-cutting
5. European Bank for Reconstruction and Development	175.79	1.57	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	1,434.45	12.79	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
7. Other	162,887.46	1,452.20	NE	NE					
(1) International Development Association	115,473.71	1,029.49	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
(2) African Development Fund	12,763.06	113.79	NE	NE	Disbursed	ODA	Equity	Cross-cutting	Cross-cutting
(3) Asian Development Fund	34,343.60	306.19	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
(4) Fund for Special Operations (IDB)	0.00	0.00	0.00	0.00	-	-	-	-	-
(5) International Renewable Energy Agency (IRENA)	307.09	2.74	NE	NE	Disbursed	OOF	Grant	Cross-cutting	Cross-cutting
Specialized United Nations bodies	7,137.97	63.64	546.29	4.87					
1. United Nations Development Programme	7,031.86	62.69	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	106.11	0.95	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
3. Other	NE	NE	546.29	4.87					
United Nations Framework Convention on Climate Change	NE	NE	528.15	4.71	Disbursed	Other(ODA/OOF)	Grant	Cross-cutting	Cross-cutting
Intergovernmental Panel on Climate Change	NE	NE	18.14	0.16	Disbursed	OOF	Grant	Cross-cutting	Cross-cutting

Footnotes

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

The exchange rate: 112.166 JPY/USD (2017).
Values converted from Japanese Yen to USD using the exchange rate above may not match the total USD amount reported due to rounding.

Table 5-4 Provision of public financial support: contribution through multilateral channels in 2018 (CTF Table 7(a))

Donor funding	Total amount				Status	Funding source	Financial instrument	Type of support	Sector
	Core/general		Climate-specific						
	Japanese yen - JPY	USD	Japanese yen - JPY	USD					
Total contributions through multilateral channels	199,888.30	1,810.21	22,383.06	202.70					
Multilateral climate change funds	213.58	1.93	21,857.02	197.94					
1. Global Environment Facility	0.00	0.00	0.00	0.00	-	-	-	-	-
2. Least Developed Countries Fund	0.00	0.00	0.00	0.00	-	-	-	-	-
3. Special Climate Change Fund	0.00	0.00	0.00	0.00	-	-	-	-	-
4. Adaptation Fund	0.00	0.00	0.00	0.00	-	-	-	-	-
5. Green Climate Fund	0.00	0.00	18,945.52	171.57	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
6. UNFCCC Trust Fund for Supplementary Activities	NE	NE	150.12	1.36	Disbursed	OOF	Grant	Cross-cutting	Cross-cutting
7. Other multilateral climate change funds	213.58	1.93	2,761.37	25.01					
(1) The Multilateral Fund for the Implementation of the Montreal Protocol	NE	NE	2,627.17	23.79	Disbursed	ODA	Grant	Mitigation	Energy
(2) Vienna Convention and the Montreal Protocol	NE	NE	68.20	0.62	Disbursed	ODA	Grant	Mitigation	Cross-cutting
(3) Asia Pacific Adaptation Network(APAN) and Global Adaptation Network(GAN)	NE	NE	66.00	0.60	Disbursed	ODA	Grant	Adaptation	Cross-cutting
(4) Asia-Pacific Network for Global Change Research(APN)	213.58	1.93	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
(5) Capacity-building Initiative for Transparency (CBIT)	0.00	0.00	0.00	0.00	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
Multilateral financial institutions, including regional development banks	192,419.51	1,742.57	NE	NE					
1. World Bank	13,774.94	124.75	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation	1,150.60	10.42	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
3. African Development Bank	3,218.75	29.15	NE	NE	Disbursed	ODA	Other (Grant/Equity)	Cross-cutting	Cross-cutting
4. Asian Development Bank	6,425.21	58.19	NE	NE	Disbursed	ODA	Other (Concessional Loan/Non-Concessional Loan/Equity)	Cross-cutting	Cross-cutting
5. European Bank for Reconstruction and Development	271.90	2.46	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	1,319.55	11.95	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
7. Other	166,258.57	1,505.65	NE	NE					
(1) International Development Association	115,848.80	1,049.14	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
(2) African Development Fund	12,802.92	115.94	NE	NE	Disbursed	ODA	Equity	Cross-cutting	Cross-cutting
(3) Asian Development Fund	34,343.60	311.02	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
(4) Fund for Special Operations (IDB)	0.00	0.00	0.00	0.00	-	-	-	-	-
(5) International Renewable Energy Agency (IRENA)	3,263.24	29.55	NE	NE	Disbursed	OOF	Grant	Cross-cutting	Cross-cutting
Specialized United Nations bodies	7,255.21	65.70	526.03	4.76					
1. United Nations Development Programme	7,159.71	64.84	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	95.50	0.86	NE	NE	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
3. Other	NE	NE	526.03	4.76					
United Nations Framework Convention on Climate Change	NE	NE	498.58	4.52	Disbursed	Other(ODA/OOF)	Grant	Cross-cutting	Cross-cutting
Intergovernmental Panel on Climate Change	NE	NE	27.46	0.25	Disbursed	OOF	Grant	Cross-cutting	Cross-cutting

Footnotes

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

The exchange rate: 110.423 JPY/USD (2018).
Values converted from Japanese Yen to USD using the exchange rate above may not match the total USD amount reported due to rounding.

Bilateral and Regional Frameworks Channels

(1) Grant Aid in Bilateral Cooperation (Examples)

- Prevention of Disaster and Rehabilitation (Adaptation)

  Apart from the assistance during disaster, Japan has provided equipment that contributes to the prevention and mitigation of disaster and educated local government staff. For example, in Fiji, in order to prevent disasters and mitigate the impacts, Japan provides equipment such as lifeboats to local police agencies that are responsible for conservation of the ocean and life-saving and rescue operations, as well as initial action, including life-saving and searches in the event of a disaster. In Papua New Guinea, Japan installed solar electricity generation systems and seawater desalination equipment in the facilities which is easily accessible and supposed to become a base at the time of a disaster. Through such support, Japan ensures electricity and drinking water during ordinary times and a necessary lifeline at the time of a disaster (cf. power, and water sources). Furthermore, in Asia, the Middle East, and Africa, Japan contributed to increasing publicity and creating a community that enhances civil awareness of disaster prevention.

- Water Supply (Adaptation)

  Japan supports constructing and repairing water supply facilities in areas that have been experiencing from droughts caused by climate change. For example, in Ethiopia, a project to provide feed pumps with solar panels is in operation in order to develop the water infrastructure and improve water quality, which will allow people to access safe water. In Vanuatu, Japan provided equipment such as a digger for groundwater that can develop water resources for the water supply. Those activities ensure access to safe water and contribute to improving the quality of life of urban residents, including immigrants from Ambae Island due to volcanic eruption in the country.

- Support for Agriculture (Adaptation)

  In Malawi, Japan provided agricultural machines in order to support activities related to food security, and contributed to increase resilience to climate change in the country.

(2) Loan Support in Bilateral Cooperation (Examples)

- Introduction of Renewable Energy (Mitigation)

  Japan contributes to sustainable development through the introduction of renewable energy to mitigate the effects of climate change, as well as to enhance the power supply. In India, Japan contributed to industrial development and improvement of living standards in Meghalaya through optimum utilization of water resources by renovating the Umiam-Umtru Stage 3 Hydroelectric Power Station. Furthermore, Japan will support the rehabilitation of units 1–3 (15 megawatts each) of the existing Olkaria I Geothermal Power Plant to approximately 51 megawatts (17 megawatts each) in the Olkaria geothermal field in Nakuru County in central Kenya.

- Improvement of Energy Access via the Maintenance of Electricity Transmission Equipment (Mitigation)

  Japan has been cooperating in reducing GHG emissions through the electrification of local areas and the improvement of transmission efficiency, while aiming for the

transfer to clean energy. For example, in Cambodia, Japan supports an increase in the number of substations and the expansion of the transmission and distribution network in Phnom Penh to stabilize the power supply in the metropolitan region. In Uganda, in order to stabilize and improve the reliability of the power supply in the Greater Kampala Metropolitan Area, Japan supports the construction of new 220 kilovolt substations, upgrades to existing 132 kilovolt substations, strengthening of the urban electricity transmission grid, and the provision of a mobile substation for emergency responses.

- Climate Change Program Loan (Mitigation/Adaptation)

  Japan's ODA loan is implemented by JICA, and one of its characteristic programs is the Climate Change Program Loan (CCPL). This project helps to develop a multi-year national climate change policy for developing countries (the "policy matrix") based on policy dialogs, and supports the implementation of those policies. In this process, Japan applies various ODA schemes such as loans or technical assistance. Japan monitors the implementation of the policy matrix every year, and considers the possibilities of extending loans. Japan is currently implementing the operation in Vietnam, by using the Program Loan until 2017.

(3) Technical Assistance in Bilateral Cooperation (Examples)

- Prevention of Disaster and Rehabilitation (Adaptation)

  Japan has provided assistance for disaster risk reduction, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, adopted by UN Member States in 2015 and the Sendai Cooperation Initiative for Disaster Risk Reduction of the government of Japan, in addition to initiatives on Climate Change. Japan has provided assistance for capacity development to the government of the Philippines, Chile, and other countries and has provided assistance to facilitate the implementation of measures for disasters, such as formulating urban storm water drainage plan in Sri Lanka.

- Agriculture (Adaptation)

  Japan promotes the technological transfer of irrigation skills which are essential for agriculture. In 20 countries such as Jamaica and Afghanistan, training in the operation and maintenance (O&M) of irrigation facilities and technological transfer to farmers were implemented for irrigation officers of the central and local governments. In Kenya, Japan supports the adoption and nationwide dissemination of rice production techniques in irrigation schemes to increase the production.

- Introduction of Energy Savings and Renewable Energy (Mitigation)

  Japan promotes decarbonization in developing countries by utilizing Japan's expertise on energy efficiency and conservation (EE&C) and renewable energy. For example, Japan has been providing training programs on EE&C policies and technologies for participants from Latin America and Asia, and planning and constructing hydropower facilities and optimal dam operations, including visiting hydropower facilities for sub-Saharan countries In Malaysia, Japan proposed a project for the development of advanced hybrid Ocean Thermal Energy Conversion

(H-OTEC). Through the joint research, the University of Technology of Malaysia and a Japanese research institution develop new hybrid-system OTEC technology, establish a method for multiple uses of deep-sea water, and implement human capital development, in order to establish a sustainable Malaysia model.

- Promotion of REDD+ Efforts (Adaptation/Mitigation)

  Japan is taking action to strengthen the policy and to expand technology that contributes to forest conservation, particularly through technical cooperation projects of REDD+ in 10 developing countries. Furthermore, Japan implemented training courses in Japan. These courses are for policy formulation and implementation based on the international framework of REDD+ targeted for senior officials in 11 countries, for the knowledge and technology required for rainforest conservation using JJ-FAST (JICA-JAXA Forest Early Warning System in the Tropics) for 11 countries, and for basic GIS technology for forest resource monitoring for 17 countries. JICA started preparations to apply for REDD+ result-based payment (RBP) under the Green Climate Fund (GCF) for Laos and Vietnam. In order to secure long-term financial commitments for REDD+ in developing countries, external funds, such as RBP, and cooperation with the private sector are crucial for reducing deforestation and forest degradation.

Table 5-5 Provision of public financial support : contribution through bilateral, regional and other channels in 2017 (CTF Table 7(b))

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
	Total contributions through bilateral, regional and other channels	1,071,665.90	9,554.28						
1	Albania, Egypt, Ethiopia, Sudan, Uganda, Mexico, Iraq, Myanmar, India	21.32	0.19	disbursed	ODA	Grant	Cross-cutting	Cross-cutting	
2	Albania, Tunisia, Gabon, Ecuador, Guyana, Mongolia	9.31	0.08	disbursed	ODA	Grant	Mitigation	Water and sanitation	
3	Algeria, Tunisia, Burundi, Comoro, Madagascar, Mali, Sao Tome and Principe, Senegal, Burkina Faso	12.44	0.11	disbursed	ODA	Grant	Mitigation	Energy	
4	Antigua Barbuda	200.00	1.78	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
5	Armenia	1,540.00	13.73	committed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
6	Armenia, Georgia, Uzbekistan	11.08	0.10	disbursed	ODA	Grant	Cross-cutting	Cross-cutting	
7	Armenia, Tajikistan, Uzbekistan	17.43	0.16	disbursed	ODA	Grant	Mitigation	Agriculture	
8	Asia, Oceania	25.00	0.22	disbursed	OOF	Grant	Adaptation	Cross-cutting	
9	Asia, Oceania	5.00	0.04	disbursed	OOF	Grant	Adaptation	Cross-cutting	
10	Azerbaijan, Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan	14.88	0.13	disbursed	ODA	Grant	Mitigation	Energy	
11	Bahamas, Jamaica, Grenada, Saint Lucia, Saint Vincent, Guyana, Fiji, Niwe, Federation of Micronesia, Papua New Guinea, Tonga	28.27	0.25	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
12	Bangladesh	5,593.00	49.86	committed	ODA	Concessional loan	Mitigation	Transport	
13	Bangladesh	10,745.00	95.80	committed	ODA	Concessional loan	Mitigation	Energy	
14	Bangladesh	20,477.00	182.56	committed	ODA	Concessional loan	Mitigation	Transport	
15	Bangladesh	11,853.00	105.67	committed	ODA	Concessional loan	Mitigation	Agriculture	
16	Bangladesh	9.00	0.08	disbursed	OOF	other	Mitigation	Water and sanitation	
17	Belize, Jamaica, Antigua and Barbuda, Grenada, Saint Lucia, Saint Vincent, Surinam	10.85	0.10	disbursed	ODA	Grant	Mitigation	Energy	
18	Bhutan	979.00	8.73	committed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
19	Bhutan	12.68	0.11	disbursed	ODA	Grant	Mitigation	Transport	
20	Bolivia	1,698.00	15.14	committed	ODA	Grant	Mitigation	Transport	
21	Bosnia and Herzegovina, Kenya, Myanmar, Sri Lanka, India, Philippines	6.02	0.05	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
22	Botswana, Uzbekistan, Philippines, Colombia, Indonesia, Tanzania, Vietnam, Myanmar	56.00	0.50	committed	ODA	Grant	Cross-cutting	Forestry	
23	Burkina Faso	18.00	0.16	disbursed	ODA	Grant	Mitigation	Transport	
24	Cambodia	8.00	0.07	disbursed	OOF	other	Adaptation	Agriculture	
25	Cambodia	10.00	0.09	disbursed	OOF	other	Mitigation	Energy	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
26	Cambodia	15.00	0.13	disbursed	OOF	other	Mitigation	Energy	
27	Cambodia	15.00	0.13	disbursed	OOF	other	Mitigation	Energy	
28	Cambodia, Myanmar, Peru	69.00	0.62	committed	OOF	Grant	Cross-cutting	Forestry	
29	Cameroon, Democratic Republic of the Congo, Gabon, Kenya, Mozambique, Zambia, Myanmar, Cambodia, Viet Nam, Papua New Guinea, Solomon	18.42	0.16	disbursed	ODA	Grant	Cross-cutting	Forestry	
30	Chile	16.70	0.15	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
31	Chile	5.33	0.05	disbursed	ODA	Grant	Adaptation	Water and sanitation	
32	Chile	0.00	0.00	disbursed	OOF	other	Mitigation	Energy	
33	China	32.00	0.29	disbursed	ODA	Grant	Mitigation	Cross-cutting	
34	China	10.00	0.09	disbursed	OOF	other	Mitigation	Water and sanitation	
35	China, Thailand, Indonesia, India, Mexico, etc.	1,305.00	11.63	disbursed	OOF	Grant	Mitigation	Energy	
36	Comoro, Indonesia, Philippines, Nauru, Solomon, Tonga	11.39	0.10	disbursed	ODA	Grant	Mitigation	Energy	
37	Costa Rica	25,991.00	231.72	committed	ODA	Concessional loan	Mitigation	Energy	
38	Costa Rica, Cuba, Guatemala, Mexico, Nicaragua, Argentina, Bolivia, Peru, Venezuela	21.85	0.19	disbursed	ODA	Grant	Mitigation	Water and sanitation	
39	Democratic Republic of Congo	5.85	0.05	disbursed	ODA	Grant	Cross-cutting	Forestry	
40	Democratic Republic of Congo, Ethiopia, Malawi, Rwanda, Zambia, Honduras, Georgia, Tajikistan, Bhutan, Myanmar, Nepal, Pakistan, Lao People's Democratic Republic	17.35	0.15	disbursed	ODA	Grant	Mitigation	Energy	
41	Democratic Republic of the Congo, Mozambique, Colombia, Malaysia, Philippines	3.16	0.03	disbursed	ODA	Grant	Cross-cutting	Forestry	
42	Djibouti	10.97	0.10	disbursed	ODA	Grant	Mitigation	Energy	
43	Ecuador	2,804.15	25.00	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
44	Egypt	21,535.87	192.00	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
45	Egypt, Brazil, Azerbaijan, Kazakhstan, Uzbekistan, Myanmar, Pakistan, Mongolia	12.02	0.11	disbursed	ODA	Grant	Mitigation	Energy	
46	Egypt, Iran, Iraq, Sri Lanka, Malaysia, Thailand	6.81	0.06	disbursed	ODA	Grant	Mitigation	Energy	
47	Egypt, Kenya, Nigeria, South Sudan, Azerbaijan, Nepal, Bangladesh, Tunisia, South Africa, Ethiopia, Malawi, Zimbabwe, Rwanda, Venezuela, Iraq, Myanmar, Sri Lanka	25.40	0.23	disbursed	ODA	Grant	Mitigation	Water and sanitation	
48	Egypt, Malawi, Mozambique, Rwanda, Southern Sudan, Tanzania, Uganda, Myanmar, Cambodia, Philippines	42.18	0.38	disbursed	ODA	Grant	Adaptation	Agriculture	
49	Egypt, Mexico, Argentina, Chile, Afghanistan, Myanmar, India, Malaysia, Mongolia	11.15	0.10	disbursed	ODA	Grant	Mitigation	Cross-cutting	
50	Egypt, Mexico, Iran, Sri Lanka, China, Thailand, Fiji	18.16	0.16	disbursed	ODA	Grant	Mitigation	Cross-cutting	
51	El Salvador	4.63	0.04	disbursed	ODA	Grant	Mitigation	Energy	
52	Ethiopia	2.51	0.02	disbursed	ODA	Grant	Adaptation	Cross-cutting	
53	Ethiopia, Kenya, Djibouti, Tanzania, El Salvador, Nicaragua, Bolivia, Ecuador, Indonesia	29.29	0.26	disbursed	ODA	Grant	Mitigation	Energy	
54	Ethiopia, Kenya, Djibouti, Tanzania, Peru, Indonesia	4.77	0.04	disbursed	ODA	Grant	Mitigation	Energy	
55	Ethiopia, Kenya, Malawi, Guyana, Indonesia, Mongolia, Papua New Guinea, Solomon	13.95	0.12	disbursed	ODA	Grant	Cross-cutting	Forestry	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
56	Ethiopia, Mauritius, Zambia, Panama, Brazil, Bangladesh, Indonesia, Fiji	10.15	0.09	disbursed	ODA	Grant	Adaptation	Water and sanitation	
57	Ethiopia, Nigeria, Sudan, South Sudan, Zambia, Brazil, Jordan, Myanmar, Pakistan, Cambodia, Timor-Leste, Malawi, Mozambique, Rwanda, Honduras, Venezuela, Iraq, Azerbaijan, Georgia, Sri Lanka, Lao People's Democratic Republic, Viet Nam	35.54	0.32	disbursed	ODA	Grant	Mitigation	Water and sanitation	
58	Fiji, Samoa, Palau, Indonesia	13.00	0.12	disbursed	ODA	Grant	Adaptation	Cross-cutting	
59	Fiji, Vanuatu, Samoa	34.00	0.30	disbursed	OOF	Grant	Adaptation	Cross-cutting	
60	Former Yugoslav Republic of Macedonia, Malawi, Argentina, Myanmar, India	24.72	0.22	disbursed	ODA	Grant	Adaptation	Cross-cutting	
61	Former Yugoslav Republic of Macedonia, Nicaragua, Myanmar, Nepal	7.82	0.07	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
62	Grenada, Saint Lucia, Saint Vincent, Viet Nam, Fiji, Nauru, Marshall	9.48	0.08	disbursed	ODA	Grant	Adaptation	Cross-cutting	
63	Haiti	364.00	3.25	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
64	Haiti	620.00	5.53	disbursed	ODA	Grant	Cross-cutting	Energy	
65	Honduras	1,728.00	15.41	committed	ODA	Grant	Mitigation	Water and sanitation	
66	Honduras	958.00	8.54	committed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
67	Honduras	9.41	0.08	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
68	India	6,224.00	55.49	committed	ODA	Concessional loan	Cross-cutting	Forestry	
69	India	14,512.00	129.38	committed	ODA	Concessional loan	Cross-cutting	Forestry	
70	India	33,321.00	297.07	committed	ODA	Concessional loan	Mitigation	Transport	
71	India	108,456.00	966.92	committed	ODA	Concessional loan	Mitigation	Transport	
72	India	67,170.00	598.84	committed	ODA	Concessional loan	Mitigation	Transport	
73	India	13,725.00	122.36	committed	ODA	Concessional loan	Mitigation	Agriculture	
74	India	21,297.00	189.87	committed	ODA	Concessional loan	Adaptation	Agriculture	
75	India	0.01	0.00	disbursed	ODA	Grant	Mitigation	Cross-cutting	
76	India	65.10	0.58	disbursed	ODA	Grant	Adaptation	Agriculture	
77	India	40.60	0.36	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
78	India	8.00	0.07	disbursed	OOF	other	Adaptation	Water and sanitation	
79	India	54.00	0.48	disbursed	OOF	other	Mitigation	Energy	
80	India	22,215.00	198.05	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
81	Indonesia	48,237.00	430.05	committed	ODA	Concessional loan	Mitigation	Agriculture	
82	Indonesia	15,896.00	141.72	committed	ODA	Concessional loan	Mitigation	Agriculture	
83	Indonesia	9,855.00	87.86	committed	ODA	Concessional loan	Adaptation	Prevention and Restoration of disaster	
84	Indonesia	30.58	0.27	disbursed	ODA	Grant	Cross-cutting	Agriculture	
85	Indonesia	14.20	0.13	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
86	Indonesia	3.01	0.03	disbursed	ODA	Grant	Adaptation	Agriculture	
87	Indonesia	78.00	0.70	disbursed	ODA	Grant	Mitigation	Cross-cutting	
88	Indonesia	21.00	0.19	disbursed	ODA	Grant	Mitigation	Cross-cutting	
89	Indonesia	25.00	0.22	disbursed	OOF	other	Mitigation	Energy	
90	Indonesia	25.00	0.22	disbursed	OOF	other	Mitigation	Water and sanitation	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
91	Indonesia	49.00	0.44	disbursed	OOF	other	Mitigation	Cross-cutting	
92	Indonesia	21.00	0.19	disbursed	OOF	other	Mitigation	Energy	
93	Indonesia	22,208.87	198.00	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
94	Indonesia	188,214.55	1,678.00	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
95	Indonesia	9,270.00	82.65	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
96	Indonesia	2,467.65	22.00	committed	OOF	Non-concessional loan	Mitigation	Energy	
97	Indonesia	81,993.35	731.00	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
98	Indonesia	53.00	0.47	disbursed	OOF	Grant	Adaptation	Cross-cutting	
99	Indonesia	27.00	0.24	disbursed	OOF	other	Mitigation	Cross-cutting	
100	Indonesia	14.00	0.12	disbursed	OOF	other	Mitigation	Cross-cutting	
101	Indonesia	14.00	0.12	disbursed	OOF	other	Mitigation	Cross-cutting	
102	Indonesia	138.00	1.23	committed	OOF	other	Mitigation	Energy	
103	Indonesia	14.00	0.12	committed	OOF	other	Mitigation	Energy	
104	Indonesia	35.00	0.31	committed	OOF	other	Mitigation	Water and sanitation	
105	Indonesia, Guinea-Bissau, Kiribati, Cook Islands, Comoro, Samoa, Sao Tome and Principe, Saint Vincent and Grenadine Islands, Solomon Islands, Tuvalu, Tonga, Nauru, Niue, Vanuatu, Palau, Bangladesh, Marshall Islands, Micronesia, Republic of Maldives	13.00	0.12	disbursed	OOF	other	Mitigation	Energy	
106	Indonesia, Philippines	43.48	0.39	disbursed	ODA	Grant	Mitigation	Forestry	
107	Indonesia, Thailand, Philippines, Viet Nam, Mexico, Mongolia, Lao People's Democratic Republic	6,000.00	53.49	committed	OOF	other	Mitigation	Cross-cutting	
108	Iraq	21,556.00	192.18	committed	ODA	Concessional loan	Mitigation	Energy	
109	Iraq	27,220.00	242.68	committed	ODA	Concessional loan	Mitigation	Energy	
110	Iraq	232.69	2.07	disbursed	ODA	Grant	Adaptation	Agriculture	
111	Jamaica	1,682.75	15.00	committed	ODA	Concessional loan	Mitigation	Energy	
112	Kenya	138.66	1.24	disbursed	ODA	Grant	Adaptation	Agriculture	
113	Kenya	9.04	0.08	disbursed	ODA	Grant	Adaptation	Agriculture	
114	Kenya	25.00	0.22	disbursed	OOF	other	Mitigation	Energy	
115	Kenya	11.00	0.10	disbursed	OOF	other	Mitigation	Energy	
116	Kenya, Argentina, Iran, Lao People's Democratic Republic	17.91	0.16	disbursed	ODA	Grant	Mitigation	Agriculture	
117	Kenya, Ethiopia, Palau, Republic of Maldives	80.00	0.71	committed	OOF	other	Mitigation	Cross-cutting	
118	Kenya, Niger, Senegal	2.74	0.02	disbursed	ODA	Grant	Adaptation	Cross-cutting	
119	Kenya, Uganda, Indonesia, Fiji	27.29	0.24	disbursed	ODA	Grant	Cross-cutting	Cross-cutting	
120	Kyrgyz Republic	616.00	5.49	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
121	Kyrgyz Republic	128.00	1.14	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
122	Lao People's Democratic Republic	837.00	7.46	committed	ODA	Grant	Mitigation	Agriculture	
123	Lao People's Democratic Republic	7.19	0.06	disbursed	ODA	Grant	Mitigation	Transport	
124	Lao People's Democratic Republic	12.22	0.11	disbursed	ODA	Grant	Mitigation	Water and sanitation	
125	Lao People's Democratic Republic	8.00	0.07	disbursed	OOF	other	Adaptation	Agriculture	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
126	Lao People's Democratic Republic	80.00	0.71	committed	OOF	other	Mitigation	Forestry	
127	Macedonia, former Yugoslav Republic, Albania, Morocco, Brazil, Chile, Peru, Georgia, Myanmar, Sri Lanka, Malaysia, Thailand, Viet Nam, Samoa	13.69	0.12	disbursed	ODA	Grant	Adaptation	Water and sanitation	
128	Madagascar	200.00	1.78	disbursed	ODA	Grant	Mitigation	Water and sanitation	
129	Madagascar, Malawi, Zimbabwe, Rwanda, Sudan, Tanzania, Uganda, Zambia, Afghanistan, Myanmar, Sri Lanka, Cambodia	17.32	0.15	disbursed	ODA	Grant	Adaptation	Agriculture	
130	Malaysia	60.00	0.53	committed	OOF	other	Mitigation	Energy	
131	Malaysia, Thailand, Viet Nam, Palau	131.00	1.17	committed	OOF	other	Mitigation	Cross-cutting	
132	Marshall	1,070.00	9.54	committed	ODA	Grant	Mitigation	Energy	
133	Marshall, Federation of Micronesia, Tonga, Samoa	8.11	0.07	disbursed	ODA	Grant	Mitigation	Water and sanitation	
134	Mexico, Chile, Costa Rica	50.00	0.45	committed	OOF	other	Mitigation	Cross-cutting	
135	Mongolia	7.47	0.07	disbursed	ODA	Grant	Mitigation	Cross-cutting	
136	Mongolia	7.27	0.06	disbursed	ODA	Grant	Adaptation	Transport	
137	Mongolia	80.00	0.71	disbursed	ODA	Grant	Adaptation	Cross-cutting	
138	Mongolia	10.00	0.09	disbursed	ODA	Grant	Mitigation	Cross-cutting	
139	Mongolia	1,009.49	9.00	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
140	Mongolia	22.00	0.20	disbursed	OOF	Grant	Adaptation	Cross-cutting	
141	Mongolia, Bangladesh, Viet Nam, Lao People's Democratic Republic, Cambodia, Myanmar	90.00	0.80	committed	OOF	other	Mitigation	Cross-cutting	
142	Morocco	300.00	2.67	disbursed	ODA	Grant	Mitigation	Transport	
143	Morocco, Ghana, Liberia, Malawi, Mali, Mozambique, Zimbabwe	15.35	0.14	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
144	Mozambique	7.56	0.07	disbursed	ODA	Grant	Cross-cutting	Forestry	
145	Mozambique	16.81	0.15	disbursed	ODA	Grant	Adaptation	Water and sanitation	
146	Mozambique	2.66	0.02	disbursed	ODA	Grant	Adaptation	Water and sanitation	
147	Multiple countries in Oceania, Palau, Solomon, Samoa	194.52	1.73	disbursed	ODA	Grant	Mitigation	Water and sanitation	
148	Multiple regions including Belize, Saint Lucia, Guyana, Surinam, Myanmar, Kiribati, Palau, Tuvalu, Egypt, Brazil, India, Malaysia, Philippines, Cuba, Dominican Republic, Argentina, Chile, Colombia, Ecuador, Tajikistan	52.80	0.47	disbursed	ODA	Grant	Mitigation	Energy	
149	Multiple regions including Dominican Republic, Honduras, Argentina, Bolivia, Brazil, Peru, Ukraine, Egypt, Belize, Antigua-Barbuda, Kyrgyz Republic, Sri Lanka, Pakistan, Bangladesh	24.36	0.22	disbursed	ODA	Grant	Mitigation	Energy	
150	Multiple regions including Egypt, Mozambique, Jamaica, Afghanistan, Bangladesh, Kiribati, Federation of Micronesia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Argentina, Bolivia, Ecuador, Paraguay, Peru, Venezuela	21.63	0.19	disbursed	ODA	Grant	Mitigation	Water and sanitation	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
151	Multiple regions including Malawi, Zimbabwe, Uganda, Timor-Leste, Marshall, Egypt, Ethiopia, Guinea, Rwanda, Peru, Iraq, Malaysia	11.15	0.10	disbursed	ODA	Grant	Mitigation	Water and sanitation	
152	Multiple regions including Mozambique, Tanzania, Iran, Myanmar, and Papua New Guinea, Zambia, Myanmar, Sri Lanka, Bangladesh, Mongolia	32.24	0.29	disbursed	ODA	Grant	Mitigation	Energy	
153	Multiple regions including Ukraine, Tajikistan, Turkmenistan, Uzbekistan, Afghanistan, Myanmar, Sri Lanka, Nepal, Pakistan, Indonesia, Mongolia, Philippines, Papua New Guinea, Egypt, South Africa, Carbovelde, Ghana, Kenya, Malawi, Nigeria, Tanzania, Uganda	24.10	0.21	disbursed	ODA	Grant	Mitigation	Cross-cutting	
154	Myanmar	23,979.00	213.78	committed	ODA	Concessional loan	Mitigation	Cross-cutting	
155	Myanmar	4,856.00	43.29	committed	ODA	Concessional loan	Mitigation	Energy	
156	Myanmar	10,787.00	96.17	committed	ODA	Concessional loan	Mitigation	Energy	
157	Myanmar	15,135.00	134.93	committed	ODA	Concessional loan	Cross-cutting	Agriculture	
158	Myanmar	32.00	0.29	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
159	Myanmar	8.00	0.07	disbursed	OOF	other	Cross-cutting	Agriculture	
160	Myanmar	15.00	0.13	disbursed	OOF	other	Mitigation	Energy	
161	Myanmar	30.00	0.27	disbursed	OOF	other	Mitigation	Water and sanitation	
162	Myanmar	15.00	0.13	disbursed	OOF	other	Mitigation	Energy	
163	Myanmar	14.00	0.12	disbursed	OOF	other	Mitigation	Water and sanitation	
164	Myanmar	14.00	0.12	disbursed	OOF	other	Mitigation	Water and sanitation	
165	Myanmar	26.00	0.23	committed	OOF	other	Mitigation	Energy	
166	Myanmar	14.00	0.12	committed	OOF	other	Mitigation	Energy	
167	Myanmar, Fiji, Kiribati, Papua New Guinea, Solomon	7.29	0.06	disbursed	ODA	Grant	Cross-cutting	Cross-cutting	
168	Myanmar, Thailand, Philippines	42.00	0.37	committed	ODA	Grant	Cross-cutting	Forestry	
169	Nepal	25.31	0.23	disbursed	ODA	Grant	Cross-cutting	Water and sanitation	
170	Nepal	59.00	0.53	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
171	Nepal	36.00	0.32	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
172	Nepal	32.00	0.29	disbursed	ODA	Grant	Adaptation	Agriculture	
173	Nepal	81.00	0.72	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
174	Nepal	46.00	0.41	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
175	Nepal	20.00	0.18	disbursed	ODA	Grant	Adaptation	Cross-cutting	
176	Nepal	6.00	0.05	disbursed	ODA	Grant	Adaptation	Cross-cutting	
177	Nepal	5.00	0.04	disbursed	ODA	Grant	Adaptation	Cross-cutting	
178	Nicaragua	76.34	0.68	disbursed	ODA	Grant	Adaptation	Water and sanitation	
179	Niger, Zimbabwe, Rwanda, Sudan, Tanzania, Uganda, Sri Lanka, Pakistan, Cambodia, Philippines	7.37	0.07	disbursed	ODA	Grant	Mitigation	Agriculture	
180	Pakistan	2,665.00	23.76	committed	ODA	Concessional loan	Mitigation	Transport	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
181	Pakistan	3.68	0.03	disbursed	ODA	Grant	Mitigation	Energy	
182	Palau	53.90	0.48	disbursed	ODA	Grant	Mitigation	Transport	
183	Papua New Guinea	11.88	0.11	disbursed	ODA	Grant	Mitigation	Cross-cutting	
184	Philippines	15,928.00	142.00	committed	ODA	Concessional loan	Adaptation	Prevention and Restoration of disaster	
185	Philippines	16,259.28	144.96	committed	ODA	Concessional loan	Mitigation	Water and sanitation	
186	Philippines	68.08	0.61	disbursed	ODA	Grant	Mitigation	Transport	
187	Philippines	15.52	0.14	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
188	Philippines	53.00	0.47	disbursed	ODA	Grant	Cross-cutting	Forestry	
189	Philippines	8.00	0.07	disbursed	OOF	other	Cross-cutting	Energy	
190	Philippines	9.00	0.08	disbursed	OOF	other	Mitigation	Water and sanitation	
191	Philippines	45.00	0.40	disbursed	OOF	other	Mitigation	Water and sanitation	
192	Philippines	15.00	0.13	disbursed	OOF	other	Mitigation	Energy	
193	Philippines	103.00	0.92	committed	OOF	other	Mitigation	Energy	
194	Philippines	3.00	0.03	committed	OOF	other	Mitigation	Water and sanitation	
195	Philippines	211.00	1.88	committed	OOF	other	Mitigation	Energy	
196	Rwanda	4.53	0.04	disbursed	ODA	Grant	Adaptation	Agriculture	
197	Saint Lucia	200.00	1.78	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
198	Saudi Arabia	24.00	0.21	disbursed	OOF	other	Mitigation	Cross-cutting	
199	Sierra Leone	2.00	0.02	disbursed	ODA	Grant	Adaptation	Cross-cutting	
200	Sierra Leone	26.00	0.23	disbursed	ODA	Grant	Adaptation	Cross-cutting	
201	Solomon	21.49	0.19	disbursed	ODA	Grant	Cross-cutting	Forestry	
202	Somalia, South Sudan, Nigeria, Ethiopia, Yemen, Kenya	3,120.00	27.82	disbursed	ODA	Grant	Adaptation	Cross-cutting	
203	Somalia, South Sudan, Yemen, Nigeria	1,210.00	10.79	disbursed	ODA	Grant	Adaptation	Cross-cutting	
204	South Africa, Botswana, Ethiopia, Malawi, Zimbabwe, Namibia	8.34	0.07	disbursed	ODA	Grant	Mitigation	Energy	
205	Sri Lanka	31,810.00	283.60	committed	ODA	Concessional loan	Mitigation	Water and sanitation	
206	Sri Lanka	2,503.00	22.32	committed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
207	Sri Lanka	37.00	0.33	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
208	Sri Lanka	39.00	0.35	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
209	Sri Lanka	18.00	0.16	disbursed	ODA	Grant	Adaptation	Cross-cutting	
210	Sri Lanka	16.00	0.14	disbursed	ODA	Grant	Adaptation	Cross-cutting	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
211	Sri Lanka	20.00	0.18	disbursed	ODA	Grant	Adaptation	Cross-cutting	
212	Sri Lanka	6.00	0.05	disbursed	ODA	Grant	Adaptation	Cross-cutting	
213	Sri Lanka, Republic of Maldives	15.00	0.13	committed	OOF	other	Mitigation	Energy	
214	Tanzania	2.65	0.02	disbursed	ODA	Grant	Mitigation	Cross-cutting	
215	Tanzania	5.29	0.05	disbursed	ODA	Grant	Mitigation	Energy	
216	Tanzania, Brazil, Sri Lanka, India, Nepal, Pakistan, Bangladesh, Philippines, Viet Nam, Fiji	16.98	0.15	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
217	Thailand	2.22	0.02	disbursed	ODA	Grant	Cross-cutting	Cross-cutting	
218	Thailand	59.22	0.53	disbursed	ODA	Grant	Cross-cutting	Cross-cutting	
219	Thailand	143.09	1.28	disbursed	ODA	Grant	Mitigation	Energy	
220	Thailand	2.51	0.02	disbursed	ODA	Grant	Mitigation	Transport	
221	Thailand	0.55	0.00	disbursed	ODA	Grant	Adaptation	Water and sanitation	
222	Thailand	25.00	0.22	disbursed	OOF	other	Mitigation	Cross-cutting	
223	Thailand	20.00	0.18	disbursed	OOF	other	Mitigation	Energy	
224	Thailand	53.00	0.47	disbursed	OOF	other	Mitigation	Energy	
225	Thailand	27.00	0.24	disbursed	OOF	other	Mitigation	Energy	
226	Thailand	23.00	0.21	disbursed	OOF	other	Mitigation	Water and sanitation	
227	Thailand	26.00	0.23	disbursed	OOF	other	Mitigation	Water and sanitation	
228	Thailand	29.00	0.26	disbursed	OOF	Grant	Adaptation	Cross-cutting	
229	Thailand	15.00	0.13	disbursed	OOF	other	Mitigation	Water and sanitation	
230	Thailand	15.00	0.13	disbursed	OOF	other	Mitigation	Transport	
231	Thailand	15.00	0.13	disbursed	OOF	other	Mitigation	Energy	
232	Thailand	17.00	0.15	committed	OOF	other	Mitigation	Energy	
233	Thailand	8.00	0.07	committed	OOF	other	Mitigation	Water and sanitation	
234	Thailand	172.00	1.53	committed	OOF	other	Mitigation	Energy	
235	The former Yugoslav Republic of Macedonia	9.86	0.09	disbursed	ODA	Grant	Adaptation	Forestry	
236	Tonga	2,100.00	18.72	committed	ODA	Grant	Mitigation	Energy	
237	Tunisia	36,676.00	326.98	committed	ODA	Concessional loan	Mitigation	Water and sanitation	
238	Tunisia	9.65	0.09	disbursed	ODA	Grant	Mitigation	Water and sanitation	
239	Uganda	57.00	0.51	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
240	Viet Nam	10,000.00	89.15	committed	ODA	Concessional loan	Cross-cutting	Cross-cutting	
241	Viet Nam	24,257.00	216.26	committed	ODA	Concessional loan	Adaptation	Agriculture	
242	Viet Nam	24,700.00	220.21	committed	ODA	Concessional loan	Mitigation	Water and sanitation	
243	Viet Nam	9.92	0.09	disbursed	ODA	Grant	Cross-cutting	Cross-cutting	
244	Viet Nam	26.00	0.23	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
245	Viet Nam	34.00	0.30	disbursed	OOF	other	Mitigation	Energy	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
246	Viet Nam	50.00	0.45	disbursed	OOF	other	Mitigation	Energy	
247	Viet Nam	5,720.47	51.00	committed	OOF	Non-concessional loan	Mitigation	Energy	
248	Viet Nam	34.00	0.30	disbursed	OOF	other	Mitigation	Water and sanitation	
249	Viet Nam	15.00	0.13	disbursed	OOF	Grant	Adaptation	Cross-cutting	
250	Viet Nam	15.00	0.13	disbursed	OOF	other	Mitigation	Cross-cutting	
251	Viet Nam	15.00	0.13	disbursed	OOF	other	Mitigation	Cross-cutting	
252	Viet Nam	33.00	0.29	committed	OOF	other	Mitigation	Water and sanitation	
253	Viet Nam	34.00	0.30	committed	OOF	other	Mitigation	Energy	
254	Viet Nam, Lao People's Democratic Republic, Cambodia, Myanmar	30.00	0.27	committed	ODA	Grant	Cross-cutting	Forestry	
255	Zimbabwe, Sudan, India, Pakistan, Indonesia, Mongolia, Thailand, Viet Nam, Fiji, Federation of Micronesia, Papua New Guinea	8.84	0.08	disbursed	ODA	Grant	Adaptation	Cross-cutting	

Custom Footnotes

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

The exchange rate is 112.166 JPY/USD. Values converted from Japanese Yen to USD using the 112.166 yen/US dollar rate may not match the total USD amount reported due to rounding.

Table 5-6 Provision of public financial support : contribution through bilateral, regional and other channels in 2018 (CTF Table 7(b))

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
	Total contributions through bilateral, regional and other channels	1,195,014.93	10,822.16						
1	Afghanistan	1,456.00	13.19	disbursed	ODA	Grant	Adaptation	Cross-cutting	
2	Afghanistan	48.00	0.43	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
3	Algeria, Egypt, Brazil, Uzbekistan, Afghanistan, Myanmar, Bangladesh	10.82	0.10	disbursed	ODA	Grant	Mitigation	Energy	
4	Asia, Oceania	29.90	0.27	disbursed	OOF	Grant	Adaptation	Cross-cutting	
5	Asia, Oceania	74.90	0.68	disbursed	OOF	Grant	Adaptation	Cross-cutting	
6	Asia, Oceania	13.00	0.12	disbursed	OOF	Grant	Adaptation	Cross-cutting	
7	Asia-Pacific	24.00	0.22	disbursed	OOF	Grant	Cross-cutting	Cross-cutting	
8	Bangladesh	54.00	0.49	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
9	Bangladesh	86,629.00	784.52	committed	ODA	Concessional loan	Mitigation	Transport	
10	Bangladesh	67,311.00	609.57	committed	ODA	Concessional loan	Mitigation	Energy	
11	Bhutan	8.58	0.08	disbursed	ODA	Grant	Adaptation	Transport	
12	Bhutan, India, Nepal, Cambodia, Malaysia, Timor-Leste, Viet Nam, Ghana, Tanzania, Uganda, Burundi, Cameroon, Guinea, Senegal, Burkina Faso	47.40	0.43	disbursed	ODA	Grant	Adaptation	Water and sanitation	
13	Bosnia and Herzegovina, North Macedonia, El Salvador, Iraq, Myanmar, Thailand, Viet Nam	6.62	0.06	disbursed	ODA	Grant	Adaptation	Forestry	
14	Botswana, Cameroon, Brazil, Bangladesh, Lao People's Democratic Republic	19.27	0.17	disbursed	ODA	Grant	Adaptation	Cross-cutting	
15	Botswana, Cameroon, Democratic Republic of the Congo, Ethiopia, Zambia, Myanmar, Papua New Guinea	4.23	0.04	disbursed	ODA	Grant	Mitigation	Forestry	
16	Brazil	10.03	0.09	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
17	Brazil	5,521.15	50.00	committed	OOF	Non-concessional loan	Mitigation	Energy	
18	Brazil, Ecuador, Peru, Iran, Georgia, Myanmar, Pakistan, Indonesia, Philippines, Timor-Leste, Viet Nam	6.91	0.06	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
19	Cambodia	31.64	0.29	disbursed	ODA	Grant	Adaptation	Water and sanitation	
20	Cambodia	9,216.00	83.46	committed	ODA	Concessional loan	Mitigation	Energy	
21	Cambodia	15.00	0.14	disbursed	OOF	other	Mitigation	Cross-cutting	
22	Cambodia, Lao People's Democratic Republic, Viet Nam	27.00	0.24	committed	ODA	Grant	Cross-cutting	Forestry	
23	Cambodia, Myanmar, Peru	59.00	0.53	committed	OOF	Grant	Cross-cutting	Forestry	
24	Cameroon	26.96	0.24	disbursed	ODA	Grant	Cross-cutting	Forestry	
25	Cameroon, Chad, Benin, Guinea, Cote d'Ivoire, Senegal, Burkina Faso	14.29	0.13	disbursed	ODA	Grant	Adaptation	Water and sanitation	
26	Cameroon, Kenya, Malawi, Uganda, Fiji, Papua New Guinea	5.86	0.05	disbursed	ODA	Grant	Cross-cutting	Forestry	
27	Carboberde, Santome Principe, Antigua Barbuda, Grenada, Saint Lucia, Republic of Maldives, Marshall, Solomon	9.93	0.09	disbursed	ODA	Grant	Adaptation	Water and sanitation	
28	Chile	0.33	0.00	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
29	Chile	85.29	0.77	disbursed	ODA	Grant	Adaptation	Agriculture	
30	China	36.00	0.33	disbursed	ODA	Grant	Mitigation	Cross-cutting	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
31	China	42.38	0.38	disbursed	OOF	other	Mitigation	Energy	
32	China, Thailand, Indonesia, India, Mexico, etc.	1,286.00	11.65	disbursed	OOF	Grant	Mitigation	Other	
33	Cook	200.00	1.81	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
34	Costa Rica, Dominican Republic, El Salvador, Guatemala, Argentina, Bolivia, Peru, Nigeria, Sri Lanka, Viet Nam, the Federation of Micronesia	17.69	0.16	disbursed	ODA	Grant	Mitigation	Water and sanitation	
35	Costa Rica, El Salvador, Honduras, Panama, Argentina, Peru	7.81	0.07	disbursed	ODA	Grant	Adaptation	Cross-cutting	
36	Costa Rica, Guatemala, Mexico, Nicaragua, Argentina, Bolivia, Colombia, Peru	15.40	0.14	disbursed	ODA	Grant	Adaptation	Water and sanitation	
37	Democratic Republic of Congo, Lesotho, Malawi, Nigeria, Sierra Leone, Zambia, Tajikistan, Bhutan, Myanmar, Nepal, and Pakistan	6.02	0.05	disbursed	ODA	Grant	Mitigation	Energy	
38	Democratic Republic of the Congo, Gabon, Mozambique, Brazil, Suriname, Myanmar, Malaysia	4.87	0.04	disbursed	ODA	Grant	Cross-cutting	Forestry	
39	Dominican Republic, Peru, Federation of Micronesia, Tuvalu	5.95	0.05	disbursed	ODA	Grant	Adaptation	Cross-cutting	
40	Egypt, Antigua Barbuda, St. Christopher Navis, Guyana, Myanmar, Bangladesh	8.26	0.07	disbursed	ODA	Grant	Mitigation	Energy	
41	Egypt, Ethiopia, Sudan, Iraq, Myanmar, India	16.95	0.15	disbursed	ODA	Grant	Adaptation	Water and sanitation	
42	Egypt, Ghana, Kenya, Rwanda, Zambia, Iran, Jordan, India, Pakistan, Cambodia, Malaysia, Philippines, Viet Nam	9.54	0.09	disbursed	ODA	Grant	Mitigation	Transport	
43	Egypt, Zimbabwe, Myanmar, Sri Lanka, India, Papua New Guinea, Morocco, Ethiopia, Rwanda, Guyana, Palestine, Bangladesh, Malaysia, Viet Nam	34.64	0.31	disbursed	ODA	Grant	Adaptation	Water and sanitation	
44	El Salvador	7.00	0.06	disbursed	ODA	Grant	Mitigation	Energy	
45	Esvantini, Barbados, Belize, Saint Lucia, Guyana, Kiribati, Samoa, Serbia, Bosnia and Herzegovina, Tunisia, Egypt, Brazil, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Panama, Argentina, Colombia, Bolivia, Ecuador, Peru, Armenia, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan	52.69	0.48	disbursed	ODA	Grant	Mitigation	Energy	
46	Ethiopia	200.00	1.81	disbursed	ODA	Grant	Mitigation	Water and sanitation	
47	Ethiopia, Brazil, Lebanon, Indonesia, Laos, Fiji	6.72	0.06	disbursed	ODA	Grant	Adaptation	Water and sanitation	
48	Ethiopia, Dominican Republic, Guatemala, Nicaragua, Colombia, India, Nepal	13.34	0.12	disbursed	ODA	Grant	Adaptation	Cross-cutting	
49	Ethiopia, Kenya, Dominican Republic, Myanmar, Sri Lanka, Nauru, Federation of Micronesia	13.54	0.12	disbursed	ODA	Grant	Mitigation	Water and sanitation	
50	Ethiopia, Kenya, Djibouti, El Salvador, Ecuador	17.16	0.16	disbursed	ODA	Grant	Mitigation	Energy	
51	Ethiopia, Kenya, Malawi, Nigeria, Rwanda, Eritrea	7.27	0.07	disbursed	ODA	Grant	Adaptation	Water and sanitation	
52	Ethiopia, Kenya, Mauritania, Niger, Eritrea, Somalia, Sudan, South Sudan, Burkina Faso	4.39	0.04	disbursed	ODA	Grant	Adaptation	Cross-cutting	
53	Ethiopia, Kenya, Tanzania, Indonesia, Papua New Guinea	3.25	0.03	disbursed	ODA	Grant	Mitigation	Energy	
54	Ethiopia, Lesotho, Nigeria, Sudan, Brazil, Yemen, Bosnia and Herzegovina, Guinea, Cote d'Ivoire, Liberia, Malawi, Mozambique, Eritrea, Afghanistan, Sri Lanka, Indonesia	22.44	0.20	disbursed	ODA	Grant	Adaptation	Water and sanitation	
55	Fiji	300.00	2.72	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
56	Ghana, Mozambique, Tanzania, Cuba, Uzbekistan, Myanmar, India	6.15	0.06	disbursed	ODA	Grant	Mitigation	Energy	
57	Guinea, Barbados, Saint Christopher Navis, Georgia, Myanmar, Republic of Maldives, Indonesia, Mongolia, Samoa	12.39	0.11	disbursed	ODA	Grant	Mitigation	Energy	
58	Guyana	1,848.00	16.74	committed	ODA	Grant	Mitigation	Energy	
59	Haiti	67.00	0.61	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
60	India	38.00	0.34	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
61	India	25,903.00	234.58	committed	ODA	Concessional loan	Mitigation	Transport	
62	India	100,000.00	905.61	committed	ODA	Concessional loan	Mitigation	Transport	
63	India	8,082.00	73.19	committed	ODA	Concessional loan	Mitigation	Transport	
64	India	5,497.00	49.78	committed	ODA	Concessional loan	Mitigation	Energy	
65	India	75,519.00	683.91	committed	ODA	Concessional loan	Mitigation	Transport	
66	India	53,675.00	486.09	committed	ODA	Concessional loan	Mitigation	Transport	
67	India	239,547.00	2,169.36	committed	ODA	Concessional loan	Mitigation	Transport	
68	India	11,136.00	100.85	committed	ODA	Concessional loan	Cross-cutting	Forestry	
69	India	12,287.00	111.27	committed	ODA	Concessional loan	Cross-cutting	Forestry	
70	India	45,000.00	407.52	committed	ODA	Concessional loan	Adaptation	Water and sanitation	
71	India	30,000.00	271.68	committed	ODA	Concessional loan	Adaptation	Water and sanitation	
72	India	25.00	0.23	disbursed	OOF	other	Mitigation	Energy	
73	India	23.00	0.21	disbursed	OOF	other	Mitigation	Energy	
74	India	8.39	0.08	disbursed	OOF	other	Mitigation	Energy	
75	India	29.29	0.27	disbursed	OOF	other	Mitigation	Energy	
76	Indonesia	1.30	0.01	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
77	Indonesia	70,021.00	634.12	committed	ODA	Concessional loan	Mitigation	Transport	
78	Indonesia	41.00	0.37	disbursed	ODA	Grant	Mitigation	Cross-cutting	
79	Indonesia	20,847.75	188.80	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
80	Indonesia	66,731.82	604.33	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
81	Indonesia	41.72	0.38	disbursed	OOF	other	Mitigation	Water and sanitation	
82	Indonesia	0.00	0.00	disbursed	OOF	other	Mitigation	Energy	
83	Indonesia	0.00	0.00	disbursed	OOF	other	Mitigation	Energy	
84	Indonesia	28.28	0.26	disbursed	OOF	other	Mitigation	Other	
85	Indonesia	13.27	0.12	disbursed	OOF	other	Mitigation	Other	
86	Indonesia	40.96	0.37	disbursed	OOF	Grant	Adaptation	Cross-cutting	
87	Indonesia	20.00	0.18	disbursed	OOF	other	Mitigation	Cross-cutting	
88	Indonesia	15.00	0.14	disbursed	OOF	other	Mitigation	Cross-cutting	
89	Indonesia	15.00	0.14	disbursed	OOF	other	Mitigation	Energy	
90	Indonesia	15.00	0.14	disbursed	OOF	other	Mitigation	Cross-cutting	
91	Indonesia	7.52	0.07	disbursed	OOF	Grant	Adaptation	Cross-cutting	
92	Indonesia	20.00	0.18	committed	OOF	other	Mitigation	Energy	
93	Indonesia	2.00	0.02	committed	OOF	other	Mitigation	Energy	
94	Indonesia	31.00	0.28	committed	OOF	other	Mitigation	Cross-cutting	
95	Indonesia, Thailand, Philippines, Viet Nam, Mexico, Mongolia, Lao People's Democratic Republic	6,900.00	62.49	committed	OOF	other	Mitigation	Cross-cutting	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
96	Iran	21.97	0.20	disbursed	ODA	Grant	Mitigation	Forestry	
97	Iraq	19,415.00	175.82	committed	ODA	Concessional loan	Adaptation	Water and sanitation	
98	Iraq	15,465.00	140.05	committed	ODA	Concessional loan	Adaptation	Agriculture	
99	Iraq	2,463.00	22.31	committed	ODA	Concessional loan	Adaptation	Water and sanitation	
100	Jamaica, Afghanistan, Myanmar, India, Nepal, Pakistan, Bangladesh, Timor-Leste, Ghana, Malawi, Zimbabwe, Sudan, Estiani, Tanzania, Uganda	17.27	0.16	disbursed	ODA	Grant	Adaptation	Water and sanitation	
101	Jamaica, Antigua Barbuda, St. Christopher Navis, St. Lucia, St. Vincent, Guyana, Fiji, Marshall, Federation of Micronesia, Palau, Papua New Guinea, Tonga	17.74	0.16	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
102	Jamaica, Philippines, Fiji, Marshall, Tonga, Tuvalu	8.69	0.08	disbursed	ODA	Grant	Mitigation	Energy	
103	Jordan	0.00	0.00	disbursed	OOF	other	Mitigation	Energy	
104	Kazakhstan, Kyrgyz Republic, Tajikistan	12.31	0.11	disbursed	ODA	Grant	Adaptation	Agriculture	
105	Kenya	10,077.00	91.26	committed	ODA	Concessional loan	Mitigation	Energy	
106	Kenya, Ethiopia, Palau, Republic of Maldives, Saudi Arabia	80.00	0.72	committed	OOF	other	Mitigation	Cross-cutting	
107	Kenya, Sudan, Iraq, Jordan, Palestine and Afghanistan, Armenia, Azerbaijan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan	22.51	0.20	disbursed	ODA	Grant	Adaptation	Agriculture	
108	Kiribati	300.00	2.72	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
109	Lao People's Democratic Republic	54.90	0.50	disbursed	ODA	Grant	Mitigation	Water and sanitation	
110	Liberia, Myanmar, Sri Lanka, India, Nepal, Pakistan, Bangladesh, Philippines	13.06	0.12	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
111	Liberia, Tanzania, Brazil, Cambodia, Malaysia, Mongolia, and Philippines	4.95	0.04	disbursed	ODA	Grant	Adaptation	Water and sanitation	
112	Malawi	200.00	1.81	disbursed	ODA	Grant	Adaptation	Agriculture	
113	Malawi, Honduras, Bangladesh	15.96	0.14	disbursed	ODA	Grant	Adaptation	Cross-cutting	
114	Malaysia	42.60	0.39	disbursed	OOF	other	Mitigation	Energy	
115	Malaysia South Africa, Angola, Botswana, Ethiopia, Malawi, Sierra Leone, Namibia, Sudan	12.66	0.11	disbursed	ODA	Grant	Mitigation	Energy	
116	Malaysia, Thailand, Viet Nam, Palau	84.00	0.76	committed	OOF	other	Mitigation	Cross-cutting	
117	Mexico, Brazil, Myanmar, Philippines, Fiji, Kiribati, Papua New Guinea, Solomon	5.02	0.05	disbursed	ODA	Grant	Adaptation	Cross-cutting	
118	Mexico, Chile, Costa Rica	50.00	0.45	committed	OOF	other	Mitigation	Cross-cutting	
119	Mexico, Myanmar, Sri Lanka, Bangladesh, Philippines	5.03	0.05	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
120	Micronesia	200.00	1.81	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
121	Central America (excluding Caribbean)	5,521.15	50.00	committed	OOF	Non-concessional loan	Mitigation	Energy	
122	Mongolia	17.00	0.15	disbursed	ODA	Grant	Mitigation	Cross-cutting	
123	Mongolia	15.66	0.14	disbursed	OOF	Grant	Adaptation	Cross-cutting	
124	Mongolia, Bangladesh, Viet Nam, Lao People's Democratic Republic, Cambodia, Myanmar	172.00	1.56	committed	OOF	other	Mitigation	Cross-cutting	
125	Morocco	77.00	0.70	disbursed	ODA	Grant	Mitigation	Water and sanitation	
126	Morocco, Nigeria, Sudan, Sri Lanka, Nepal	14.10	0.13	disbursed	ODA	Grant	Adaptation	Water and sanitation	
127	Mozambique, Nigeria, Tanzania, Turkmenistan, Uzbekistan, Myanmar, Philippines	5.65	0.05	disbursed	ODA	Grant	Mitigation	Energy	
128	Multiple regions	2.53	0.02	disbursed	ODA	Grant	Mitigation	Forestry	
129	Multiple regions	8.42	0.08	disbursed	ODA	Grant	Adaptation	Water and sanitation	
130	Myanmar	33.00	0.30	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
131	Myanmar	51.00	0.46	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
132	Myanmar	17.43	0.16	disbursed	ODA	Grant	Cross-cutting	Cross-cutting	
133	Myanmar	30,469.00	275.93	committed	ODA	Concessional loan	Adaptation	Agriculture	
134	Myanmar	5,247.30	47.52	disbursed	OOF	Non-concessional loan	Cross-cutting	Transport	
135	Myanmar	15.00	0.14	disbursed	OOF	other	Mitigation	Water and sanitation	
136	Myanmar	15.00	0.14	disbursed	OOF	other	Mitigation	Cross-cutting	
137	Myanmar	15.00	0.14	disbursed	OOF	other	Mitigation	Cross-cutting	
138	Myanmar, Cambodia, Laos, Malaysia, the Philippines, Thailand, Micronesia, Papua New Guinea	4.15	0.04	disbursed	ODA	Grant	Mitigation	Transport	
139	Myanmar, Malawi, Zimbabwe, Afghanistan, Philippines, Marshall, Ethiopia, Guinea, Nigeria, Rwanda, Sri Lanka, Cambodia, Laos, Tanzania, Myanmar, Nepal, Fiji	18.53	0.17	disbursed	ODA	Grant	Adaptation	Water and sanitation	
140	Myanmar, Sri Lanka, Nepal, Bangladesh, Philippines, Fiji	5.86	0.05	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
141	Myanmar, Uzbekistan, Thailand, Philippines	37.00	0.34	committed	ODA	Grant	Cross-cutting	Forestry	
142	Nauru	250.00	2.26	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
143	Nepal	700.00	6.34	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
144	Nepal	65.00	0.59	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
145	Nepal	87.00	0.79	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
146	Nepal	42.00	0.38	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
147	Nepal	48.00	0.43	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
148	Nigeria, Tanzania, Mexico, Brazil, Colombia, Ecuador, Afghanistan, Indonesia, Thailand	6.64	0.06	disbursed	ODA	Grant	Mitigation	Transport	
149	Nigeria, Uganda, Afghanistan, India, Nepal, Tunisia, Benin, Rwanda, Eritrea, Sri Lanka, Pakistan	15.98	0.14	disbursed	ODA	Grant	Adaptation	Water and sanitation	
150	Niue	100.00	0.91	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
151	Northern Macedonia, Morocco, Liberia, Brazil, Chile, Peru, Iran, Bhutan, Myanmar, Sri Lanka, Thailand, Viet Nam	10.48	0.09	disbursed	ODA	Grant	Adaptation	Water and sanitation	
152	Oman	0.00	0.00	disbursed	OOF	other	Mitigation	Water and sanitation	
153	Pakistan	40.00	0.36	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
154	Papua New Guinea	300.00	2.72	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
155	Philippines	39.00	0.35	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
156	Philippines	201.07	1.82	disbursed	ODA	Grant	Mitigation	Transport	
157	Philippines	0.23	0.00	disbursed	ODA	Grant	Adaptation	Water and sanitation	
158	Philippines	104,530.00	946.63	committed	ODA	Concessional loan	Mitigation	Transport	
159	Philippines	25.00	0.23	disbursed	OOF	other	Mitigation	Cross-cutting	
160	Philippines	15.00	0.14	disbursed	OOF	other	Mitigation	Water and sanitation	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
161	Philippines	199.00	1.80	committed	OOF	other	Mitigation	Energy	
162	Philippines, Papua New Guinea, Micronesia, Solomon Islands, Fiji, Palau	26.00	0.24	disbursed	ODA	other	Mitigation	Cross-cutting	
163	Republic of Maldives	143.58	1.30	disbursed	ODA	Grant	Mitigation	Transport	
164	Rwanda, Sudan, South Sudan, Tanzania, Uganda, Azerbaijan, Afghanistan	33.95	0.31	disbursed	ODA	Grant	Adaptation	Water and sanitation	
165	Samoa	200.00	1.81	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
166	Saudi Arabia	25.00	0.23	disbursed	OOF	other	Mitigation	Other	
167	Saudi Arabia	30.00	0.27	committed	OOF	other	Mitigation	Energy	
168	Sri Lanka	48.00	0.43	disbursed	ODA	Grant	Adaptation	Cross-cutting	
169	Sri Lanka	37.76	0.34	disbursed	ODA	Grant	Adaptation	Water and sanitation	
170	Sri Lanka, Pakistan, Bangladesh, Philippines, Thailand, Fiji	6.15	0.06	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
171	Sri Lanka, Republic of Maldives	11.00	0.10	committed	OOF	other	Mitigation	Energy	
172	Tanzania	114.00	1.03	committed	OOF	other	Mitigation	Energy	
173	Tanzania, Indonesia, Viet Nam, Myanmar	50.00	0.45	committed	ODA	Grant	Cross-cutting	Forestry	
174	Thailand	33.76	0.31	disbursed	ODA	Grant	Mitigation	Transport	
175	Thailand	26.09	0.24	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
176	Thailand	25,143.32	227.70	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
177	Thailand	27.00	0.24	disbursed	OOF	other	Mitigation	Energy	
178	Thailand	28.00	0.25	disbursed	OOF	other	Mitigation	Energy	
179	Thailand	49.99	0.45	disbursed	OOF	other	Mitigation	Energy	
180	Thailand	16.44	0.15	disbursed	OOF	other	Mitigation	Energy	
181	Thailand	15.24	0.14	disbursed	OOF	other	Mitigation	Energy	
182	Thailand	4.69	0.04	disbursed	OOF	other	Mitigation	Energy	
183	Thailand	31.20	0.28	disbursed	OOF	Grant	Adaptation	Cross-cutting	
184	Thailand	15.00	0.14	disbursed	OOF	other	Mitigation	Transport	
185	Thailand	15.00	0.14	disbursed	OOF	other	Mitigation	Cross-cutting	
186	Thailand	45.00	0.41	committed	OOF	other	Mitigation	Water and sanitation	
187	Thailand and India	42.56	0.39	disbursed	OOF	other	Mitigation	Energy	
188	Turkey, Albania, Ethiopia, Malawi, Sudan, Peru, Myanmar, India, Philippines, Viet Nam, Fiji, Papua New Guinea, Solomon	24.70	0.22	disbursed	ODA	Grant	Cross-cutting	Forestry	
189	Turkmenistan	868.04	7.86	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
190	Turkmenistan	10,111.54	91.57	disbursed	OOF	Non-concessional loan	Mitigation	Energy	
191	Turkmenistan	0.00	0.00	disbursed	OOF	other	Mitigation	Energy	
192	Uganda	50.00	0.45	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
193	Uganda	13,659.00	123.70	committed	ODA	Concessional loan	Mitigation	Energy	
194	Ukraine, Argentina, Colombia, Lebanon, Philippines	13.39	0.12	disbursed	ODA	Grant	Mitigation	Agriculture	
195	Vanuatu	250.00	2.26	disbursed	ODA	Grant	Adaptation	Water and sanitation	

No.	Recipient country/ region/project/programme	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
		Climate-specific							
		Japanese yen - JPY	USD						
196	Vanuatu, the Federation of Micronesia, Palau, Solomon, Samoa	7.38	0.07	disbursed	ODA	Grant	Adaptation	Water and sanitation	
197	Viet Nam	28.00	0.25	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	
198	Viet Nam	11.53	0.10	disbursed	ODA	Grant	Adaptation	Cross-cutting	
199	Viet Nam	28.91	0.26	disbursed	OOF	other	Mitigation	Energy	
200	Viet Nam	32.06	0.29	disbursed	OOF	Grant	Adaptation	Cross-cutting	
201	Viet Nam	15.00	0.14	disbursed	OOF	other	Mitigation	Cross-cutting	
202	Viet Nam	15.00	0.14	disbursed	OOF	other	Mitigation	Cross-cutting	
203	Viet Nam	8.00	0.07	committed	OOF	other	Mitigation	Water and sanitation	
204	Viet Nam	27.00	0.24	committed	OOF	other	Mitigation	Energy	
205	Zambia, Honduras, Brazil, Guyana, Philippines, Timor-Leste, Papua New Guinea, Morocco, Democratic Republic of the Congo, Mexico, Iran, Georgia, Tajikistan, Nepal	20.54	0.19	disbursed	ODA	Grant	Adaptation	Prevention and Restoration of disaster	

Custom Footnotes

The unit of JPY is "million Japanese Yen", and the unit of USD is "million US dollars".
The exchange rate is 110.423JPY/USD. Values converted from Japanese Yen to USD using the 110.423 yen/US dollar rate may not match the total USD amount reported due to rounding.

■ Private Financial Flows

In order to further promote action on climate change, Japan has been working to establish a mechanism to leverage private investment by using public finance. Co-financing by the JBIC with the private sector and trade insurance by NEXI are examples of utilizing private finance. Private finance also plays an important role in tackling climate change as its total amount is over USD 4.5 billion as of December 2018.

(1) Other Official Flow, Including Co-funding with Private Sector

In April 2010, JBIC started a new operation titled GREEN (Global action for Reconciling Economic growth and Environmental preservation) wherein the primary purpose is to support projects with favorable impacts on preservation of the global environment, such as renewable energy projects and energy efficiency projects. Under the GREEN operation, JBIC implements support by using united loans, guarantees, and equity investments while mobilizing private funds. Furthermore, in July 2018, JBIC launched a new facility titled QI-ESG (JBIC Global Facility to Promote Quality Infrastructure Investment for Environmental Preservation and Sustainable Growth), which achieved an expansion of the scope of eligible projects and diversified financial support tools.

<Examples>

- Credit line for Ecuador government under GREEN Operations (Supporting energy efficiency projects/ JBIC loan portion: USD 25 million)
- Credit line for the Brazilian Development Bank under GREEN Operations (Supporting renewable energy projects/ JBIC loan portion: USD 50 million)
- Credit line for the Central American Bank for Economic Integration (CABEI) under GREEN Operations (Supporting smart energy projects/ JBIC loan portion: USD 50 million)
- Credit line for Vietcombank under GREEN Operations (Supporting renewable energy projects/ JBIC loan portion: USD 100 million)

Furthermore, in July 2019, NEXI launched the Loan Insurance for Green Innovation with an increased risk coverage rate compared with that of its usual loan insurance. This insurance can be applied for financing projects in the field of environmental protection and climate change prevention, such as projects using renewable energy, energy savings, and innovative technology.

5.4 Technology Development and Transfer

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

5.4.1 Innovation of Low-Carbon Technology and Promotion of its Dissemination

In order to contribute to significant reductions in global emissions through innovation, Japan will promote the development of innovative technology with great reduction potential and impact in a long-term perspective based upon National Energy and Environment Strategy for Technical Innovation towards 2050 adopted in April 2016. For example, Japan will promote research and development, demonstration, and model projects for manufacturing, transporting and storing, and utilizing energy carriers, such as hydrogen, the future power electronics using gallium nitride (GaN), Carbon Capture and Storage (CCS), and Carbon Capture and Utilization (CCU).

Japan will also deepen the discussions for driving innovation through the Innovation for Cool Earth Forum (ICEF), which aims to be the global platform to promote discussions and cooperation on innovation among the worldwide academic, industrial and public sectors. Furthermore, Japan will promote demonstration projects to create innovations for drastically redeveloping advanced low-carbon technology in accordance with the specific characteristics of developing countries. Japan will also create co-innovation projects by incorporating the needs of developing countries and the seeds provided by Japanese industries, while taking the initiative in dispatching business missions to developing countries, and accelerating the collaboration of private companies and local governments on both sides. Japan will foster further innovation by sharing information on the dissemination of innovative technology to developing countries and its effectiveness.

Japan has been supporting the dissemination of advanced low-carbon and decarbonizing technologies through public-private partnerships via the Joint Crediting Mechanism (JCM), where Japan has established partnerships with 17 partner countries and supported more than 160 projects. Japan will also support both the introduction of waste power generations as one of the environmental infrastructure and waste management system as a package. Japan will also support the optimization of existing infrastructure and operation and maintenance (O&M) by private companies through utilizing the Internet of Things (IoT), which contributes to emission reduction and visualization of the reduction effects. In addition, in order to implement large-scale projects and wider dissemination of low-carbon and decarbonizing technologies, Japan will enhance collaboration with public finance of, among others, the JICA, JBIC and NEXI will enhance capacities and carry out feasibility studies for project formation to improve access to GCF. As the chair of the Global Research Alliance on Agricultural Greenhouse Gases (GRA), Japan will promote the improvement of low-carbon irrigation technology and its dissemination in developing countries. Regarding emission reduction of fluorocarbons, Japan will provide support based upon its knowledge and promote an understanding of the importance of the programs implemented in developing countries.

5.4.2 Implementation of adaptation projects

Through collaboration with Japanese cooperation organizations or governmental financial institutions including, the JICA, JBIC as well as NEXI, Japan will support adaptation projects based on the priorities and needs of each country, while

diversifying the financial resources, including mobilization of private finance.

In order to enhance resilience to climate change, Japan will support infrastructure development, including the fields of irrigation, waterworks, and disaster risk reduction. Japan will also support the development and dissemination of drought-resistant and short-duration rice varieties for a sustainable and stable food supply, and provide support for agricultural insurance for smallholder farmers vulnerable to climate change. Japan's support extends to ecosystem-based adaptation for coastal protection by utilizing ecosystems such as coral reefs and mangroves. Being mindful of the situation among Small Island Developing States (SIDS), which are particularly vulnerable to climate change, Japan will provide comprehensive support focused on disaster risk reduction by integrating the provision of necessary equipment, such as meteorological observation and disaster early warning equipment, and technical cooperation.

5.4.3 Emission Reductions in Overseas Countries by Diffusing Technologies

Japan has been promoting the global "application" of existing low-carbon and decarbonizing technologies. Accelerating the diffusion of such technologies and verifying the reduction effect from the technologies will realize further emission reductions of greenhouse gases and new economic growth simultaneously.

■ Joint Crediting Mechanism (JCM)

Japan has been implementing the JCM in order to both appropriately evaluate contributions from Japan to GHG emission reductions and removals in a quantitative manner achieved through the diffusion of low carbon and decarbonizing technologies, products, systems, services, and infrastructure to developing countries, as well as the implementation of mitigation actions in developing countries, and to use them to achieve Japan's emission reduction target.

Since Japan and Mongolia signed a bilateral agreement in January 2013 for the first time to start the JCM, the number of partner countries has increased to 17. There are more than 160 GHG emission reduction projects being implemented so far and the accumulated emission reductions from these projects are expected to be about 15 Mt-CO_2 (preliminary estimation towards the period by FY 2030). At this point there are more than 50 registered projects with 27 projects issued JCM credits. Furthermore, more than 70 MRV methodologies (methods for calculating GHG emission reductions) have been approved as a step towards project registration. Japan will continue to support the further formulation of JCM projects in collaboration with the relevant ministries and agencies.

■ 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. The government will also propose assessing measures for energy efficiencies such as LED lighting and thus will contribute to international standardization onwards. In addition, the government

will provide support for 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

  See section 5.4.1 and 5.4.2 for details.

- Utilization of Satellites

  The government launched the successor to GOSAT, GOSAT-2 in October 2018 to contribute to tackling climate change. It will support nations in making use of satellite data to verify their national GHGs inventories and to decide on the GHG reduction policies by refining the accuracy of estimations of GHGs at the national, mega-city, and/or major emission source levels.

- 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).

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 the sustainable management of forests in developing countries, which will contribute to forest conservation in those countries. Japan will also support developing countries to combat illegal logging and to promote sustainable forest management in cooperation with international organizations such as the International Tropical Timber Organization (ITTO) and the Food and Agriculture Organization of the United Nations (FAO).

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 emission reduction, which is a global concern.

5.4.4 Projects Related to the Provision of Support for Technology Development and Transfer

Information on Japan's projects on the provision of support for technology development and transfer is shown in Table 5-7.

In addition, as an example of a success story related to a project to facilitate the transfer of environmentally sound technologies, the descriptions of Promotion of Green Hospital by improving efficiency and environment in national hospitals in

Vietnam (demonstration project) and the Yangon Waste to Energy plant by introducing power generation and avoidance of landfill gas emissions through combustion of municipal solid waste (MSW) (JCM Model project) implemented by Japan are shown in Table 5-8.

Table 5-7 Provision of support for technology development and transfer (CTF Table 8)

No.	Recipient country and/or region	Targeted area	Measures and activities related to technology transfer	Sector	Source of the funding for technology transfer	Activities undertaken by	Status	Additional information
1	Antigua Barbuda	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	By deployment of disaster prevention equipment manufactured in Japan, improve the capacity in the field of disaster prevention, thereby contributing to the socioeconomic development of Antigua and Barbuda through disaster prevention and environmental support and the support of foreign deployment by Japanese companies.
2	Armenia	Adaptation	The Project for Improvement of Fire Fighting Equipment	Prevention and Restoration of disaster	Public	Private and Public	Planned	Fire engine vehicles and equipment is deployed in the prioritized regions of disaster countermeasures in Armenia (Lori, Shirak, and Syunik) to improve the fire extinguish activity and contribute to strengthen disaster prevention measures.
3	Bangladesh	Mitigation	Dhaka Mass Rapid Transit Development Project (Line 1) (E/S)	Transport	Public	Private and Public	Planned	Support is made to construct a 20.1-kilometer urban highway line to mitigate traffic congestion by shifting to the public transportation. It is also expected to reduce atmosphere contamination in the Dhaka metropolitan area and contribute to climate-change mitigation and economic development in the country as a whole.
4	Bangladesh	Mitigation	Matarbari Ultra Super Critical Coal-Fired Power Project III	Energy	Public	Private and Public	Planned	Highly efficient ultra supercritical pressure coal-fired power plant in the Matarbari District of Chittagong District, southeastern Bangladesh, coal import ports, transmission lines, and other facilities is constructed, thereby responding to the rapid increase in electricity demand and energy transformation needs in Bangladesh.
5	Bangladesh	Mitigation	Dhaka Underground Substation Construction Project	Transport	Public	Private and Public	Planned	A new substation is constructed under the ground of the existing substation site. This improves the reliability of electric power sharing and the demand for electric power, thereby contributing to the improvement of the investment environment and the promotion of economic growth in the country.
6	Bangladesh	Mitigation	Sirajganj Independent Power Project	Energy	Public	Private and Public	Planned	SNWPC builds and operates a combined cycle gas Thermal Power Generation station with a capacity of approximately 400 megawatts in Sirajganj Province, north-western Bangladesh, and sells electricity to the Bangladesh Electricity Development Agency (Bangladesh Power Development Board) for 22 years, thereby providing a stable supply of electricity in Bangladesh and contributing to alleviation of power shortages and sustainable economic development.
7	Bangladesh	Mitigation	Maheshkhali LNG Floating Storage Re-gasification Unit Terminal Activities Project	Transport	Public	Private and Public	Planned	Construction and operation of LNG offshore import terminals, including offshore facilities, port operations, and chartering contracts for floating LNG storage and Gasification facilities (Floating Storage and Regasification Unit, hereinafter referred to as "FSRU") is carried out. This project contributes to the stable supply of natural gas in Bangladesh and to the early improvement of primary energy supply and demand.
8	Bangladesh	Mitigation	Small Scale Water Resources Development Project (Phase 2)	Agriculture	Public	Private and Public	Planned	In rural areas in Dhaka and three other districts, the project aims to increase agricultural productivity and raise farmers' incomes through the development of small-scale water resource management facilities and technical guidance to water management associations.
9	Bangladesh	Mitigation	FY2017 Subsidy for CO2 Emission Suppression Measures Project Expense etc. (Project for Assistance of Reduction of CO2 Emission by Strategic Overseas Development of Japanese Venous Industry) (Polyester Recycling Social Business in Bangladesh)	Water and sanitation	Public	Private and Public	Implemented	A project in Bangladesh to establish a mechanism to collect polyester fiber and PET-resin scrap from business operators and consumers, and to construct polyester recycle facilities, reduce environmental impact, and create jobs in Bangladesh.
10	Bangladesh	Mitigation	Dhaka Mass Rapid Transit Development Project	Transport	Public	Private and Public	Planned	Build urban high-speed railway in Dhaka City, which is a mass rapid transit railway system.
11	Bangladesh	Mitigation	Matarbari Ultra Super Critical Coal-Fired Power Project (IV)	Energy	Public	Private and Public	Planned	A highly efficient supercritical pressure coal-fired power plant with a rated output of 1,200 megawatts (600 megawatts x 2 units) is constructed in the Matarbari District, Chittagong District, southeastern Bangladesh.
12	Bhutan	Adaptation	The Project for the Construction of Disaster-Resilient Emergency Mobile Network	Prevention and Restoration of disaster	Public	Private and Public	Planned	In Jakar City, Bhutan, a system for expansion of mobile communication networks is developed. It is expected that this will improve the state of communications and enable stable communications, leading to risk reduction.
13	Bolivia	Mitigation	The Project for Road Disaster Prevention of National Road No.7	Transport	Public	Private and Public	Planned	The project aims to reduce traffic obstacles by implementing road disaster prevention measures at five locations that are likely to suffer large-scale disasters on National Road No. 7, which is the main road in the country, and to contribute to the revitalization of regions economies and the improved accessibility of public services such as educational and healthcare for local residents.
14	Burkina Faso	Mitigation	Sustainable rural road maintenance using Do-nou technology by the community Phase-3	Transport	Public	Private and Public	Implemented	Unpaved roads and roads that suffer traffic obstacles due to flood damage in the rainy season will be repaired using the "sandbag method". It also contributes to the creation of non-agricultural jobs by providing technical guidance to local youth so that they acquire skills, when repairing (including the support of entrepreneurs to start up in business, etc.).
15	Cambodia	Mitigation	Methane fermentation and power generation project of organic waste discharged from markets.	Energy	Public	Private and Public	Implemented	In order to contribute to the appropriate treatment of waste from Phnom Penh, the cogeneration project is conducted by dry Methane fermenting using organic wastes such as food waste, papers, and agricultural residues which account for the majority of the municipal waste disposed in landfill, as raw materials. Created renewable energy is sold or used for supplying heat to surrounding facilities. It aims to reduce GHG emissions from landfill sites.

No.	Recipient country and/or region	Targeted area	Measures and activities related to technology transfer	Sector	Source of the funding for technology transfer	Activities undertaken by	Status	Additional information
16	Cambodia	Mitigation	Phnom Penh City Transmission and Distribution System Expansion Project (Phase 2)(II)	Energy	Public	Private and Public	Planned	In order to meet the expanding demand for electricity from Phnom Penh, support for new and additional substations (two sites) and expansion of transmission and distribution networks (overhead transmission lines, underground transmission lines, and distribution lines), continued from the first stage, is provided.
17	Chile	Mitigation	Huatacondo Photovoltaic Project	Energy	Private	Private and Public	Implemented	This is a project to construct A 98.0MW solar energy generation plant in the Huatacondo area, and after the completion the generated electricity is sold to the Chilean electricity market.
18	Cook	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	It is expected that by providing construction machinery, etc. required to promote infrastructure development, etc. with disaster prevention and mitigation capabilities, and contribute in overcoming the vulnerabilities of the country.
19	Djibouti	Mitigation	Test Well Drilling Project for Geothermal Development	Energy	Public	Private and Public	Implemented	This project aims to improve the geothermal development technologies of Djibouti Geothermal Development Corporation (ODDEG) by obtaining the information needed to decide geothermal development policies in Djibouti through the drilling of test wells in geothermal development areas in Djibouti, and by cooperating with ODDEG in the management of drilling, the construction of reservoir models, and the assessment of geothermal resources.
20	Ethiopia	Mitigation	The Economic and Social Development Programme	Water and sanitation	Public	Private and Public	Implemented	Provision of water supply equipment (water supply pumps, solar panels, etc.) to promote water infrastructure maintenance and water quality assurance in Tigray Province, and to improve accessibility to safe water by residents.
21	Ethiopia	Mitigation	Improving Public Health by Solar-powered Water Sanitation Systems in Ethiopia	Water and sanitation	Public	Private and Public	Implemented	Install solar-powered water purification systems to provide safe water for internally displaced people and immigrants.
22	Fiji	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	Provide life rescue and search operations in the same area when disasters occur, as well as provision of maritime security-related equipment, such as life boats, to Fiji police, which are engaged in marine conservation in coastal waters, life rescue and search operations, for disaster prevention and mitigation in the country.
23	Honduras	Mitigation	The project for Improvement and Extension of Water Supply System in Comayagua City	Water and sanitation	Public	Private and Public	Planned	In Comayagua City, the project aims to improve water quality and sanitation environments through the development and expansion of water works facilities, including the construction of a water purification plant. This is expected to contribute to the solution of public health issues with the aim of improving the quality of water supplied and increasing water supply time, as well as increasing the amount of water purified using river water as raw water.
24	Honduras	Adaptation	Project for Landslide Prevention in National Road No.6	Prevention and Restoration of disaster	Public	Private and Public	Planned	By implementing landslide measures (three locations) on Route 6, the project aims to reduce vulnerabilities to natural disasters and ensure smooth transportation, thereby contributing to enhance disaster countermeasures.
25	Honduras	Adaptation	Project for Control and Mitigation of Landslide in Tegucigalpa Metropolitan Area	Prevention and Restoration of disaster	Public	Private and Public	Implemented	In order to concretely reduce the risk of the region considered to be a landslide hazard zone, this project carries out technical transfer related to planning, designing, and execution of countermeasures and evacuation according to forewarning.
26	India	Mitigation	Chennai Metro Project (V)	Transport	Public	Private and Public	Planned	This project aims to respond to the increasing transportation demand by constructing mass high-speed transportation systems in the Chennai metropolitan area of Tamil Nadu, southern India, thereby contributing to the development of the region's economies and improving urban environments through mitigation of traffic congestion and decrease of atmosphere pollution and noise.
27	India	Mitigation	DFC Project (Procurement of Electric Locomtives)	Transport	Public	Private and Public	Planned	By introducing high-power, high-speed locomotive as part of a project to construct a new freight railway line from Delhi to Mumbai, it aims to respond to future freight transportation demand and improve the efficiency of logistics networks, thereby contributing to the economic development of India.
28	India	Mitigation	North East Road Network Connectivity Improvement Project (Phase 1)(I)	Transport	Public	Private and Public	Planned	Improvements is made to National Routes 51 and 54 of the Northeast regions, which is the border to Myanmar, Bangladesh, and Bhutan. This improves connectivity by facilitating transportation within the regions, at home and abroad, and with other regions, and contribute to economic development.
29	India	Mitigation	Rajasthan Water Sector Livelihood Improvement Project (I)	Agriculture	Public	Private and Public	Planned	Taking in to account the participation of female farmers, the farming support based on the improvement of aging irrigation facilities and market-based demand is provided. This improves irrigation efficiencies and agricultural productivity, contributing to improved farmers' livelihoods and women's participation in social economic activity.
30	India	Adaptation	AP Irrigation & Livelihood Improvement Project (Phase2)(I)	Agriculture	Public	Private and Public	Planned	In Andhra Pradesh, the project aims to expand the area of irrigation, increase agricultural productivity, and strengthen the farmers' marketing capacity by modifying the old irrigation facilities that cover approximately 160,000 ha, and by supporting the comprehensive farming system for farmers' organizations. Through these, the project contributes to the improvement of the livelihoods of farmers in the regions covered by the project and the construction of the agricultural value chain.
31	India	Adaptation	Feasibility study on adaptation business development by introducing groundwater purification system in India	Water and sanitation	Public	Private and Public	Implemented	Highly efficient purification system for groundwater using an ion-exchange membrane in inland rural regions is introduced, where groundwater levels are lowered or contaminated seriously and pure water cannot reach. This provides stable and safe supplies of drinking water and agricultural water, and contribute to the system to secure safe water, which is an adaptation issue for India.
32	India	Mitigation	Kolkata East-West Metro Project (III)	Transport	Public	Private and Public	Planned	In the Kolkata metropolitan area, mass rapid transit systems are constructed to respond to increasing transportation demand and contribute to regions economic development and improved urban environments through mitigation of traffic congestion and decrease of traffic pollution.
33	India	Mitigation	Mumbai Metro Line 3 Project (II)	Transport	Public	Private and Public	Planned	In the Mumbai metropolitan area, by developing subways, the project aims to respond to increasing transportation demand, thereby contributing to the development of region's economy and improving urban environment through mitigation of traffic congestion and decrease of traffic pollution.
34	India	Mitigation	Project for Installation of Chennai Metropolitan Area Intelligent Transport Systems	Transport	Public	Private and Public	Planned	In the Chennai metropolitan area, Intelligent Transport Systems is introduced, and smooth traffic systems capable of coping with rapidly increasing traffic volumes are constructed, thereby contributing to the mitigation of traffic congestion and region's economic development in the same metropolitan area.
35	India	Mitigation	Project for Renovation and Modernization of Umiam-Umtru Stage-III Hydroelectric Power Station	Energy	Public	Private and Public	Planned	In the Umiam and Umtru River Basin, Meghalaya, Umium-Umtru Third Hydropower generation Station (2 units 30MW) is renovated to improve the power supply capacity in the province, thereby contributing to industrial development and improvement of living standard in the province.

No.	Recipient country and/or region	Targeted area	Measures and activities related to technology transfer	Sector	Source of the funding for technology transfer	Activities undertaken by	Status	Additional information
36	India	Mitigation	Chennai Metro Rail Project (Phase 2)(I)	Transport	Public	Private and Public	Planned	In the Chennai metropolitan area, by constructing mass rapid transit systems, the project aims to respond to increasing transportation demand, thereby improving urban mobility, alleviating traffic congestion, and support measures against traffic pollution such as atmosphere pollution and noise. Through the development of region's economies and the improvement of urban environment, the project contributes to the enhancement of industrial competitiveness.
37	India	Mitigation	Delhi Mass Rapid Transport System Project Phase 3 (III)	Transport	Public	Private and Public	Planned	Building mass rapid transit systems will respond to increasing transport demand and contribute to regions economic development, improved urban environments, and climate-change mitigation through mitigation of traffic congestion and reduced traffic pollution.
38	India	Mitigation	Project for Construction of Mumbai - Ahmedabad High Speed Rail (I)	Transport	Public	Private and Public	Planned	It is support to construct a high-speed railway using Japanese Shinkansen systems in a section of about 500km connecting Mumbai and Ahmadabad.
39	India	Adaptation	Bengaluru Water Supply and Sewerage Project (Phase 3)(I)	Water and sanitation	Public	Private and Public	Planned	In the Bengaluru metropolitan area of Karnataka, southern India, the project provides stable water supply and sewerage system services to meet the rapidly increasing water demand by developing water facilities and sewerage facilities that use the Kaveri river as a source of water.
40	India	Adaptation	Project for Construction of Chennai Seawater Desalination Plant(I)	Water and sanitation	Public	Private and Public	Planned	Construct seawater desalination plant, and construct and improve water supply and distribution facilities in the Chennai metropolitan area.
41	Indonesia	Mitigation	Rentang Irrigation Modernization Project	Agriculture	Public	Private and Public	Planned	Support is given to the improvement of irrigation facilities, the construction of water management systems, and the strengthening of maintenance and management systems in the Rentang Irrigation Area. This increases agricultural productivity, such as rice, and contribute to raising farmers' incomes and Indonesian food security.
42	Indonesia	Mitigation	Komering Irrigation Project (Phase 3)	Agriculture	Public	Private and Public	Planned	As a final step, water is supplied to the cropland to which irrigation water is not yet supplied, and maintenance and management capacity will be strengthened, and the facilities developed up to phase 2 will be renovated. This increases the agricultural output of rice and other products in the Komering Irrigated Area and contribute to the improvement of farmers' incomes and the food security of Indonesia.
43	Indonesia	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development of an energy management system (EMS) supplying renewable energy steadily)	Energy	Public	Private and Public	Planned	Development and demonstration of energy management systems that provide stable renewable energy.
44	Indonesia	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Commercial Development of High Efficiency Biodiesel Fuel Production Process Utilizing Various Low-Quality Fat and Oil)	Energy	Public	Private and Public	Planned	Development and demonstration of high-efficiency biodiesel fuel production process using palm oil and fat as raw materials.
45	Indonesia	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Energy saving through the modification of carbonize process of high calorific value biomass waste such as Palm Empty Fruit Bunch)	Water and sanitation	Public	Private and Public	Planned	Developing and demonstrating an energy-saving two-chamber vertical carbonization cassette furnace.
46	Indonesia	Mitigation	Rantau Dedap Geothermal IPP Project	Energy	Private	Private and Public	Implemented	In South Sumatra, Indonesia, a 98.4MW geothermal power station is constructed and sold to Indonesia's National Power Corporation PT PLN(Persero) for 30 years.
47	Indonesia	Mitigation	Jawa 1 LNG to Power Project	Energy	Private	Private and Public	Implemented	A gas thermal power generation station with a power generation capacity of 1,760 MW and a FSRU with a storage capacity of 170,000m^3 are constructed and generated electricity is sold to the Indonesian National Electricity Public Corporation PT PLN (Persero) for 25 years.
48	Indonesia	Mitigation	Construction of Jakarta Mass Rapid Transit Project (Phase 2) (I)	Transport	Public	Private and Public	Planned	Support the development of the Northern Extension Zone for the first Mass Rapid Transit (MTR) implemented by the Special District of Jakarta Metropolitan Government.
49	Indonesia	Mitigation	Study for Low Carbon Society by the Introduction of Energy Saving Equipment in Industry Sector of Semarang City through JCM City-to-City Collaboration with Toyama City	Cross-cutting	Public	Private and Public	Implemented	Semarang City formulated the Low Carbonization Society scenario in 2030. In particular, the industrial sector, which has a large CO2 reduction target, will be a model on the urban industrial sector's low carbonization by promoting the energy conservation of industrial parks by introducing high-efficiency boilers, natural-gas fuel switching, and high-efficiency freezers by utilizing business technologies in Toyama City in collaboration with Toyama City and Semarang City.
50	Indonesia	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development of an energy management system (EMS) supplying renewable energy steadily)	Energy	Public	Private and Public	Planned	Developing and demonstrating energy management systems that provide stable renewable energy.

No.	Recipient country and/or region	Targeted area	Measures and activities related to technology transfer	Sector	Source of the funding for technology transfer	Activities undertaken by	Status	Additional information
51	Indonesia	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Commercial Development of High Efficiency Biodiesel Fuel Production Process Utilizing Various Low-Quality Fat and Oil)	Energy	Public	Private and Public	Planned	Development and demonstration of high-efficiency biodiesel fuel production process using palm oil and fat as raw materials.
52	Indonesia	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries （Development of continuous compaction and carbonization process for low density waste and exhaust heat utilization system）	Cross-cutting	Public	Private and Public	Planned	Demonstration of carbonization treatment technology and continuous compaction process for low density waste and exhaust heat utilization system.
53	Indonesia, Thailand, Philippines, Viet Nam, Mexico, Mongolia, Lao People's Democratic Republic	Mitigation	JCM Model Project	Cross-cutting	Public	Private and Public	Planned	Subsidies of less than half of the up-front cost is provided for projects (including construction, facility, and office expenses) that introduce facilities and equipment to reduce energy-related CO2 emissions, and the Japanese government will acquire more than half of the JCM credits issued from these projects. Twenty projects were adopted and implemented in 2017.
54	Iraq	Mitigation	Hartha Thermal Power Station Rehabilitation Project (Phase2)	Energy	Public	Private and Public	Planned	By upgrading the Hartha electricity Station's Unit 1 (rated output 200MW), which has the largest rated output in Basra Prefecture, it restores and stabilize domestic power-supply capacity and contribute to the strengthening of Iraqi basic economic infrastructure. (The Hartha Power Station was constructed by Japanese companies in 1982 in response to Japanese support (ODA Loans and Export Credit)
55	Iraq	Mitigation	Electricity Sector Reconstruction Project (Phase 3)	Energy	Public	Private and Public	Planned	This project aims to improve the stability of electric power supply by constructing fixed substations and installing mobile substations, mainly in Anbar Prefecture, which has been affected by the battle with extremist groups in recent years, Baghdad Prefecture, which is the hub-site for Iraqi electric power supply, and the
56	Iraq	Adaptation	Basrah Water Supply Improvement Project (II)	Water and sanitation	Public	Private and Public	Planned	In Basrah and Hartha cities, water facilities such as purification plant and water grids are developed to improve the water supply condition of both cities.
57	Iraq	Adaptation	Irrigation Sector Loan (Phase 2)	Agriculture	Public	Private and Public	Planned	Establishment of irrigation and drainage facilities, and cropland maintenance and restoration are implemented in the downstream Tigris-Euphrates river basin.
58	Iraq	Adaptation	Water Supply Improvement Project in Kurdistan Region (II)	Water and sanitation	Public	Private and Public	Planned	In the prefectures of Slemani, Erbil, and Duhok in Kurdistan regions, water intake facilities, purification plant is newly established and expanded, and water distribution facilities is developed to improve the water supply status of the respective prefectures.
59	Jamaica	Mitigation	Energy Management and Efficiency Programme	Energy	Public	Private and Public	Planned	By implementing renovation work to introduce energy-saving technologies and equipment in public facilities mainly in Kingston but throughout the country, by improving fuel consumption in the transportation sector in Kingston, and by strengthening the organization of the Ministry of Energy and Science and Technology, it promotes energy-savings in both public and private entities, and contributes to the mitigation of climate change impacts and overcoming
60	Jordan	Mitigation	Al-Muwaqqar Solar Energy Project	Energy	Public	Private and Public	Planned	Construction and operation of the 200MW Solar energy generation Plant, the largest in Jordan, in Al-Muwaqqar Prefecture is carried out, where BSEC is located in Jordan. This project is expected to diversify power sources and reduce CO2 by 360,000 tons per year.
61	Jordan	Mitigation	Al Manakher Photovoltaic Project	Energy	Private	Private and Public	Implemented	Project to build a new solar energy generation station with a capacity of approximately 52MW in the Al Manakher areas in Jordan.
62	Kenya	Mitigation	Feasibility Study on Renewable Energy Creation in KituiCounty, Kenya with Installation of Mega Solar System	Energy	Public	Private and Public	Implemented	By installing mega-solar power generation and selling the generated electricity to Kenya Electric Power Public Corporation (KPLC) through the fixed purchase price system (FIT system), the project aims to achieve development of energy that contributes to climate-change measures by introducing renewable energy and to promote the diffusion of construction mega-solar power plants.
63	Kenya	Mitigation	Olkaria I Units 1, 2 and 3 Geothermal Power Plant Rehabilitation Project	Energy	Public	Private and Public	Planned	In the geothermal area of Orcaria, Nakur-County, Central Kenya, Olkaria 1 (Units 1, 2, and 3) geothermal power station (15MW x 3) with an output of 45MW, which was constructed in the 1980s, is renovated to an output of 51MW (17MW x 3).
64	Kiribati	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	Disaster prevention and environmental-related equipment such as water trucks will be provided to the remote islands of the Line Phoenix Islands, thereby improving the livelihoods of the remote islands and contributing to overcoming the vulnerability of the country.
65	Lao People's Democratic Republic	Mitigation	The Project for the Improvement of Irrigated Agriculture in Tha Ngon	Agriculture	Public	Private and Public	Planned	In the Tha Ngon District, Vientiane, grant to renovate existing old pump-irrigation facilities is provided. It is expected that the development of agricultural infrastructure in the Tagon district will promote transition in commercial agriculture, which is one of the priority policies of the Lao People's Democratic Republic, and contribute to the development of agriculture in the Lao People's Democratic Republic as a whole.
66	Madagascar	Mitigation	The Economic and Social Development Programme	Water and sanitation	Public	Private and Public	Implemented	It aims to contribute to improved access to safe water in Madagascar and economic and social development in Madagascar through the provision of water purification systems.
67	Malawi	Adaptation	The Economic and Social Development Programme	Agriculture	Public	Private and Public	Implemented	Provide vehicles for agricultural equipment and food transportation, support efforts to ensure food security, and contribute to building climate-resilience in the country.
68	Malaysia	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (The development for the efficient capturing methane gas technology of renewable energy process in palm oil industry)	Energy	Public	Private and Public	Planned	Developing and demonstrating highly efficient palm wood pellets manufacturing technologies and CO2 saving.
69	Malaysia, Thailand, Viet Nam, Palau	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development of the high drainage processing technology by methane-gas power generation system using feces and urine, and membrane treatment at pig farms in Southeast Asian countries)	Cross-cutting	Public	Private and Public	Planned	Demonstration of CO2 reductions and zero emission systems by methane-gas power generation and membrane treatment of pig farm feces and urine.
70	Malaysia, Thailand, Viet Nam, Palau	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development of the high drainage processing technology by methane-gas power generation system using feces and urine, and membrane treatment at pig farms in Southeast Asian countries)	Cross-cutting	Public	Private and Public	Planned	Demonstration of CO2 reductions and zero emission systems by methane-gas power generation and membrane treatment of pig farm feces and urine.

No.	Recipient country and/or region	Targeted area	Measures and activities related to technology transfer	Sector	Source of the funding for technology transfer	Activities undertaken by	Status	Additional information
71	Marshall	Mitigation	The Project for the Installation of Solar Electricity Generation System in Ebeye Island	Energy	Public	Private and Public	Planned	By developing solar energy generation systems on Ebeye, solar power capacity is expected to reach 600 kilowatts in 2022 (three years after the completion of the project), and as a result, diesel-fuel consumption is expected to be reduced by approximately 3,000 kiloliters per year.
72	Micronesia	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	Provides generators and other facilities to prepare for frequent power failures in peacetime, in addition to the time of disasters, and it is expected to strengthen the country's disaster prevention and mitigation capabilities.
73	Morocco	Mitigation	The Economic and Social Development Programme	Transport	Public	Private and Public	Implemented	By providing next-generation vehicles produced in Japan, the project will enhance Morocco's ability to respond to environmental problems and climate change, and contribute to the support for the expansion of Japanese business in foreign countries.
74	Myanmar	Mitigation	Regional Development Project for Poverty Reduction Phase II	Cross-cutting	Public	Private and Public	Planned	New construction, renovation, and installation of life infrastructure (roads, bridges, electricity, and water supply) is carried out in Myanmar (seven states in seventh regions). This aims to improve the livelihoods of local residents and contribute to local development and poverty reduction.
75	Myanmar	Mitigation	Power Distribution System Improvement Project in Major Cities	Energy	Public	Private and Public	Planned	By upgrading distribution network facilities in major local cities in Myanmar, improve power supply of target cities thereby contribute to the economic development of the country as a whole and improvement of the livelihoods of its citizens.
76	Myanmar	Mitigation	Hydropower Plants Rehabilitation Project	Energy	Public	Private and Public	Planned	Renovation of existing Hydropower generation power plants (Baluchaung 1st Hydropower generation station and Sedaudi Hydropower generation Station) and related transmission facilities is carried out in Mandalay regions, Kayah State. As a result, it improves the status of electric power supplies by increasing the maximum power output and operating rate of hydroelectric power plants that are subject to support, thereby contributing to the promotion of economic and social development of the country as a whole and the improvement of the livelihoods of its citizens.
77	Myanmar	Mitigation	Project to realize low carbonization in Mandalay region, through introduction of saving energy technologies and renewable energies (City of Kitakyushu- Mandalay City Cooperation Project)	Energy	Public	Private and Public	Implemented	With the cooperation between Mandalay City and Kitakyushu City in the Federal Republic of Myanmar, the project aims to significantly reduce GHG emissions by introducing energy conservation chillers and solar energy generation systems for large hotels and hospitals, and by introducing power generation systems that utilize region's biomass such as rice husk and livestock manure.
78	Myanmar	Mitigation	Project for Introduction of high-efficiency pumps into existing pumping station and energy-saving through efficient collection and recycling of garbage	Water and sanitation	Public	Private and Public	Implemented	Replacing aged pumps in existing pumping stations controlled by Yangon City with custom-designed high-efficiency pumps tailored to the current status of existing facilities will not only reduce GHG emissions but also contribute to the operation of efficient water work facilities. In addition, in the collection and transportation of garbage, sensors are used to measure the volume of garbage in trash boxes and containers in real time, and the route from garbage collection to garbage final disposal site is optimized and optimally distributed. Furthermore, in final disposal, waste is efficiently converted into power generation materials by waste recycling plants, and power generation by biomass is carried out.
79	Myanmar	Mitigation	Waste to Energy Plant Project for Yangon City in Myanmar	Water and sanitation	Public	Private and Public	Implemented	In order to further improve waste-disposal systems in Yangon City, JFE and Kawasaki City will, in cooperation with Yangon City, study the feasibility of projects aimed at sustainable society development by introducing large-scale waste incineration power plants, which is a Japanese technology, contributes to reducing GHG emissions and eliminating power shortages in Yangon City, and build cooperative relationships with Yangon City to form low-carbon cities.
80	Myanmar	Mitigation	Study on feasibility of a low-carbon waste treatment system and micro-grid system and promotion of activities under inter-regional collaboration in Ayeyarwady region and Sagaing region.	Water and sanitation	Public	Private and Public	Implemented	In cooperation between the Ayeyarwady and Sagaing Districts, support is provided to the investigation of introduction of low-carbon waste treatment systems (e.g., power generation of rice husks) and micro-grid systems, as well initiatives for independent decentralized regional electricity supply such as capacity building, and the formulation of plans that contribute to the smooth implementation of projects.
81	Myanmar	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development of rice husk gasification CHP system Note）CHP : Combined Heat and Power)	Energy	Public	Private and Public	Planned	Development of gasification cogeneration systems fueled by rice husk.
82	Myanmar	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development of low-cost, small-scale power generation and power system by improvement of Stirling Engine using biomass fuel)	Energy	Public	Private and Public	Planned	Development and demonstration of low-cost small-scale power generation and power systems through refinement of biomass-fueled Stirling engines.
83	Myanmar	Mitigation	Feasibility Study of Joint Crediting Mechanism Project by City to City Collaboration in Yangon city Phase-4 (Utilization of Energy and Energy Saving. in Fruits and Vegetables Wholesale Market)	Water and sanitation	Public	Private and Public	Implemented	Organic wastes generated from the Danyingone fruit and vegetable markets newly established by Dagon Group are Methane fermented by the WTM-system, which is an advanced technology, and biogas is utilized. Consider reducing CH4 emissions from open damping and reducing CO2 emissions by generating electricity with biogas and supplying electricity to markets.
84	Nauru	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	It is expected that by providing equipment related to the development of the Aiwo Port, the port functions with disaster prevention and mitigation capabilities will be strengthened, thereby contributing to the socioeconomic development of the country through the stabilization of society.
85	Nepal	Adaptation	the Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	This project aims to restore and reconstruct from natural disasters in Nepal and to strengthen disaster prevention capabilities through the provision of disaster prevention and recovery-related equipment manufactured in Japan, thereby contributing to the socio-economic development of Nepal through social
86	Niue	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	It is expected that by providing construction equipment and other equipment needed to promote disaster-resilient infrastructure development, etc. the project contribute to the country's efforts to overcome its vulnerabilities.
87	Oman	Mitigation	Sharqiyah Independent Water Project	Water and sanitation	Private	Private and Public	Implemented	Project to construct RO-membrane desalination plant in Sharqiyah area, Oman.
88	Pakistan	Mitigation	Islamabad and Burhan Transmission Line Reinforcement Project	Transport	Public	Private and Public	Planned	Support is made to increase the number of existing transmission lines required for supplying electricity to the metropolitan area of Islamabad and the surrounding regions. This helps to improve the capacity shortage of transmission lines, thereby contributing to the improvement of Pakistan's economic foundation through stable power supply.
89	Palau	Mitigation	The Project for Study on Upgrading and Maintenance Improvement of National Power Grid	Transport	Public	Private and Public	Implemented	Development and planning of the renewal of transmission and distribution systems, including the energy roadmap is carried out, and technical support on transmission and distribution operation maintenance management is provided.
90	Papua New Guinea	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	Solar energy generation facilities and seawater desalination systems are installed in facilities that can be easily accessed by region's residents and that can serve as bases in the time of disasters. These facilities ensure the electric power and drinking water required for residents' lives in peacetime, as well as the lifelines (power sources and water sources) required in the time of disasters.

No.	Recipient country and/or region	Targeted area	Measures and activities related to technology transfer	Sector	Source of the funding for technology transfer	Activities undertaken by	Status	Additional information
91	Philippines	Adaptation	Cavite Industrial Area Flood Risk Management Project	Prevention and Restoration of disaster	Public	Private and Public	Planned	In the San Juan River Basin in Cavite, construction of a diversion channel is carried out and flooding measures for drainage ditches and river renovation is implemented. This reduces the damage caused by floods in the regions, particularly industrial clusters, and contribute to the regions' sustainable and stable
92	Philippines	Mitigation	Non-Revenue Water Improvement Project in the West Zone of Metro Manila	Water and sanitation	Public	Private and Public	Planned	The west area of the Metropolitan Area of Manila is a region which includes area of low average-household income level in the metropolitan area, and it has a high potential needs for development, This project aims to achieve efficient water supply with low water distribution loss by implementing non-revenue water measures such as renewal of water pipes and meters, and to contribute to improving water work services such as increased water supply pressure and stable supply during drought.
93	Philippines	Mitigation and Adaptation	Feasibility study on reinforcing resilience of power and communication infrastructure utilizing wind power and satellite communication adaptable to increasing climate change related disasters accompanied by climate change	Energy	Public	Private and Public	Implemented	By continuously supplying the necessary electric power from the time of typhoon attack to the time of reconstruction with a wind turbine that can continuously generate electricity even in the event of typhoon, access to necessary information and medical services even in the event of disasters is ensured.
94	Philippines	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Establishment of bioethanol production system by utilizing unused biomass)	Energy	Public	Private and Public	Planned	Establishment and demonstration of ethanol production system using sugar cane bagasse as a raw material.
95	Philippines	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Waste plastics recycling project in Cebu to produce fluff fuel (alternative to fossil fuel such as coal) consumed by cement manufacturers)	Water and sanitation	Public	Private and Public	Planned	Development and demonstration of fluff fuel production equipment using waste plastic as a raw material.
96	Philippines	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development and Demonstration Project of absorbing surplus energy from wind turbine generators with typhoon resistant system by mobile power pack in small scale islands of the Philippines.)	Energy	Public	Private and Public	Planned	Development and demonstration of surplus power use systems using typhoon-resistant wind energy generation machines and multi-purpose batteries.
97	Philippines	Mitigation	Metro Manila Subway Project (Phase 1)(I)	Transport	Public	Private and Public	Planned	In the metropolitan area of Manila, the first underground railway in the Philippines (about 25 kilometers) that connects the cities of Quezon in the north and Paranaque in the south is built to respond to increasing transportation demand and contribute to alleviating serious traffic congestion and atmosphere and climatic changes in the metropolitan area of Manila.
98	Philippines	Mitigation	City to City Collaboration between Osaka and Quezon (Introduction of energy-saving technologies to factories and transport sector, and introduction of a solar power generation system to a closed landfill)	Cross-cutting	Public	Private and Public	Implemented	In this project, based on the cooperation between Osaka City and Quezon City, the following are carried out : Expansion of the JCM project promotion manual, energy conservation project in factories, update/efficiency improvement of trucks of garbage collections, feasibility study of solar energy generation introduction in large-scale waste landfill.
99	Philippines	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development and Demonstration Project of absorbing surplus energy from wind turbine generators with typhoon resistant system by mobile power pack in small scale islands of the Philippines.)	Energy	Public	Private and Public	Planned	Development and demonstration of surplus power use systems using typhoon-resistant wind energy generation machines and multi-purpose batteries.
100	Saint Lucia	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	By deployment of disaster prevention equipment manufactured in Japan, improve the capacity in the field of disaster prevention, thereby contributing to the socioeconomic development of Saint Lucia through disaster prevention and environmental support, and support the expansion of Japanese business in foreign countries.
101	Samoa	Adaptation	The Economic and Social Development Programme	Prevention and Restoration of disaster	Public	Private and Public	Implemented	By providing medical equipment necessary for disasters, it is expected that the country will improve its disaster prevention and mitigation capabilities.
102	Saudi Arabia	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries （The verification test of CO2 emissions control technology by the high performance solar power generation system adopted to dessert conditions.）	Energy	Public	Private and Public	Planned	Demonstration and verification of high-efficiency, low-cost heterojunction silicon PV technologies in desert regions.
103	Sri Lanka	Mitigation	Kalu Ganga Water Supply Expansion Project (I)	Water and sanitation	Public	Private and Public	Planned	By developing new water works facilities and rebuilding water distribution systems in Kalutara and Colombo prefectures, the project aims to improve the safety of water supplies and water supply in the regions, thereby contributing to improved living conditions.
104	Sri Lanka	Adaptation	The Project for the Establishment of a Doppler Weather Radar Network	Prevention and Restoration of disaster	Public	Private and Public	Planned	Meteorological observation radar towers and meteorological radar central processing and display systems that cover the whole of Sri Lanka is installed. In this way, the project aims to strengthen the ability to observe rainfall in real time and aim to mitigate the disaster caused by weather disasters.
105	Sri Lanka, Republic of Maldives	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Installation and demonstration test project for battery-combined roof-top solar power generation system in South Asia)	Energy	Public	Private and Public	Planned	Developing and demonstrating battery storage system that effectively utilizes solar energy generation.

No.	Recipient country and/or region	Targeted area	Measures and activities related to technology transfer	Sector	Source of the funding for technology transfer	Activities undertaken by	Status	Additional information
106	Sri Lanka, Republic of Maldives	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Installation and demonstration test project for battery-combined roof-top solar power generation system in South Asia)	Energy	Public	Private and Public	Planned	Development and demonstration of storage battery system that effectively utilizes solar energy generation.
107	Tanzania	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries （Development and demonstration of an environmental value visualization platform for the expansion of CO2 reduction through the charging service using solar energy generation）	Energy	Public	Private and Public	Planned	Development and demonstration of systems for visualizing CO2 reductions in recharging services such as LED lanterns for non-electrified regions.
108	Thailand	Mitigation	The Demonstration Project for an emergency-saving resource circulation system to utilize electronic and electrical equipment waste in Thailand	Water and sanitation	Public	Private and Public	Implemented	In the Kingdom of Thailand, electric and electronic equipment waste has increased with economic development, and environmental damage due to improper disposal has become a social problem. Therefore, resource circulation system is established by introduction of recycle system for wastes from electric and electronic equipment in the vicinity of Bangkok, the Kingdom of Thailand, by introduction of an appropriate treatment promotion system, and by recycling difficult-to-dispose materials in Japan.
109	Thailand	Mitigation	The demonstration project for an emergency-saving resource circulation system to establish efficient and suitable resource recycling for end-of life vehicles in Thailand	Water and sanitation	Public	Private and Public	Implemented	In the Kingdom of Thailand, the number of vehicles owned has increased, and there is a high possibility that environmental damage caused by end-of-life vehicles will increase in the future. In response, a recycle system is established in the vicinity of Bangkok, the Kingdom of Thailand with reference to Japan's environmentally conscious deconstruction process. At the same time, an appropriate disposal promotion system is introduced, and difficult-to-dispose materials will be recycled in Japan to establish a resource recycling system.
110	Thailand	Mitigation	Introduction of high efficient waste processing facility under Integrated Waste Management Plan in Chiang Mai, Thailand	Water and sanitation	Public	Private and Public	Implemented	This project aims to achieve GHG emission reductions by introducing highly efficient and low-environmental-load treatment facilities owned by Japanese companies into the urban solid waste appropriate treatment project derived from the comprehensive support to the integrated waste management project planned by Chiang Mai, Thailand. The supervisory support for waste management shall be implemented by Kitakyushu City in accordance with an inter-city cooperation agreement with the prefectural government.
111	Thailand	Mitigation	Feasibility Study for assisting ports in Thailand to reduce CO2 Emission and to become "Smart Ports" in FY 2017	Transport	Public	Private and Public	Implemented	Introduce outstanding low carbonization technologies and products with track record in Yokohama Port, to Bangkok Port and Remchaban Port managed by the Thai Port Agency, and promote the low carbonization and smartness of the entire port in Thailand, which is a highly public logistics base. In the medium to long term, Thai port will be developed as a low-carbon smart logistics base in the ASEAN region.
112	Thailand	Mitigation	Project to realize and expand low carbonization model projects in Ecological Industrial Town by using JCM in Chiangmai Province (Kitakyushu- Chiangmai Cooperation Project)	Energy	Public	Private and Public	Implemented	In collaboration with Kitakyushu City, Chiang Mai Prefecture, the Factory Bureau of the Thai Ministry of Industry (DIW), and the Industrial Complex Public Corporation (IEAT), the project aims to drastically reduce GHG emissions by promoting energy conservation and introducing renewable energy, mainly in industrial parks and commercial facilities in Chiang Mai Prefecture.
113	Thailand	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Developing and demonstration of small-scale Seawater desalination system operated by photovoltaic power)	Energy	Public	Private and Public	Planned	Development and demonstration of small-sized seawater desalination systems using hollow fiber reverse-osmosis membranes using photovoltaic energy generation.
114	Thailand	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development of Energy-saving Submerged Mechanical Aerator/Agitator for Wastewater Treatment System in ASEAN)	Water and sanitation	Public	Private and Public	Planned	Development and demonstration of energy-saving aeration and agitator equipment in wastewater.
115	Thailand	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Technology development for manufacturing of torrefied pellet from old rubber wood without using fossil fuel)	Energy	Public	Private and Public	Planned	Developing and demonstrating technologies for manufacturing pellets for fuels made from CO2-saving old rubber wood.
116	Thailand	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Development of Energy-saving Submerged Mechanical Aerator/Agitator for Wastewater Treatment System in ASEAN)	Water and sanitation	Public	Private and Public	Planned	Development and demonstration of energy-saving aeration and agitator equipment in wastewater.
117	Tonga	Mitigation	The Project for Installation of Wind Power Generation System	Energy	Public	Private and Public	Planned	In Tongatapu, wind energy generation facilities and system stabilization equipment is installed. This will promote the introduction of renewable energy, diversify power sources, and contribute to the stable supply of energy in the country.
118	Tunisia	Mitigation	Sfax Sea Water Desalination Plant Construction Project	Water and sanitation	Public	Private and Public	Planned	The project aims to strengthen water supply capacity and improve quality in the metropolitan area, thereby contribute to the improvement of living environments and the promotion of economic and social development, by construction of seawater desalination facilities in the city of Sfax.
119	Turkmenistan	Mitigation	Natural Gas Power Plant Construction Project	Energy	Private	Private and Public	Implemented	In the project of a natural gas fired thermal power plant in Turkmenistan Lebap Province, gas turbines and generators (equivalent to 400MW) made of MHPS are supplied from Japan.
120	Uganda	Mitigation	Kampala Metropolitan Transmission System Improvement	Energy	Public	Private and Public	Planned	In Kampala, the capital city, the construction and expansion of substations, the expansion and replacement of transmission lines, and the introduction of mobile substations are carried out.

No.	Recipient country and/or region	Targeted area	Measures and activities related to technology transfer	Sector	Source of the funding for technology transfer	Activities undertaken by	Status	Additional information
121	Vanuatu	Adaptation	The Economic and Social Development Programme	Water and sanitation	Public	Private and Public	Implemented	Contributes to improving the quality of life of people living in rural areas, including people who have migrated from Ambae island by volcanic eruptions, through providing equipment that contributes to the development of water sources such as groundwater excavators and the development of water supply facilities, and ensuring safe access to water in the country.
122	Viet Nam	Adaptation	Ben Tre Water Management Project	Agriculture	Public	Private and Public	Planned	This project aims to improve agricultural productivity through the provision of low-salinity agricultural water through the development of saltwater uprush restriction facilities in Ben Tre Province, southern Viet Nam, where agricultural crops are damaged by saltwater drift, thereby contributing to the improvement of the livelihoods of regions residents through adaptation to climate change and rural and regions development.
123	Viet Nam	Mitigation	Bien Hoa City Drainage and Wastewater Treatment Systems	Water and sanitation	Public	Private and Public	Planned	Support is given to construct a sewage treatment plant (one plant) and a pumping plant (two plants) in Bien Hoa City. This increases the rate of sewerage dissemination in the city, improve the water quality of small and medium rivers and waterways in the city, and contribute to improving public health.
124	Viet Nam	Mitigation	Project to accelerate low carbonization in Hai Phong City／Kitakyushu-Hai Phong Cooperation Project	Cross-cutting	Public	Private and Public	Implemented	In cooperation with the city of Hai Phong in Viet Nam and the city of Kitakyushu in Japan, three types of project will be investigated. 1) Waste power generation business by mixed incineration of municipal solid waste and industrial waste discharged from industrial parks, 2) discovery of project with large CO_2 emission reductions such as waste heat recovery from cement factories, 3) low carbonization project combined with original finance procurement mechanism in remote islands.
125	Viet Nam	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Intermediate treatment system renovation for RPF production in Viet Nam)	Water and sanitation	Public	Private and Public	Planned	Developing and demonstrating energy-saving RPF granulating equipment.
126	Viet Nam	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Innovative experiment of high efficiency waste-to-energy and low-carbon transport technologies creating zero-emissions infrastructure in Viet Nam.)	Energy	Public	Private and Public	Planned	Demonstration of a waste collection and recycling system that combines high-efficiency waste power generation, EV motorcycles, and trucks.
127	Viet Nam	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Intermediate treatment system renovation for RPF production in Vietnam)	Water and sanitation	Public	Private and Public	Planned	Development and demonstration of energy-saving RPF granulating equipment.
128	Viet Nam	Mitigation	Demonstrate advanced low-carbon technology innovation for further deployment in developing countries (Innovative experiment of high efficiency waste-to-energy and low-carbon transport technologies creating zero-emissions infrastructure in Vietnam.)	Energy	Public	Private and Public	Planned	Demonstration of a waste collection and recycling system that combines high-efficiency waste power generation, EV motor cycles, and trucks.

Table 5-8 Description of project to facilitate the transfer of environmentally sound technologies

Project/program title:
Promotion of Green Hospital by improving efficiency and environment in national hospitals in Vietnam (demonstration project)
Purpose:
This demonstration project introduced about 1,000 energy-efficient inverter air conditioners (ACs) at two state-owned hospitals in Vietnam, along with energy management systems to efficiently optimize these ACs. The project aims to demonstrate and verify these technologies as well as CO_2 emission reduction effects, anticipating 35% energy savings and better ventilation of the entire hospital.

Recipient country:	Sector:	Total funding:	Years in operation:
Vietnam	Energy	5 million USD	2014-2017 (4 years)

Description:
In this demonstration project, high-efficiency performance inverter ACs, compliant with the energy efficiency labeling standard in Vietnam, were introduced in two state-owned hospitals, one located in Hanoi and the other in Ho Chi Minh City. Not only were inverter ACs installed, but the energy management system (EMS) was developed and installed to enhance the energy efficiency of the entire hospital. Together with the EMS, improving ventilation will lead to better indoor air quality, thus contributing to shifting these hospitals to environmental friendly "green Hospitals". As one of the JCM Projects, the amount of CO_2 emission reduction, as well as energy efficiency in the project, is monitored and verified.
Factors that led to project/program success:
The project contributes to inclusive and sustainable climate action (energy efficiency, indoor air quality and proper treatment of wasted refrigerant) through a series of consultations with local stakeholders, such as the hospitals, related ministries, and governmental agencies, such as the Ministry of Natural Resources and Environment, Ministry of Industry and Trade, and the test center for energy efficiency labelling standard in charge.
Technology transferred:
In this demonstration project, high-efficiency performance inverter ACs, compliant with the energy efficiency labeling standard in Vietnam, were introduced in two state-owned hospitals, one located in Hanoi and the other in Ho Chi Minh City. Not only were inverter ACs installed, but the energy management system (EMS) was developed and installed to enhance the energy efficiency of the respective hospitals. Together with the EMS, improving air ventilation with total enthalpy heat exchanger leads to a better indoor air quality free from heat loss, thus contributing to changing these hospitals into environmentally friendly "green hospitals". In Vietnam, the Cooling Seasonal Performance Factor (CSPF) was introduced subsequent to the launch of the energy efficiency labeling standard. CSPF is a measure for cooling efficiency calculated from the total load and total energy consumption per year of operation. Using this method, the energy efficiency of inverter ACs can be evaluated accurately in public facilities such as hospitals, where air conditioning is needed all year round. Accordingly, this project includes the installation of CSPF-supporting Balanced Room-type Calorimeter at the Testing and Verifications Centre for Industry/Institute of Energy and Mining Machine (TVCI/IEMM), the sole certification authority in Vietnam where efficiency of ACs will be verified. In replacing the ACs, a leakage prevention plan must be prepared and implemented in order to ensure that hydro chlorofluorocarbons (HCFCs) used as the refrigerant are not released into the atmosphere when removed from conventional ACs. In consideration of environmental integrity, such Eligibility Criteria have been established through the efforts of Japan and Vietnam, both of which are highly conscious of climate change issues. The removed refrigerant (HCFCs) was depleted properly at a certified destruction plant in Vietnam.
Impact on greenhouse gas emissions/removals (optional):
878 tCO_2 eq./year (estimated amount of the credit issuance, not including the emission reduction through EMS, air ventilation with total enthalpy heat exchanger and HCFC depletion) In fact, there must be more GHG emission reduction effects obtained by the introduction of EMS, air ventilation with total enthalpy heat exchanger and HCFC depletion.

Project/program title:

Yangon Waste to Energy plant by introducing power generation and avoidance of landfill gas emissions through combustion of municipal solid waste (MSW) (JCM Model project)

Purpose:

This project's aim is to reduce GHG emissions by incinerating waste that causes CH_4 emissions from a landfill disposal site, improve electricity shortage by power generation and achieve appropriate waste treatment.

Recipient country:	Sector:	Total funding:	Years in operation:
Myanmar	Energy	8 million USD	From 2017

Description:

This project built and operates a waste-to-energy plant; (1) by which some of the generated electricity is supplied to the power company, resulting in reduction of fossil fuel consumption at the power plant; (2) mitigates electricity shortage; (3) reduces CH_4 emissions from a landfill disposal site; and (4) improves waste management in Yangon City. This is a pilot project conducted by Yangon City for promotion of waste-to-energy, with relatively small capacity (60 t of waste per day).

Factors that led to project/program success:

- Close communication with stakeholders and the project that meets local needs.
- Concept and technical proposal which was suitable for Yangon city of Myanmar.
- The Japanese project participant transfers the operational skill through training to the Myanmar project participants, Yangon City Development Committee, by dispatching the supervisor from starting the operation.

Technology transferred:

This is the first waste-to-energy facility built in Myanmar with various support provided by private entities and the Ministry of the Environment, Japan. Even after the construction was completed, the Japanese project participant has been supporting the local operator by transferring operation and maintenance planning skill.

Impact on greenhouse gas emissions/removals (optional):

4,125 tCO_2/year(average) (estimated amount of the credit issuance)

5.5 Capacity-Building

5.5.1 Vision

With the early entry into force of the Paris Agreement in November 2016, the world is now moving toward its implementation. In order to achieve the 2-degree goal (1.5-degree pursued) of the Paris Agreement and to establish a decarbonized society with balancing anthropogenic emissions by sources and removals by sinks of greenhouse gases (GHG), in the second half of this century, we must diminish GHG emissions extensively worldwide and reduce vulnerability deriving from climate change and contribute to establishing a resilient society. In addition, it is essential to pursue the Sustainable Development Goals (SDGs) through economic growth, increased employment, infrastructure development and improved access to water, food, and energy.

In order to transform the world into such a state, innovation of technology and social and economic systems are indispensable. The immediate action will enable developing countries to address their infrastructure needs and avoid lock-in effects.

In order to accelerate climate change measures and sustainable development in developing countries, Japan will collaborate with them by utilizing its advanced technology and know-how, create "co-innovation" that reflects on their challenges and needs, and contribute to the global reduction of GHG emissions. Japan will incorporate the needs of each country and the seeds of technology and know-how acquired by private Japanese companies and local governments, and promote the creation of specific projects to find solutions that lead to co-innovation among Japan and developing countries. Moreover, further opportunities for co-innovation should be enhanced by visualizing those needs and seeds. It is important to develop institutions and capacities in developing countries and promote the engagement of private companies and local governments to implement climate change activities. For this purpose, Japan launched the Partnership to Strengthen Transparency for Co-Innovation (Partnership to Strengthen Transparency for co-Innovation: PaSTI) at COP23 in 2017.

For achieving this vision, Japan will coordinate closely within its relevant ministries, organizations, companies, and local governments, and continue to enhance collaboration with international organizations and international initiatives such as the NDC Partnership.

5.5.2 Specific Programs Related to Adaptation

■ Science-based development of adaptation plans and strategies

Risk evaluations based on scientific knowledge and their reflection upon the adaptation plans are essential for implementing adequate adaptation plans. Implementing adaptation measures also requires innovation of policy processes in both developed and developing countries. By providing the latest technology and know-how obtained by its industry-government-academia partnership, Japan will support the consolidation and dissemination of information on climate risk, the establishment of risk evaluation methods, and the development of national adaptation plans in developing countries.

More specifically, Japan will support impact assessments of climate change and the development of national adaptation plans through bilateral collaboration. For example, Japan has promoted the establishment of long-term risk evaluation methods on storm tides and

waves caused by cyclones in small island developing states (SIDS), including the Republic of Fiji, the Republic of Vanuatu, and Samoa. Japan has supported the development of a system of Analysis and Mapping of Impacts under Climate Change for Adaptation and Food security (AMICAF)". In addition, Japan will promote human resource developments in the field of climate change by supporting construction and institutional development of the Pacific Climate Change Center in cooperation with the Secretariat of the Pacific Regional Environment Programme (SPREP), as well as strengthening of the Climate Change International Technical and Training Center (CITC) in Thailand.

Japan will cooperate with developing countries in the Asia-Pacific region and the Asian Development Bank (ADB) to establish the Asia-Pacific Climate Change Adaptation Platform (AP-PLAT), as the information base on climate risk and adaptation measures. Japan will also collaborate with the Global Centre of Excellence on Climate Adaptation (GCECA) to contribute to developing global bases for information on climate risk. As the foundation of these programs, Japan will also continue to promote research and development to upgrade climate models and to establish global environment information platforms.

In order to promote international discussions on climate change and security, Japan will promote the findings of its recent report, *Analysis and Proposal of Foreign Policies Regarding the Impact of Climate Change on Fragility in the Asia-Pacific Region - With focus on natural disasters in the Region,* published in September 2017, in various diplomatic fields.

Japan will widely share these programs and the knowledge and lessons acquired through these initiatives by using international networks, including the Asia-Pacific Adaptation Network (APAN), the Global Adaptation Network (GAN) and the Global Earth Observation System of Systems (GEOSS) Asia-Pacific Symposium, and enhance further cooperation with each country.

■ Promotion of adaptation actions by non-state stakeholders

The private sector and local governments play important roles in responding to the diverse needs of each country and implement adequate adaptation actions according to the local circumstances.

The Japanese government will enhance engagement with the private sector and promote adaptation business through the matching of the needs of developing countries and the advanced technology and services by private companies in Japan, including disaster risk reduction infrastructure technology, early-warning technology and weather index insurance using rainfall data estimated by satellites. Japan will promote adaptation action by local governments in developing countries by supporting impact assessment and development of local adaptation plans while involving local researchers, local governments, and communities.

5.5.3 Specific Programs Related to Mitigation

■ Capacity building on development, implementation, and progress management of NDC

The Paris Agreement requires each country to prepare and submit a nationally determined contribution (NDC) and to pursue domestic mitigation measures to achieve the emission reduction target presented in the NDC. Under the enhanced transparency framework to promote effective implementation, each country needs to monitor and report the status of implementation of measures. Toward the implementation of the Paris Agreement, the needs

have been increasing for institutional development and capacity building in developing countries.

Japan will support institutional and capacity development to prepare a GHG emission inventory as the prerequisite of mitigation measures, develop concrete plans and measures as well as review of progress, and establish policies to achieve the target. This support will encompass the establishment of a system for mandatory accounting, reporting and disclosure of GHG emissions, and a mechanism for the development of emission reduction plans by private entities and evaluation of those plans by governments through the utilization of ISO. Japan will provide such supports by utilizing its experience and know-how and collaborating with JICA, the National Institute for Environmental Studies (NIES), and international initiatives such as the NDC Partnership. Japan will promote the active engagement of companies and local governments in developing countries for mitigation measures and provide incentives for their actions through these programs.

In this regard, Japan will carry out some workshops and provide training to support the construction of domestic systems to prepare GHG emission inventories and the improvement of its precision. As an example, the Workshop on Greenhouse Gas (GHG) Inventories in Asia (WGIA) has been held annually since 2003 in order to support Non-Annex I (NAI) Parties in Asia to improve the accuracy of their GHG inventories and to facilitate the enhancement of cooperative relationships in the Asian region. Japan will also support the submission, updating and implementation of each country's NDC through the development of a precise emission reduction scenario and specification of the programs and the technology necessary to achieve successful reduction by utilizing evaluation models. In order to promote the improvement of transparency, Japan contributed to the Capacity Building Initiative for Transparency (CBIT). From now on, Japan will promote the effective utilization of CBIT by collaborating with the Global Environment Facility (GEF) in order to strengthen the capacity of developing countries. Moreover, through continuous global monitoring by utilizing the series of GHG Observing Satellite GOSAT and the development and dissemination of monitoring methods by utilizing ICT, Japan will continue its contribution to securing the transparency of reduction actions and to measuring the progress of achievement for the reduction targets of each country towards the first Global Stocktake in 2023.

Promotion of mitigation actions taken by non-state actors

In order to enhance the actions and innovation by cities and private sectors, Japan will implement cooperation projects and nurture mutual learning among cities in developing countries and Japan, as well as promote private companies' investments in low-carbon technologies in developing countries.

Japan will provide technical support to prepare GHG emission inventories at the city level, develop master plans and support institutions towards low-carbon cities in developing countries by utilizing the experience and know-how of Japanese local governments and coordination among cities both in developing countries and Japan. To assist Japanese companies working on climate change programs, Japan will support the development and implementation of corporate targets consistent with the Paris 2-degree target (Science-Based Target, SBT) as well as activities to contribute to global emission reductions based on industry's action plans for a low-carbon society, and promote emission reduction in the global value chain of Japanese companies in addition to domestic emission reductions.

Moreover, Japan will collaborate with the alliances of the private sector, including the Japan Climate Leaders Partnership (Japan-CLP), which reckons climate change measures as business opportunities and back up programs led by the private sector. Japan will also promote Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+) through public-private partnerships.

5.5.4 Partnership to Strengthen Transparency for Co-Innovation (PaSTI)

As mentioned above, at COP23 in 2017, Japan launched the Partnership to Strengthen Transparency for Co-Innovation (PaSTI), in cooperation with developing countries and international organizations.

This partnership combines concrete programs presented in the previous sections and provides support focusing on the following items to respond to needs and urgent issues in developing countries.

- Development and implementation of NDC and evaluation of its progress. (See 5.5.3 for the concrete programs.)
- Establishment and operation of climate risk information platform to improve the transparency of adaptation activities. (See 5.5.2 for the concrete programs.)

In October 2018, Japan signed the first bilateral letter of intent under this partnership with the government of Indonesia. Under these themes listed above, Japan will continue to discuss establishing partnerships with other countries and implement a pilot project in collaboration with other donors and international organizations.

In addition, by using the JAIF, Japan will provide useful tools that encourage private companies to promote transparency activities.

5.5.5 Projects related to provision of capacity-building support

The detailed information on projects/program to promote capacity building in developing countries is shown in Table 5-9.

Table 5-9 Provision of capacity-building support (CTF Table 9)

No.	Recipient country and/or region	Targeted area	Programme or project title	Description of programme or project
1	Afghanistan	Adaptation	Community DRR capacity building project in Nangahar, Laghman provinces	Support is provided to: 1) capacity building for disaster risk assessment; 2) formulation and implementation of risk-information utilization plans (e.g., evacuation plans, education-raising activity); and 3) determination of strategic priorities for Afghanistan, with a view to improve community-based disaster preparedness against floods and landslides in Afghanistan.
2	Albania, Egypt, Ethiopia, Sudan, Uganda, Mexico, Iraq, Myanmar, India	Multiple Areas	Integrated Lake, River and Coastal Basin Management for Sustainable Use and Preservation of Water Resources	For a basin management involving many stakeholders such as rivers, lakes and coastal areas, it is important to promote the sustainable use and conservation of water resources in an integrated manner in six areas: organizational structure, policies, participations, technology responses, intelligence and financial resources. Starting from the training of Integrated Lake Basin management (ILBM), this training aims to promote the trainee's understanding of appropriate "Hydrostatic and Fluid Systems (Lentic-Lotic System)" including lakes, rivers, and coastal areas.
3	Albania, Tunisia, Gabon, Ecuador, Guyana, Mongolia	Mitigation	Sewage and Urban Drainage Management	The training participants will understand the basic concepts of wastewater (mainly sewage) measures and urban drainage (mainly rainwater exclusion) measures, examine appropriate methods for issues in the country through a wide range of lectures and exercises from planning to implementation, and formulate a basic plan (draft) for sewage measures and urban drainage measures in the country as an action plan.
4	Algeria, Egypt, Brazil, Uzbekistan, Afghanistan, Myanmar, Bangladesh	Mitigation	Renewable Energy in Grid -Mainly on Photovoltaic-(A)	Implement support for procurement of solar energy generation related equipment as well as the development of engineers.
5	Algeria, Tunisia, Burundi, Comoro, Madagascar, Mali, Sao Tome and Principe, Senegal, Burkina Faso	Mitigation	Knowledge Co-Creation Program (Young Leaders) for African Countries (French)/Renewable Energy Course	Training aimed at developing knowledge and awareness among young people who are responsible for solving issues in the field of renewable energy as future leaders is carried out.
6	Armenia, Georgia, Uzbekistan	Multiple Areas	Knowledge Co-Creation Program (Young Leaders) for Central Asian_Caucasus Countries/Nature Conservation Course	A training in which participants consider conservation efforts that can be applied in the home country and the activity of participation residents through examples of conservation and sustainable use of natural environments is carried out. It aims at understanding the importance of participation and collaboration among all level, including the national government, municipalities, regions, research entities, schools, and the private sector, in the conservation of natural environments.
7	Armenia, Tajikistan, Uzbekistan	Mitigation	Irrigation Water Management for Central Asia and Caucasus Countries	In the Central Asia-Caucasus regions, after the collapse of the Soviet Union, governmental management of agriculture water facilities and management of agricultural water are often inadequate, and water is often not adequately supplied to the end fields. Moreover, in the end fields, the unrobust water management organizations do not provide the beneficiary with water in a timely and fair manner, and this is one of the causes of the deficiencies in the management of facilities. Therefore, there is a necessary to strengthen the capacity of governments and water utilities' relevant parties in irrigation water management. This training is for public employees of central or local governments and relevant stakeholders from water service associations who are engaged in the operation and maintenance management of agricultural water management and irrigation facilities. It aims to improve the capacity of trainees to formulate and implement activity for improving the operation and maintenance management of irrigation facilities.
8	Asia, Oceania	Adaptation	Project for Capacity Building on Climate Change Impact Assessments and Adaptation Planning in the Asia-Pacific Region	Based on the experiences and knowledge of climate change impacts assessments conducted in the process of Japanese adaptation planning, climate change impacts evaluations for Asia-Pacific countries and capacity building workshops on adaptation planning are held.
9	Asia/Pacific	Mitigation	The 16th and 17th Workshop on Greenhouse Gas Inventories in Asia (WGIA16, 17)	WGIA has been held and organized by the Ministry of the Environment of Japan, National Institute for Environmental Studies and host countries' governments since 2003 for the purpose of the quality improvement of Greenhouse gas inventories in Asian countries and promotion of regional cooperation.
10	Asia-Pacific	Multiple Areas	Contribution to capacity building in developing countries through support to the APN (Asia-Pacific Network for Global Change Research) activities	Through APNs (Asia-Pacific Network for Global Change Research), promote research support and joint research in the Asia-Pacific regions that focus on research capacity building on global environmental change in developing country. This includes impact assessment and participatory land-use planning methodology (PWLM) deployment in Lake Laguna, the Philippines.
11	Azerbaijan, Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan	Mitigation	Knowledge Co-Creation Program (Young Leaders) for Central Asian_Caucasus Countries/Renewable Energy Course	Training aimed at developing knowledge and awareness among young people who are responsible for solving issues in the field of renewable energy as future leaders is carried out.
12	Bahamas, Jamaica, Grenada, Saint Lucia, Saint Vincent, Guyana, Fiji, Niwe, Federation of Micronesia, Papua New Guinea, Tonga	Adaptation	Comprehensive Disaster Management in Small Islands	This is a training for people engaged in disaster prevention, disaster reduction, restoration, and reconstruction operations, mainly in central governments. The purpose of this training is to identify the main problems faced by trainees' home countries and create action plans to resolve them, through sharing Japan's central ministries' and agencies' and local governments' such as Kochi Prefecture's experiences and efforts to mitigate disasters through prior investment.
13	Bangladesh	Adaptation	Capacity Building Project for the establishment and Sustainable Management of a Multi-sector Platform for Disaster Management in Bangladesh	In this project, coordination among NGOs, private organizations, and governments is carried out to build a disaster-response-specific platform and support it to function sustainably. On the activity side, in addition to enhancing disaster response networks through platform meetings, international conference meetings, and capacity building, which have been successful in projects implemented in other countries, the project also establishes an immediate response system with expertise in such areas as urgent support and the prevention of infectious diseases.
14	Bangladesh, Cambodia, Fiji, Indonesia, Malaysia, Republic of Maldives, Myanmar, Pakistan, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, East Timor, Tonga, Vanuatu, Viet Nam	Adaptation	Strengthening School Preparedness for Tsunami in the Asia-Pacific Region	At 90 schools in 18 countries in the Asia-Pacific region, support is provided to analyze tsunami risks, response to emergencies, formulate evacuation plans, and conduct evacuation disaster prevention education and evacuation trainings.
15	Belize, Jamaica, Antigua and Barbuda, Grenada, Saint Lucia, Saint Vincent, Surinam	Mitigation	Knowledge Co-Creation Program (Young Leaders) for Latin American and Caribbean Countries(English)/Renewable Energy Course	Training aimed at developing knowledge and awareness among young people who are responsible for solving issues in the field of renewable energy as future leaders is carried out.
16	Bhutan	Adaptation	Project for Capacity Development on Countermeasures of Slope Disaster on Roads in Bhutan	Support of capacity building for maintenance and management of sustainable countermeasures for road-slope disaster prevention.
17	Bhutan, India, Nepal, Cambodia, Malaysia, Timor-Leste, Viet Nam, Ghana, Tanzania, Uganda, Burundi, Cameroon, Guinea, Senegal, Burkina Faso	Adaptation	Participatory Irrigation Management System for Paddies	Through learning the successful experiences and know-how of water management of water use organizations (land-improvement districts) in Hokkaido, the project aims to enhance the necessary capacity of trainees to enable to consider measures to improve and strengthen participatory water management systems in home countries and regions.
18	Bosnia and Herzegovina, Kenya, Myanmar, Sri Lanka, India, Philippines	Adaptation	Capacity Development for Flood Risk Management with Integrated Flood Analysis System (IFAS)	In order to improve regional level disaster prevention capabilities in flood-vulnerable regions, integrated flood analysis systems (Integrated Flood Analysis System:IFAS) is acquired and applied to the target flood-vulnerable regions, thereby improving the capacity to formulate regional flood disaster prevention planning draft, including early evacuation of residents, and aims to reduce flood damage.
19	Bosnia and Herzegovina, North Macedonia, El Salvador, Iraq, Myanmar, Thailand, Viet Nam	Adaptation	Ecosystem-based Solutions for Disaster Risk Reduction (Eco-DRR)	It aims to promote the understanding of the Eco-DRR of forests, including their disaster prevention functions, and establish and strengthen disaster prevention systems based on these functions.
20	Botswana, Cameroon, Brazil, Bangladesh, Lao People's Democratic Republic	Adaptation	GIS/Remote Sensing, Information System and community participation for Biodiversity	Implement trainings to learn GIS, remote sensing database, survey, and methods and ideas to encourage participation by residents.

No.	Recipient country and/or region	Targeted area	Programme or project title	Description of programme or project
21	Botswana, Cameroon, Democratic Republic of the Congo, Ethiopia, Zambia, Myanmar, Papua New Guinea	Mitigation	Policy Planning Skills for Implementation of REDD+(for Government Executives)	In order to promote GHG emission reductions (REDD+) from deforestation and degradation in developing countries, human resources capable of formulating and implementing policies based on the situation of own country will be developed based on the international framework and international requirements.
22	Botswana, Uzbekistan, Philippines, Colombia, Indonesia, Tanzania, Vietnam, Myanmar	Multiple Areas	Project for promoting sustainable forest management in developing countries	Develop and disseminate business models in which forest conservation creates economic value.
23	Brazil	Adaptation	Comprehensive Disaster Risk Reduction(B)	Targeting government parties involved in disaster prevention, response, recovery and reconstruction, the project implements programs to comprehensively learn basic knowledge and know-how on disaster prevention administration based on experiences accumulated through disasters in Japan. Training participants formulate action plans for improving disaster prevention administration toward the implementation of the Sendai Framework for Disaster Risk Reduction in home country.
24	Brazil, Ecuador, Peru, Iran, Georgia, Myanmar, Pakistan, Indonesia, Philippines, Timor-Leste, Viet Nam	Adaptation	Disaster Management for Landslide and Sediment - Related Disasterd (Triggered by Rainfall, Earthquake and Volcanic Activity)	Lectures, exercises, and on-site inspections are held for technical administrators and administrative researchers to understand and acquire the mechanisms of the phenomena, methods for survey, observation and analysis, countermeasure planning methods, organizational structures for promoting the plans, legal systems, budgets, construction, maintenance, management, etc.
25	Cambodia	Adaptation	Forest Restoration Project (reforestation activities to increase resilience of agricultural land and utilizing the crop to produce organic textile to develop local industry)	In order to manufacture and sell organic cotton with no residue, raw material will be cultivated in rural Cambodia through tree planting using organic soil modifiers, and integrated project to manufacture, process, and sell organic cotton in Japan is promoted.
26	Cambodia	Mitigation	Project to realize low carbonization in Phnom Penh Capital City, through introduction of saving energy technologies and renewable energies (Kitakyushu-Phnom Penh Capital City Cooperation Project)	Under the framework of the sister city alliance between Kitakyushu City and Phnom Penh, the low carbonization of Phnom Penh is promoted through customized proposals for the needs of companies with needs to reduce energy costs, and the creation of ESCO business models that reduce the burden on users by packaging with financial services.
27	Cambodia	Adaptation	The Project for Strengthening Administrative Capacity of Urban Water Supply in Cambodia	Strengthening of the capacity of the water administration to enforce water supply regulations is promoted through the development of human resource development system for the staff of the water administration entity in the target country.
28	Cambodia, Myanmar, Peru	Multiple Areas	Project to accelerate REDD-plus activities by private sector	In order to encourage private companies to enter the REDD+ activities, development of technologies and provision of information which are related to REDD+ are carried out.
29	Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Philippines, Thailand, Viet Nam	Mitigation	"Healthy Soil" management for Combating Climate Change in Southeast Asia	Workshops will be held to introduce Japan's outstanding technologies (technologies for measuring and evaluating the greenhouse gas absorbed and emitted by agricultural soils, technologies for mitigating emissions, and technologies for carbon storage) to developing countries, and aims to develop the capacity of developing countries to scientifically calculate and evaluate the amount of greenhouse gas absorbed and emitted by agricultural soils.
30	Cameroon	Multiple Areas	The Project of Co-creation of Innovative Forest Resources Management Combining Ecological Methods and Indigenous Knowledge	Support the development of a roadmap for the sustainable use of wildlife and non-wood forest products initiated by the residents in the regions of Eastern Province.
31	Cameroon, Chad, Benin, Guinea, Cote d'Ivoire, Senegal, Burkina Faso	Adaptation	PARTICIPATORY SAFE WATER MANAGEMENT IN RURAL AREAS IN AFRICAN COUNTRIES	Trainings for administrative officers in charge of village water supply to acquire appropriate solution formulation capabilities, by accurately understanding issues in their own countries, learn Japanese ground water management knowledge, skills, and project formulation methods, and by exchanging information with trainees from neighboring countries, is provided.
32	Cameroon, Democratic Republic of the Congo, Gabon, Kenya, Mozambique, Zambia, Myanmar, Cambodia, Viet Nam, Papua New Guinea, Solomon	Multiple Areas	Proceeding Ability of Policy Making for Sustainable Forest Management	Global discussions on the importance of forests, such as United Nations Framework Convention on Climate Change and Convention on Biological Diversity, are increasing, while forests are decreasing and degrading in many countries. Strengthening the policymaking capacity of the administrative staff in charge of forest management is an urgent issue. This training is conducted through learning international trends on forests, and outstanding forestry technologies and pioneering initiatives of Japanese industry, government, and academia. The project also includes development of action plans to resolve national policy challenges for sustainable forest management.
33	Cameroon, Kenya, Malawi, Uganda, Fiji, Papua New Guinea	Multiple Areas	Remote Sensing of Forest Resources	A technical training to acquire basic remote sensing skills to understand the dynamics of forest resources and to acquire basic GIS skills necessary for creating a database in home country is carried out.
34	Carboberde, Santome Principe, Antigua Barbuda, Grenada, Saint Lucia, Republic of Maldives, Marshall, Solomon	Adaptation	Conservation and Management of Water Environment in Islands	Lectures are held in Okinawa, an Island Prefecture. Government/NGO officials involved in the environmental sector in target countries learn the methods for conservation and management of the water environment, which is the foundation of industry development, safe and comfortable living, and natural and cultural conservation.
35	Chile	Adaptation	Institutional Strengthening of ONEMI for Capacity Development in Disaster Risk Reduction Project	Capacity building of the National Emergency Response Office (ONEMI) in Chile is implemented to reduce disaster risks.
36	Chile	Adaptation	Development of harmful algal bloom monitoring methods and forecast system for sustainable aquaculture and coastal fisheries in Chile	This research aims to clarify the mechanism of generation of hazardous red tide, which causes massive lean death in farmed salmon in southern Chile, both from the environmental (climate, water quality, water temperature, etc.) and microbiological viewpoints. The red tide consists of a comprehensive microbial ecosystem (red tide horobiome) containing rapidly growing red tide-causing algae and their associated bacterial flora and viruses.
37	Chile	Adaptation	Institutional Strengthening of ONEMI for Capacity Development in Disaster Risk Reduction Project	Prioritization of operations to be performed as a national disaster prevention entity, formulation of concepts and strategies of knowledge management center, and development of disaster prevention human resources and capacity building are carried out in ONEMI.
38	Chile	Adaptation	Development of harmful algal bloom monitoring methods and forecast system for sustainable aquaculture and coastal fisheries in Chile	Utilizing Japanese knowledge and experiences, the mechanism of red tide generation is explored, red tide monitoring kit is developed, and red tide early predictive model is developed.
39	China	Mitigation	FY2017 Subsidy for CO2 Emission Suppression Measures Project Expense etc. (Project for Assistance of Reduction of CO2 Emission by Strategic Overseas Development of Japanese Venous Industry) (Solid Fuel Formation from Oleaginous Waste and Biomass Waste etc. in Liaoning, China)	Using the coal-substitute solid fuel BWF production technology owned by Toa Oil Industry Co., Ltd., solid fuels are produced and sold using wastes generated in the surrounding regions of Liaoning Province as raw materials. This contributes to reduce environmental impact.
40	China	Mitigation	Co-benefits project for low-carbon society	Based on the Memorandum of Understanding between Japan and China in April 2016, the project contributes to enhance Chinese measures against environmental pollution and measures to reduce GHG emissions by selecting candidate technologies for model projects for the introduction of co-benefits technologies, formulating a guideline of quantitative Co-benefits evaluation, and strengthening Chinese capabilities such as training program in Japan.

No.	Recipient country and/or region	Targeted area	Programme or project title	Description of programme or project
41	China, Thailand, Indonesia, India, Mexico, etc.	Mitigation	Human resources development program for promoting export of low-carbon technologies	In order to promote GHG reductions and energy conservation in emerging countries and other countries through highly efficient energy infrastructure and oversea deployment of energy conservation technologies from Japan, a support is provided to train foreign human resources who serve as bases for overseas expansion of Japanese companies.
42	China, Thailand, Indonesia, India, Mexico, etc.	Mitigation	Human resources development program for promoting export of low-carbon technologies	In order to promote GHG reductions and energy conservation in emerging countries and other countries through highly efficient energy infrastructure and overseas introduction of energy conservation technologies in Japan, support will be provided to train foreign human resources who will serve as bases for overseas expansion of Japanese companies.
43	Colombia	Mitigation	Development of Cultivation Management System to Reduce Greenhouse Gas derived from Agriculture and its Crop Development	Support is given to a research and development conducted by the International Center for Tropical Agriculture (CIAT) to develop an efficient cultivation management system by combining the developed high biological nitrification inhibition (BNI) tropical grass with Japan's ICT technology, and to develop new rice varieties, aiming to reduce greenhouse gas (GHG) emissions.
44	Comoro, Indonesia, Philippines, Nauru, Solomon, Tonga	Mitigation	Renewable Energy and Diesel Power Operation in Small Islands	In introducing renewable energy, improvement in reliability of existing power sources (e.g., diesel generators) through appropriate and economical operation and maintenance management, reducing fuel costs, and integrated planning and operation with system stabilization measures through the introduction of storage batteries and EMS are required. This training is a micro-grid of remote islands. Taking advantage of the characteristics of Okinawa, which has a large number of islands, the project aims provide training for obtaining solutions for the challenges of integrating renewable energy and diesel-powered power generation facilities in small island nations, including the system stabilization method.
45	Costa Rica, Dominican Republic, El Salvador, Guatemala, Argentina, Bolivia, Peru, Nigeria, Sri Lanka, Viet Nam, the Federation of Micronesia	Mitigation	Management of Composting Project(A)	Training aimed at transferring technologies and know-how for business operations, on the issues that become issues when promoting composting projects, such as the role of government and regions, quality control, promotion of public involvement, and establishment of distribution systems, is carried out.
46	Costa Rica, Cuba, Guatemala, Mexico, Nicaragua, Argentina, Bolivia, Peru, Venezuela	Mitigation	Wastewater Treatment Techniques	In the training participants learn the knowledge and technologies required to achieve appropriate wastewater treatment by referring to experiences and cases in Japan and developing countries, and capacity building for wastewater treatment measures that are appropriate for their national situation is carried out.
47	Costa Rica, El Salvador, Honduras, Panama, Argentina, Peru	Adaptation	Ecosystem conservation through collaborative management of protected areas	In addition to the management method of Japan's regional based natural park, the training will provide understandings on the philosophy and activity of Japan's Satoyama and Satoumi which seeks for a society coexisting with nature, and provide knowledge and lessons for effective regional conservation management (conservation activity/dissemination education) and sustainable use of natural resources (ecotourism, etc.) through private sector participation or active participation (cooperation) of the region's residents.
48	Costa Rica, Guatemala, Mexico, Nicaragua, Argentina, Bolivia, Colombia, Peru	Adaptation	Wastewater Treatment Techniques	Training participants will learn the knowledge and technologies required to achieve appropriate wastewater treatment by referring to experiences and cases in Japan and developing countries, and build the capacity for appropriate wastewater treatment measures suitable for their national circumstances.
49	Democratic Republic of Congo	Multiple Areas	Project for Operationalization of the National Forest Monitoring System and REDD+ Pilot	In Bandundu, support is provided to the preparation of forest base charts and the formulation of operational plans for national forest resource inventory systems. Through these efforts, the project aims to implement sustainable forest management through the use of data obtained through forestry resource monitoring.
50	Democratic Republic of Congo, Ethiopia, Malawi, Rwanda, Zambia, Honduras, Georgia, Tajikistan, Bhutan, Myanmar, Nepal, Pakistan, Lao People's Democratic Republic	Mitigation	Hydropower Planning & Operation	This program provides trainees with basic knowledge and knowledge on hydropower development that Japan has accumulated so that developing country can steadily promote hydropower development.
51	Democratic Republic of Congo, Lesotho, Malawi, Nigeria, Sierra Leone, Zambia, Tajikistan, Bhutan, Myanmar, Nepal, and Pakistan	Mitigation	Hydropower Planning and Operation	Accept trainees from target countries and transfer expertise and technology in the electric power sector.
52	Democratic Republic of the Congo, Gabon, Mozambique, Brazil, Suriname, Myanmar, Malaysia	Multiple Areas	Tropical forest management using the JJ-FAST, an ALOS-2 -based forest monitoring system, and other satellite technologies	Training to acquire the knowledge and technologies required for the conservation of tropical forests in home country using the JICA-JAXA Forest Early Warning System in the Tropics (JJ-FAST) for tropical forest monitoring, including measures against illegal logging.
53	Democratic Republic of the Congo, Mozambique, Colombia, Malaysia, Philippines	Multiple Areas	Tropical Forest Conservation using the Forest Monitoring System with ALOS-2 Satellite	In December 2015, JICA and JAXA announced the implementation of the "Forest governance Improvement Initiative" focused on the development of "Forest Change Detection System" which contributes to measures to deforestation caused by illegal logging, and development of human resources. This training aims to contribute to the more effective conservation of tropical forests, and development of administrative officials responsible for tropical forest inspection using the "Forest Change Detection System" developed under the Initiative.
54	Dominican Republic, Peru, Federation of Micronesia, Tuvalu	Adaptation	Adaptation to Climate Change	Improve the capacity of administrative officials in central administrative entity and local administrative entity in charge of policy-making on the adaptation to climate change at national, regional, or sectoral level.
55	Egypt, Antigua Barbuda, St. Christopher Navis, Guyana, Myanmar, Bangladesh	Mitigation	Energy Efficiency and Conservation Technology in Commercial and Residential Sector(B)	Systematic and practical training is provided through classrooms and practical trainings on Japan's policies and technologies related to the energy conservation in the commercial an residential sector (buildings, housing, commercial facilities, etc.).
56	Egypt, Brazil, Azerbaijan, Kazakhstan, Uzbekistan, Myanmar, Pakistan, Mongolia	Mitigation	Renewable Energy in Grid -Mainly on Photovoltaic-	Appropriate maintenance and management is the key when introducing renewable energy. It is desirable that technicians with specialized knowledge acquire these skills and operate and manage the business efficiently. The project (training) aims to promote the dissemination and development of renewable energy in countries which has renewable energy installation, or installation plans, particularly solar power.
57	Egypt, Ethiopia, Sudan, Iraq, Myanmar, India	Adaptation	Integrated Lake, River and Coastal Basin Management for Sustainable Use and Preservation of Water Resources	Provide trainings aimed at strengthening trainees' understanding of the appropriate management of "Lentic-Lotic System" including lakes, rivers, and coastal areas.
58	Egypt, Ghana, Kenya, Rwanda, Zambia, Iran, Jordan, India, Pakistan, Cambodia, Malaysia, Philippines, Viet Nam	Mitigation	Practical Technology on Intelligent Transport System(ITS)	Training is conducted to acquire practical knowledge/skills of ITS (Intelligent Transport Systems) and formulate plans.
59	Egypt, Iran, Iraq, Sri Lanka, Malaysia, Thailand	Mitigation	High Efficient and Clean Thermal Power -for Executives	The project promotes the understanding of merits of promoting the introduction of high-efficiency thermal power generation such as ultra supercritical pressure thermal power generation, gas combined cycle power generation, and coal gasification combined cycle power generation (IGCC) and the environmental aspects, introduce advanced power generation technologies in Japan, and provide information and knowledge necessary for the consideration of installation of technologies and facilities in the country.
60	Egypt, Kenya, Nigeria, South Sudan, Azerbaijan, Nepal, Bangladesh, Tunisia, South Africa, Ethiopia, Malawi, Zimbabwe, Rwanda, Venezuela, Iraq, Myanmar, Sri Lanka	Mitigation	Operation and Maintenance of Urban Water Supply System(Water Quality and Purification)	Among the field technical expert (engineer level) who carry out maintenance and management of urban water works, the transfer and dissemination of intensive and practical technologies to engineers who engage in "water purification and water quality" will be promoted.

No.	Recipient country and/or region	Targeted area	Programme or project title	Description of programme or project
61	Egypt, Malawi, Mozambique, Rwanda, Southern Sudan, Tanzania, Uganda, Myanmar, Cambodia, Philippines	Adaptation	Irrigation and Drainage Technology based on Integrated Water Management	The aim is to improve the knowledge on irrigation wastewater technology of irrigation wastewater sector engineers, and the ability to apply them. More specifically, in addition to survey on irrigation wastewater, designing facilities, and maintaining and management technologies, participants learns the wide knowledge required for administrative officials to implement integrated water management, such as measures against global warming and project management.
62	Egypt, Mexico, Argentina, Chile, Afghanistan, Myanmar, India, Malaysia, Mongolia	Mitigation	Capacity Building towards Air Quality Management	Appropriate air environment management at local, national and cross-border level is required, in order to limit the impacts of air pollutants on present and future human health and flora and fauna in developing countries. Utilizing Japanese expertise and experiences, this training strengthens the air environment management capacity based on scientific methods such as monitoring of air pollutants concentration in the air, the development of an emission inventory for the consideration of countermeasures, and the projection countermeasures' effect using models.
63	Egypt, Mexico, Iran, Sri Lanka, China, Thailand, Fiji	Mitigation	Control of Air Pollution from Motor Vehicles	The project provides opportunity for learning how to formulate environmental management plans for roads and traffic, taking into account environmentally sustainable transport (EST) initiatives. The focus is mainly on public transport as an environmentally sustainable transport (EST), particularly on the mobile emission source, automobile pollution countermeasures as one of the causes of atmosphere contamination, and not only automobile exhaust emission countermeasures technologies, but also including social aspect such as urban transportation plans.
64	Egypt, Zimbabwe, Myanmar, Sri Lanka, India, Papua New Guinea, Morocco, Ethiopia, Rwanda, Guyana, Palestine, Bangladesh, Malaysia, Viet Nam	Adaptation	Operation and Maintenance of Sewerage System(A)(B)(C)	An overview of Japanese sewerage projects will be provided, and planning and maintenance, including business management, will be addressed. The main focus is on large-scale treatment for urban cities, but medium-to small-scale sewerage facilities is also introduced.
65	El Salvador	Mitigation	The Project for Geothermal Exploration by Thermoluminescence Technique Prospection and Reservoir Evaluation by Integration of Geological, Geophysical and Geochemical Data Analysis	The research aims to facilitate the development of geothermal energies by providing integrated systems which support exploration of geothermal resources.
66	El Salvador	Mitigation	The Project for Thermoluminescence Techniques in Geothermal Exploration and Integrated Evaluation System of Geothermal Reservoir	Contributing to promoting the use of geothermal heat energies in the country by constructing comprehensive systems for exploring geothermal resources, including the deployment and promotion of thermoluminescence geothermal exploration methods, development of geothermal exploration data analysis technologies, and development of reservoir simulation.
67	Esvantini, Barbados, Belize, Saint Lucia, Guyana, Kiribati, Samoa, Serbia, Bosnia and Herzegovina, Tunisia, Egypt, Brazil, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Panama, Argentina, Colombia, Bolivia, Ecuador, Peru, Armenia, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan	Mitigation	Promotion of Energy Efficiency and Conservation	Introduces Japan's energy conservation policies and energy conservation technologies in commercial and residential and industry sector sectors through lectures, practical sessions, and visits, and provide systematic training on cases at national and local administrative level such as environmental model cities, and energy conservation cases by commercial, residential and industry sector.
68	Ethiopia	Adaptation	The Project for Development of Next-Generation Sustainable Land Management (SLM) Framework to Combat Desertification	In 3 pilot regions which soil erosion conditions differ in highlands, intermediate and lowlands of the Blue Nile River upstream in the Ethiopia, the project conduct evaluation of soil erosion prevention measures based on quantitative verification that are optimal for regions conditions, develop SLM technologies, and support a livelihood improvement activity that leads to SLM for farmers (in particular, young people and women). As a result, farmers are expected to voluntarily and sustainably engage in SLM, and this will contribute to the promotion of next-generation SLM in the upstream region of the Blue Nile River.
69	Ethiopia, Brazil, Lebanon, Indonesia, Laos, Fiji	Adaptation	On-Site Wastewater Treatment System	Provide comprehensive coerces on decentralized sewage treatment systems, including legislation, human waste and wastewater treatment methods to prevent water pollution, as well as methods for Johkaso maintenance and management, through training.
70	Ethiopia, Dominican Republic, Guatemala, Nicaragua, Colombia, India, Nepal	Adaptation	Promotion of SATOYAMA Initiative: Biodiversity conservation and rural development through the sustainable management of natural resources	Through lectures on Japan's Satoyama Policies and other initiatives, the project aims to deepen participants' basic understanding of the SATOYAMA approach (including IPSI), to learn about the current state of degradation and measures of Satoyama in Ishikawa Prefecture, to understand lessons learned, to compare the actual state of the participants' natural resource management in their own country with the actual state of Japan, and to provide information on secondary natural resource management in their own country.
71	Ethiopia, Kenya, Dominican Republic, Myanmar, Sri Lanka, Nauru, Federation of Micronesia	Mitigation	Design and Maintenance of Semi Aerobic Landfill Site (Fukuoka Method)	Learn about semi-aerobic landfill technology (Fukuoka method) which is one of the technologies for improving final disposal sites for wastes, from design/maintenance to environmental conservation of the surrounding area, and promote introduction and effective operation of this technology.
72	Ethiopia, Kenya, Djibouti, El Salvador, Ecuador	Mitigation	Intensive Training for Geothermal Resource Engineers	Training for engineers to promote development of geothermal resources in developing countries, in the fields of geology, geochemistry, physical exploration, and reservoir engineering.
73	Ethiopia, Kenya, Djibouti, Tanzania, El Salvador, Nicaragua, Bolivia, Ecuador, Indonesia	Mitigation	Geothermal Resource Engineers	In many countries, development of geothermal heat has not progressed due to the high risks of resource development. In addition to ensure finance, human resource development has become an urgent issue. Human resource development is a key to improving the reliability of national geothermal heat exploration and analysis. This is an updated and new training which course was first carried out at Kyushu University from 1970 to 2001. It covers the fields of geology, geochemistry, physical exploration, and reservoir engineering. After a three-month lecture, trainees will set themes according to the challenges that their own country face and practical research is conducted for three months, and the outcomes are presented to externally. In addition, action plan on the initiatives at home country is developed.
74	Ethiopia, Kenya, Djibouti, Tanzania, Peru, Indonesia	Mitigation	Geothermal policy and strategy program for executives	This is a programme for executives where they reconsider better geothermal policies and plans. Referring to the current status and challenges of the participating countries and Japan and the results of the most recent analyses of JICA, discussions and examination is held regarding the role distribution between the government and the private sector, and investment environment required to attract private investment. Top level stakeholders on geothermal from Japanese industry, government, and academia joins the opinion exchange and also aims to build network.
75	Ethiopia, Kenya, Malawi, Guyana, Indonesia, Mongolia, Papua New Guinea, Solomon	Multiple Areas	Remote Sensing of Forest Resources	Although it is recognized that reducing GHG emissions (REDD+) resulting from the deforestation and degradation of the forests in developing countries is an urgent issue for the global community, developing country lacks arrangements and resources for the understanding of forest resource dynamics. Also, many countries face challenges in human resource development. The project (training) is for "technology acquisition", by learning basic remote sensing technology to understand the dynamics of resources, and to learn basic GIS technology necessary for the creation of a database in Japan.
76	Ethiopia, Kenya, Malawi, Nigeria, Rwanda, Eritrea	Adaptation	African Region Urban Waterworks Engineering	Lectures are provided not only for technical aspects such as water treatment, water quality management, water pressure and water volume distribution management, water supply planning, and facility management, but also for water supply business in general, including fee management, customer management, customer services, and business planning.
77	Ethiopia, Kenya, Mauritania, Niger, Eritrea, Somalia, Sudan, South Sudan, Burkina Faso	Adaptation	Combating desertification to strengthen resilience to climate change in Sub-Saharan Africa	For administrative officials involved in policy decisions on measures against desertification, provide opportunities for lectures and discussions to acquire the necessary knowledge.
78	Ethiopia, Kenya, Tanzania, Indonesia, Papua New Guinea	Mitigation	Geothermal Development Policy -for Executives-	Regarding better geothermal development policies and plans, discussions will be held on the role distribution between the national and private sectors and investment environment required to attract private sector investment, with reference to the current status and challenges of participating countries and Japan as well as the results of the most recent analyses of JICA.
79	Ethiopia, Lesotho, Nigeria, Sudan, Brazil, Yemen, Bosnia and Herzegovina, Guinea, Cote d'Ivoire, Liberia, Malawi, Mozambique, Eritrea, Afghanistan, Sri Lanka, Indonesia	Adaptation	Operation and Maintenance of Urban Water Supply System(Water Distribution and Service)(A)(B)	Among the field engineers (engineer level) who carry out maintenance and management of urban water works, specifically for those engaged in "water supply and distribution", carry out transfer and dissemination of intensive and practical technologies.
80	Ethiopia, Mauritius, Zambia, Panama, Brazil, Bangladesh, Indonesia, Fiji	Adaptation	On-Site Wastewater Treatment System	The project aims to build capacities to cope with waste water treatment issues, through classroom lectures and practical training etc., that include relevant systems, finance, and methods of maintenance of facilities, regarding various decentralized waste treatment technologies, including Johkaso technologies that Japan has accumulated.

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81	Ethiopia, Nigeria, Sudan, South Sudan, Zambia, Brazil, Jordan, Myanmar, Pakistan, Cambodia, Timor-Leste, Malawi, Mozambique, Rwanda, Honduras, Venezuela, Iraq, Azerbaijan, Georgia, Sri Lanka, Lao People's Democratic Republic, Viet Nam	Mitigation	Operation and Maintenance of Urban Water Supply System (Water Distribution and Service)	The intensive and practical skills are expected to be transferred and disseminated to engineers engaged in "water supply and distribution" among field engineers (engineers level) who carry out maintenance and management of urban water works.
82	Fiji, neighboring countries	Adaptation	Emergency Preparedness and Response in the Pacific: Fiji and Beyond	Disaster prevention and response support in Oceania, which is a disaster-prone regions, including strengthening of logistical and capacity building in information management.
83	Fiji, Samoa, Palau, Indonesia	Adaptation	Environment scientists network for Asia- Pacific islands	The researchers of the Asia-Pacific small island nations share the outcomes of research on climate-related impacts and countermeasures in small island nations, with an aim to make use of these results in future policy recommendations.
84	Fiji, Vanuatu, Samoa	Adaptation	Impact Assessment Project of Climate Change in Pacific Region	For the long-term goals of establishing effective climate change impacts assessment methods using satellites data and hazard map systems, the long-term risks of high waves and storm surge from cyclones are assessed.
85	Former Yugoslav Republic of Macedonia, Malawi, Argentina, Myanmar, India	Adaptation	Adaptive Watershed Management to Climate Changes:Flood Control and Ecosystem Conservation	This project is designed for central and local governments or public expert entity officials involved in flood countermeasures or ecosystem conservation in the basin, to be able to develop an draft action plan in the target basin by learning the disaster prevention measures towards unexpected floods caused by climate change that do not rely solely on building structures (including the utilization of multiple functions of forests), and technique for the adaptive basin management, which incorporates environmental conservation measures that are balanced with the ecosystem.
86	Former Yugoslav Republic of Macedonia, Nicaragua, Myanmar, Nepal	Adaptation	Ecosystem-based Solutions for Disaster Risk Reduction (Eco-DRR)	In recent years, as natural disasters have become more frequent and severe, in order to reduce damage caused by disasters, it is necessary to promote not only symptomatic ex-post responses but also proactive and comprehensive responses in order to achieve sustainable development of society and economy, as well as to promote cross-sectoral approaches with an awareness of such mainstreaming of disaster risk reduction. Eco-DRR is one of the risk-reduction measures, and comprehensive, overarching and continuous implementation and deployment from the perspective of disaster risk reduction are required.
87	Ghana, Mozambique, Tanzania, Cuba, Uzbekistan, Myanmar, India	Mitigation	High Efficient and Clean Thermal Power -for Executives-(B)	Promote understanding of the merits of the introduction and promotion of high-efficiency thermal power generation such as ultra super critical pressure coal thermal power generation (USC), advanced ultra super critical pressure coal thermal power generation (A-USC), integrated coal gasification combined cycle power generation (IGCC), and gas turbine combined cycle power generation (GTCC), as well as importance of environmental measures, and introduce advanced thermal power generation technologies in Japan, and provide information/knowledge required for examining the introduction of technologies and facilities in home countries.
88	Global	Adaptation	Global Adaptation Network, Asia-Pacific Adaptation Network	Share adaptation knowledge through Global Adaptation Network.
89	Global	Multiple Areas	Mitigation potential of global actions to enhance forest carbon stocks	The project supports to identify suitable sites for afforestation/reforestation and to formulate land-use plans in order to promote sustainable forest management in developing countries.
90	Global	Mitigation	Enhancing knowledge and capacity around forest-related legislation and timber legality	Support measures to improve forest-related legislation and strengthen enforcement capabilities to build governance, including the eradication of illegal logging.
91	Grenada, Saint Lucia, Saint Vincent, Viet Nam, Fiji, Nauru, Marshall	Adaptation	Sustainable coastal protection measures at island countries	Transfer technologies related to coastal conservation measures to coastal engineers. During the project, knowledge and technologies on coastal conservation and maintenance management, including lessons learned from failure cases as well as successful cases in Japan is shared, and participants learn the basic concept of coastal conservation, and aims for them to acquire knowledge on both hard side and soft side, including planning, maintenance, and management, and utilize this knowledge in future activities in home countries.
92	Guinea, Barbados, Saint Christopher Navis, Georgia, Myanmar, Republic of Maldives, Indonesia, Mongolia, Samoa	Mitigation	Adaptation of Small-Scale Renewable Energy as a step for Climate Change	Implement training to deepen understanding of the renewable energy and enhance the adaptability of climate-change measures using regional level renewable energy.
93	Haiti	Adaptation	The Project for Strengthening Disaster Prevention and Management	For Haiti, which is vulnerable to natural disasters, the project will strengthen its disaster response capabilities by establishing a disaster forecasting information collection, management, and sharing system, strengthening emergency response systems, and improving the functions of its emergency operations center, thereby contributing to the strengthening of its economic foundation through disaster prevention and environmental conservation.
94	Haiti	Multiple Areas	The Project for the Improvement of Rural Electrification	In Haiti's northern and southern prefectures, the project will develop small-scale power generation facilities and conduct capacity-building support for operation management, thereby improving livelihoods and economic development through improved accessibility to renewable energy, and thereby contributing to the strengthening of Haiti's economic foundation through disaster prevention and environmental protection.
95	Haiti	Adaptation	Capacity building and strengthen community resilience during natural disaster in Saint Jean du Sud, South Department, Republic of Haiti	Through the construction of community centers, training will be provided on hurricane-resilient construction techniques, and workshops will be held to strengthen resilience to natural disasters for not only carpenters and plasterers of regions, but also the aim is to improve the knowledge and skills of residents related to the construction and to strengthen the capacity of the entire regions to respond to natural disasters.
96	India	Multiple Areas	Nagaland Forest Management Project	In mobile field-burn cultivated land in Nagaland, forest conservation activities, such as tree planting, are conducted with the participation of local residents, and support is provided to strengthen the technical and financial management capabilities of the joint forest management union, which conduct afforestation. This contributes to the conservation of sustainable forests and the improvement of the livelihoods of local residents.
97	India	Multiple Areas	Odisha Forestry Sector Development Project (Phase 2)	Sustainable forest management, biodiversity conservation activity and community-development support are conducted in other regions in Odisha, taking outcomes and lessons learned from the implementation of phase 1. As a result, the ecosystem of forests is conserved through the strengthening of the living foundations of the local residents, which contributes to the harmonization of environmental conservation and region's social economy.
98	India	Mitigation	The Project for Smart Cities for Emerging Countries based on Sensing, Network and Big Data Analysis of Multimodal Regional Transport System	By creating a "Policy Handbook for Smart Mobility Establishment by Multi modalization in Indian Metropolitan Areas" (hereinafter referred to as the Handbook), which includes simulation models based on traffic sensing and big data analysis, and utilization of public transportation through utilization of ITS technologies, it aims to develop urban transportation policies and joint research systems which contribute to CO2 reductions through traffic facilitation, therefore contribute to the construction of efficient urban transportation systems in Ahmedabad City and other major cities.
99	India	Adaptation	The Project on Capacity Enhancement for Sustainable Agriculture and Irrigation Development in Mizoram	The aim of the project is to strengthen the capacity of state governments to develop agricultural and irrigation development methods based on the Agricultural Master Plan in order to promote the development of the agricultural and irrigation sector in India.
100	India	Adaptation	The Project for Natural Disaster Management in Forest Areas in Uttarakhand	This project aims to establish a system for implementing measures against mountainous disasters using mountain control technologies based on the state as a model, through the development of mountain control technology suitable for the state, the improvement of the knowledge and capacity of UKFD and other relevant agencies staff, and the sharing of the developed mountain control technology within the state and with other states in the Himalayan regions that have similar conditions to those of Uttara-Kand. This will contribute to the appropriate implementation of the mountain control project in Himalayas and the dissemination of the mountain control knowledge and technologies in other states of the Himalayan regions.

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101	India	Adaptation	Participatory Community Based Disaster Risk Reduction Approaches in Varanasi	The project aims to improve the practical disaster prevention capabilities of citizens through development of disaster prevention educational materials to effectively raise citizens' awareness of disaster prevention, dissemination to residents via Citizens' Disaster Prevention Activity Promotion Center, and implementation of disaster prevention climate-change trainings
102	India	Multiple Areas	Project for Improvement of Himachal Pradesh Forest Ecosystems Management and Livelihoods	Implement support to promote sustainable forest ecosystem management and activities related to biodiversity conservation, establishment of the implementation system and strengthening of the capacities of workers, and strengthening the livelihoods of region's residents in Himachal Pradesh.
103	India	Multiple Areas	Project for Sustainable Catchment Forest Management in Tripura	Implement sustainable forest management, water and soil conservation activities, and livelihood improvement activities in Tripura to improve the quality of forests and contribute to improving forest ecosystem and the livelihoods of region's residents.
104	Indonesia	Adaptation	Bali Beach Conservation Project (Phase 2)	In addition to protecting the coast in the eastern part of Bali, which is expected to be a new sightseeing spot, the project supports to strengthen the capacities of organizations responsible for coastal maintenance and management. As a result, through the achievements of sustainable coastal management and the reduction of coastal erosion damage, it aims to disaster prevention in coastal areas and contribute to the promotion of the Bali tourism industry, the development of regional economies, and the adaptation to climatic change.
105	Indonesia	Multiple Areas	Project of Capacity Development for the Implementation of Agricultural Insurance	In order to reduce challenges and crop-production risks in the current agricultural insurance system, support is provided with the introduction of index-type insurance and expansion of agricultural insurance to different crops.
106	Indonesia	Adaptation	The Project for Enhancement of Disaster Risk Reduction through Improvement of the Disaster Risk Information and Communication Framework in Indonesia	In order to promote the "mainstreaming of disaster risk reduction" by the National Disaster Reduction Agency (BNPB) in Indonesia, expert is sent with the aim of strengthening BNPB's capabilities.
107	Indonesia	Adaptation	The Project for Development and Implementation of New Damage Assessment Process in Agricultural Insurance as Adaptation to Climate Change for Food Security	By accumulating academic research results on efficient methods for assessing damage of agriculture insurance, a new method for assessing damage on rice croplands in the country will be developed, which will contribute to the improvement and dissemination of agricultural insurance as a climate-change adaptation measure in the country.
108	Indonesia	Mitigation	Project for Development of JCM Projects under City to City Collaboration between Batam City and the City of Yokohama (Introduction of Smart LED Street Light and energy efficient materials for green building)	By utilizing the experiences and technologies of Yokohama City and its businesses in the city, promote the formulation of plans for the introduction of LED street lights and green buildings in Batam City and the development of relevant systems, and JCM facility subsidy projects for the next fiscal year is formed and the support of greening policies in the city is made.
109	Indonesia	Mitigation	Promotion on Green Innovation through JCM City-to-city Collaboration	In this project, 1) concrete business of JCM candidates is examined, and JCM is expanded by enterprises and others who are connected to the cities of Kawasaki and Jakarta, and further implementation of the project is promoted, and 2) JCM matching is carried out. In addition, 3) Green Innovation Promotion activity is implemented in the Jakarta District based on the knowledge possessed by Kawasaki City.
110	Indonesia	Adaptation	Project for Community Movement Program on Forest and Land Fire Prevention	1) Develop a system for fire prevention, 2) develop a community-based fire prevention model and peatland management model, and 3) support policies at the national level, to reduce the fire ruins.
111	Indonesia	Adaptation	Impact Assessment Project of Climate Change in Indonesia for Local Adaptation Planning	Implementing climate change impacts assessments in cooperation with Indonesian governmental entity and research entity, with a view to formulating local adaptation plans that form part of Indonesia's National Adaptation Action Program (RAN-API).
112	Indonesia	Mitigation	Survey on co-benefits Type Wastewater Treatment for fish processing industry	Based on the co-benefits bilateral co-operation signed by the Japanese-Indonesian Environment Minister in December 2007 and renewed in July 2015, capacity building has been carried out for fish processing plants, including demonstration tests and evaluations of co-benefits effects and creation of co-benefits wastewater guideline. Simultaneous achievements of environmental improvements and GHG emissions reductions in the industry is pursued through on-site training using the results of demonstration tests and guidelines created.
113	Indonesia	Mitigation	Project for Development of Low-carbon City through City-to-City Collaboration between Batam and Yokohama (Promotion of Green Building Regulation and Optimization of Renewable Energy Utilization in Industrial Parks)	This project monitors the energy generated from existing thermal power generation and newly installed solar energy generation (1MW) in the largest industrial park in Batam City, optimizes the efficiency of renewable energy through smart systems, predicts energy demand among a number of factories in the park, shifts peaks through demand response, and maximizes energy use. In addition, by utilizing the achievements and experiences of the building assessment (CASBEE Yokohama) in Yokohama City, the support of the introduction of the green building system in Batam City is made as a part of the city cooperation project.
114	Indonesia, Guinea-Bissau, Kiribati, Cook Islands, Comoro, Samoa, Sao Tome and Principe, Saint Vincent and Grenadine Islands, Solomon Islands, Tuvalu, Tonga, Nauru, Niue, Vanuatu, Palau, Bangladesh, Marshall Islands, Micronesia, Republic of Maldives	Mitigation	Workshop on Financing for Renewable Energy in Small Island Developing States	Workshops are held in Kuala Lumpur, Malaysia, jointly hosted by the International Renewable Energy Agency (IRENA) to discuss finance and human resource development related to the introduction of renewable energy for SIDs administrative officials.
115	Indonesia, Madagascar	Adaptation	Climate change adaptation through Development of Decision-Support Tool to Guide Rainfed Rice Production (CCADS-RR)	Support is given to the research and development undertaken by the International Rice Research Institute (IRRI) on the construction of cultivation systems that realize double cropping in Asian and African rainfed rice cultivation areas that are vulnerable to climate change, using existing cultivation technologies and outstanding paddy rice varieties.
116	Indonesia, Philippines	Mitigation	The Project for Comprehensive Assessment and Conservation of Blue Carbon Ecosystems and Their Services in the Coral Triangle (Blue CARES)	Develop comprehensive monitoring and modelling systems, formulate blue carbon strategies based on assessments and projections of blue carbon dynamics, and recommend policies.
117	Iran	Mitigation	The Project on capacity development for participatory forest and rangeland management in upper Karoon Basin	In Karoon Basin, Iran, where disasters such as soil runoff, landslides, and flooding have occurred due to excessive grazing of livestock and forest logging for firewood and charcoal, by enhancement of the implementation framework of the Integrated Watershed Management (here in after referred to as "IWM") which the Government of Iran promotes, by strengthening of basin conservation through promoting participatory forest grassland management, and by improving the livelihoods of regions residents, the project aims to strengthen the implementation capacity of IWM in the Karoon Basin and thereby contribute to the effective implementation of IWM in the Kahn Basin.
118	Iraq	Adaptation	Project for Sustainable Irrigation Water Management through Water Users Associations	Technical assistance is provided for the development of water management models required for the achievement of sustainable water management by established user associations with the aim of ensuring the improvement of irrigation efficiencies.
119	Jamaica, Afghanistan, Myanmar, India, Nepal, Pakistan, Bangladesh, Timor-Leste, Ghana, Malawi, Zimbabwe, Sudan, Estiani, Tanzania, Uganda	Adaptation	Maintenance, Operation and Management of Irrigation Facilities(A)(B)	Implementation of training for practitioners in charge of agriculture and rural development policies in central or local governments, with the aim of improving the capacity to plan and implement the appropriate maintenance and management of irrigation facilities and technology transfer to farmers.
120	Jamaica, Antigua Barbuda, St. Christopher Navis, St. Lucia, St. Vincent, Guyana, Fiji, Marshall, Federation of Micronesia, Palau, Papua New Guinea, Tonga	Adaptation	Comprehensive Disaster Risk Reduction in Small Islands	For those who are engaged in disaster prevention in general, including disaster prevention, preparation, emergency response, and restoration and reconstruction, at the central and local governments in small island nations, conduct training to identify major issues faced by their countries and prepare action plans to resolve them, through sharing of experiences and initiatives of disaster prevention plans possessed by Japanese central ministries and local governments and prior investments for disaster reduction measures.

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121	Jamaica, Philippines, Fiji, Marshall, Tonga, Tuvalu	Mitigation	Renewable Energy and Diesel Power Operation in Small Islands	Implement training aimed at acquiring solutions including issues and system stabilization methods for integrated operation of renewable energy and diesel-powered power generation facilities in small island nations.
122	Kazakhstan, Kyrgyz Republic, Tajikistan	Adaptation	Irrigation Water Management for Central Asia and Caucasus Countries	Provide training on appropriate operation, maintenance, and management of water facilities, water management techniques, and methodologies of facility management for those in central and local governments, entities in a position to supervise and guide water associations, or water associations, engaged in water management, facility management, and instruction of beneficiaries.
123	Kenya	Adaptation	Project on Enhancing Community Resilience against Drought through Sustainable Natural Resources Management and Livelihood Diversification	Support to establish sustainable natural grassland management through underground water use based on the scientific evidence and behavioral characteristics of livestock farmers, and to establish alternative livelihoods other than livestock farming by target communities in Turkana County is provided. This contributes to improvement of adaptation capacity (resilience) against drought.
124	Kenya	Adaptation	Water Saving Rice Culture Promotion Project	The aim of this project is to further refine the accuracy of RiceMAPP outcomes (WSRC, improved basal shoot production, improved water management, mechanization of harvests, etc.), promote the dissemination and establishment of technology within the Mwea Irrigation Area, and improve the deployment of the technology to other irrigation regions and rice productivity.
125	Kenya, Argentina, Iran, Lao People's Democratic Republic	Mitigation	Sustainable development of rural area by biomass	Characteristics of biological resources, cultivation plans, and effective use are introduced through lectures, practical training, visits, etc., and each trainee prepares utilization plans tailored to his/her own country, and share the knowledge and plan obtained in the training for the implementation of the painting with the department to which the employee belongs.
126	Kenya, Ethiopia, Palau, Republic of Maldives, Saudi Arabia	Mitigation	FY2018 Project Planning and Capacity Building for further implementation of the Joint Crediting Mechanism in Africa, South east and SIDS.	Conduct capacity building and project support for JCM implementation in the African regions, the regions of Islands and the Middle East regions.
127	Kenya, Niger, Senegal	Adaptation	Combating desertification to strengthen resilience to climate change in Sub-Saharan Africa	For senior-level government officers in ministries engaged in policy formulation to cope with desertification in countries vulnerable to climate change in Sub-Saharan Africa, the project provides opportunities to acquire knowledge to strengthen policy formulation and implementation in the relevant field, share knowledge among participants, and strengthen their policy formulation and implementation capacities to cope with desertification which contribute to climate change measures and resilience enhancement in their home countries.
128	Kenya, Sudan, Iraq, Jordan, Palestine and Afghanistan, Armenia, Azerbaijan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan	Adaptation	Appropriate Management of Land and Water Resources for Sustainable Agriculture in Arid/Semi-arid Regions	Support technical experts from central and local governments and researchers in the field of land and water resource management, to improve their knowledge and skills on the appropriate management of land and water resources required for sustainable agriculture activities.
129	Kenya, Uganda, Indonesia, Fiji	Multiple Areas	GIS and Remote Sensing utilized for Biodiversity Information System and Participatory Approach toward Biodiversity Conservation Actions	Strategic Plan for Biodiversity (2010) set a vision to achieve a world where "biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people". To achieve this vision, understanding of the current situation, accumulation of data, sharing of information and taking measures based on facts, and consensus building among relevant parties are required. This training provides learnings on GIS, remote sensing, databases, surveys, methods and ideas to encourage participation of local residents, as a basis for putting them into practice in home country.
130	Kyrgyz Republic	Adaptation	The Project for Strengthening Integrated Risk Governance Capacities and Regional Cooperation in Central Asia(through UNDP)	Strengthening the vulnerable disaster prevention and disaster response capabilities of the Kyrgyz Republic and promotion of regional co-operation in the area of disaster prevention in the Central Asian regions, by establishing a unified disaster monitoring and early warning system in the Kyrgyz Republic, expanding and strengthening emergency response facilities networks, and strengthening the capabilities of the ministries and agencies in charge of disaster prevention in the five Central Asian countries.
131	Kyrgyz Republic	Adaptation	The Project for Supporting Safe School Programme(through UNICEF)	Enhancement of capacity to strengthen school safety, preparation of training materials, preparation of disaster prevention educational materials, installation of warning systems, provision of disaster prevention supplies, and educational activity on school disaster prevention is carried out.
132	Lao People's Democratic Republic	Mitigation	Project for Institutional Capacity Building for Sustainable Urban Transport System	In Laos, the capacity of urban transportation administration, including the review of long-term urban transportation strategies, is strengthened.
133	Lao People's Democratic Republic	Mitigation	The Project for Improvement of Management Capacity of Water Supply Sector (MaWaSU 2)	In Laos, this project aims to develop a mechanism to strengthen the business management capabilities of the water utilities based on the medium-and long-term perspectives by (1) strengthening the data management required for the formulation of business plans by the pilot water utilities; (2) strengthening the short-term, medium-term, and long-term business plans/implementation capabilities of the pilot water utilities; (3) strengthening the monitoring of business plans within and at the national level of the pilot water utilities; (4) establishing a water utilities planning technology guideline (hereinafter referred to as the "technology guideline") based on the above; and (5) establishing a mechanism to promote the formulation of business plans by water utilities other than the pilot water utilities. Through this project, all Water Supply Public Corporation in Laos will be able to expand and renew facilities and stabilize water supply based on medium-to long-term business plans in the future, thereby contributing to the realization of a sustainable water supply system.
134	Lao People's Democratic Republic	Adaptation	Agro-forestry promotion project to reinforce resilience against climate change and improve the livelihood in rural areas of Lao PDR	Select crop varieties and cultivation methods that have resistance to the effects of climate change, provide cultivation guidance to local farmers, and promote agricultural production. In addition, the project aims to establish a system to ensure long-term sustainability of agricultural production by developing sales channels in and outside Lao PDR and by steadily returning profits to local communities.
135	Lao People's Democratic Republic	Mitigation	REDD+ project in Luang Prabang Province through controlling slash-and-burn	Joint Steering Committee (JSC) is held in part of Phongsaly County, Luang Prabang Province, Lao PDR, to discuss strategy and policy-based issues with a view of REDD+.
136	Lao People's Democratic Republic	Mitigation	The Project for Improvement of Management Capacity of Water Supply Sector (MaWaSU 2)	Improve water administration, strengthen planning and implementation capacities of water utilities, strengthen review, monitoring and assessment capabilities of relevant ministries and agencies, and improve technical standards, and develop the basis required to strengthen water utilities' capabilities.
137	Liberia, Myanmar, Sri Lanka, India, Nepal, Pakistan, Bangladesh, Philippines	Adaptation	Flood disaster risk reduction	In developing countries where flood disasters occur frequently, training will be provided to develop trainees who have the capacity to cope with the on-site level disaster damages caused by flood disasters, in a practical manner and mitigate the damage.
138	Liberia, Tanzania, Brazil, Cambodia, Malaysia, Mongolia, and Philippines	Adaptation	Sewage and Urban Drainage Management	Through wide range of lectures and exercises on basic concepts of wastewater (mainly sewage) measures and urban drainage (mainly rainwater exclusion) measures, as well as planning to implementation, participants examine appropriate methods for problems in home country, and formulate a draft basic plan for wastewater measures and urban drainage countermeasures in home country as an action plan.
139	Macedonia, former Yugoslav Republic, Albania, Morocco, Brazil, Chile, Peru, Georgia, Myanmar, Sri Lanka, Malaysia, Thailand, Viet Nam, Samoa	Adaptation	Water Related Disaster Management (Preparedness, Mitigation and Reconstruction)	There are concerns that water disasters will become more severe due to the impacts of climate change caused by global warming. This training targets personals who implement flooding measures in developing countries (planning and implementation of measures), and aims to strengthen their capacities to formulate and implement policies for water disaster countermeasures, through lectures and visits on systems and measures related to water management and disaster prevention in Japan, and practical exercises on development of action plans for flood control measures in each country.
140	Madagascar, Malawi, Zimbabwe, Rwanda, Sudan, Tanzania, Uganda, Zambia, Afghanistan, Myanmar, Sri Lanka, Cambodia	Adaptation	Maintenance, Operation and Management of Irrigation Facilities	The aim is to improve the planning and implementation capacity of central and local government officials in charge of agriculture and rural development policies in order to carry out appropriate maintenance and management of irrigation facilities and to transfer technologies to farmers.

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141	Malawi, Honduras, Bangladesh	Adaptation	Adaptive Watershed Management to Climate Change: Disaster Risk Reduction and Ecosystem Conservation	The project aims to develop a draft action plan in the target basin by central and local governments or administrative officials in public expert agencies involved in flooding measures or ecosystem conservation in the basin, through learning the reduction of disaster risks by ecological methods that do not rely on buildings (EcoDRR) , and thereby acquiring sustainable basin management methods that take into account disaster prevention measures that make use of the multiple functions of forests.
142	Malaysia South Africa, Angola, Botswana, Ethiopia, Malawi, Sierra Leone, Namibia, Sudan	Mitigation	Knowledge Co-Creation Program (Young Leaders) /Renewable Energy Course	Lectures on renewable energy are held for young people in the target countries. Provide opportunities for practical sessions, discussions, and visits to related facilities.
143	Marshall, Federation of Micronesia, Tonga, Samoa	Mitigation	Management of Water Resources and Water Supply Services	In addition to learning about water-related policies and management of water resources including drought countermeasures in Okinawa prefecture, which shares the same nature of being islands and subtropical regions, and learning about concepts of integrated water resource management, the project also aims to build network of stakeholder relevant to water supply businesses in Oceanian countries. Also, Okinawa prefecture's Office of Enterprises and municipalities' middle-level and young water supply business operators will participate in the training and therefore contributes to human resource development in water supply business in Okinawa prefecture.
144	Mexico	Mitigation	Environmental protection using traits associated with biological nitrification inhibition (BNI) - Reduction of N fertilizer use for wheat production using the BNI function	Support is given to a research and development conducted by the International Maize and Wheat Improvement Center (CIMMYT) to develop new wheat varieties using high BNI lines as well as to determine and accumulate BNI related genes to achieve much higher level of BNI wheat lines that will be able to lead a huge reduction of nitrogen fertilizer input and associated greenhouse gas (GHG) emission.
145	Mexico, Brazil, Myanmar, Philippines, Fiji, Kiribati, Papua New Guinea, Solomon	Adaptation	Coastal and Marine Ecosystem Conservation through Collaborative Management of Marine Protected Areas	This training targets at coastal and marine ecosystem, and in addition to the management method of Japan's regional based natural park, the training will provide understandings on the philosophy and activity of Japan's Satoyama and Satoumi which seeks for a society coexisting with nature, and provide knowledge and lessons for effective regional conservation management (conservation activity/dissemination education) and sustainable use of natural resources (ecotourism, etc.) through private sector participation or active participation (cooperation) of the region's residents.
146	Mexico, Chile, Costa Rica	Mitigation	FY2018 Project Planning and Capacity Building for further implementation of the Joint Crediting Mechanism in Central and South America.	Conduct capacity building and project support for JCM implementation in Latin American and Caribbean regions.
147	Mexico, Myanmar, Sri Lanka, Bangladesh, Philippines	Adaptation	Gender and Diversity in Disaster Risk Reduction	Learn issues and good practices on prevention, emergency response, and restoration and reconstruction that take into account consideration and participation of women, children, the elderly and persons with disabilities, etc. who are at high-risk for disasters, with reference to the experience of Japanese relevant agencies' initiatives and experiences in disaster-stricken areas, and learn how to strengthen disaster response capabilities through women's participation, while sharing the efforts of participating countries.
148	Mongolia	Mitigation	Project for capacity development to establish a national GHG inventory cycle of continuous improvement	In Mongolia, this project aims to strengthen the capacity of Mongolia to establish regular national GHG inventory improvement cycle.
149	Mongolia	Adaptation	Project for Capacity Development of Road Pavement Design Suitable for Mongolian Climate Condition	In expanding the national road network in Mongolia, cooperation is made in developing road paving standards appropriate to climate conditions.
150	Mongolia	Adaptation	Educational Support and School-based DRR Strengthening for Dzud Affected Children	The following activities will be carried out in four prefectures (Arkhangai , Dornod, Dzavkhan, and Bayan olgii) suffering from Dzud damage. 1. Educational support for children in schools in disaster-stricken areas and in vulnerable nomadic households 2. Activity for disaster risk reduction and improving response capabilities at schools levels
151	Mongolia	Adaptation	Impact Assessment Project of Climate Change in Mongolia	Implemented a climate change impacts assessment support in cooperation with the Mongolian government entity (in particular, the Ministry of Natural Environment and Green Development (MEGDT) and the researchentity) with a view to formulating a national adaptation program in Mongolia.
152	Mongolia	Mitigation	Study on Co-benefits type pollution control for Heat Only Boiler	In order to raise awareness of the dissemination of small and medium-scale coal-fired heat-supply boilers (HOBs) with co-benefits potential in Mongolia, training will be provided for HOB relevant parties, including Mongolian administrative officials, and consultations and coordination will be held with relevant parties for registering JCM projects.
153	Mongolia, Bangladesh, Viet Nam, Lao People's Democratic Republic, Cambodia, Myanmar	Mitigation	FY2018 Collection and provision of information on utilization of international market mechanism and project planning in Asia for the Joint Crediting Mechanism.	Collect and provide information on the use of market-based mechanism internationally, and provide capacity building and project support for JCM implementation in the Asian regions.
154	Morocco	Mitigation	The Project for Elaboration of the National Strategy for Treatment of Household and Similar Waste for the Kingdom of Morocco	In the Kingdom of Morocco (hereinafter referred to as "Morocco"), by developing national municipal wastes disposal strategy, improvement of the implementation of the current National Urban Waste Management Plan (hereinafter referred to as "PNDM") and recommendation on the direction of the next PNDM will be made, thereby contributing to the improvement of waste management in Morocco.
155	Morocco, Ghana, Liberia, Malawi, Mali, Mozambique, Zimbabwe	Adaptation	Comprehensive disaster management in the African region	Based on Japan's lessons on preparation for disasters and how to respond to emergencies in general, participants learn how to respond differently to different types of disasters. In addition, participants understand the characteristics of disasters in home country through training, understand the overview pattern of disasters in home country through case study exercises, and acquire the basic skills necessary to develop an appropriate disaster prevention system in home country. With a view to promoting the "Sendai Framework for Disaster Reduction Target E", share the status of the formulation of disaster prevention plans in each country, and learn Japan's findings based on disaster prevention plans, etc. In addition, by establishing appropriate disaster prevention systems/plans through the implementation of the action plan, it aims to reduce disaster damage in Africa.
156	Morocco, Nigeria, Sudan, Sri Lanka, Nepal	Adaptation	Comprehensive Engineering on Water Supply Systems:Practical Training for Water Supply System(B)	A training for mid-level water supply engineers in developing countries, which include lectures, visits, and practical sessions on water supply technology in general is provided.
157	Mozambique	Multiple Areas	Project for Sustainable Forest Management and REDD+	Support is given to capacity building for sustainable forest management and REDD + implementation. This contributes to sustainable forest management across the country.
158	Mozambique	Adaptation	The Project on Promoting Sustainability of Water Supply System in Niassa Province	In the four districts of Niassa Province, where the construction of new water supply facilities has not progressed and the only area where water supply rate is on the decline trend in the country, support is made on the construction of water supply facilities, implementation plans for improving water supply and sanitation, and strengthening the implementation management capacity. This improves the water supply and sanitation conditions in the district concerned, and aims at dissemination and introduction to other districts.
159	Mozambique	Adaptation	The Project on Promoting Sustainability of Water Supply System in Niassa Province	In the four districts of Niassa Province, where the construction of new water supply facilities has not progressed and the only area where water supply rate is on the decline trend in the country, support is made on the construction of water supply facilities, implementation plans for improving water supply and sanitation, and strengthening the implementation management capacity. This aims to improve the water supply and sanitation conditions in the district concerned, and also aims at dissemination and introduction to other districts.
160	Mozambique, Nigeria, Tanzania, Turkmenistan, Uzbekistan, Myanmar, Philippines	Mitigation	Introduction of Advanced Natural Gas Utilization Technology	Transfer of expertise and technology in the electric power sector.

No.	Recipient country and/or region	Targeted area	Programme or project title	Description of programme or project
161	Multiple countries in Oceania, Palau, Solomon, Samoa	Mitigation	Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries Phase II (J-PRISMII)	Support was provided to strengthen waste management systems and develop human resources in 11 countries that need to improve their waste management on an ongoing basis. This will contribute to the promotion of self-development of waste management in the Oceania region.
162	Multiple regions	Mitigation	Sustainable Forestry Management with Community Participation	Promote forest management activity in target countries through learning examples of forest management activity involving region's residents while giving consideration to the ecosystem in Japan and abroad.
163	Multiple regions	Adaptation	Sewerage and Urban Drainage Management	Carry out wide range of lectures and exercises on basic concepts of wastewater (mainly sewerage) measures and urban wastewater (mainly rainwater exclusion) measures, as well as planning to implementation.
164	Multiple regions including Belize, Saint Lucia, Guyana, Surinam, Myanmar, Kiribati, Palau, Tuvalu, Egypt, Brazil, India, Malaysia, Philippines, Cuba, Dominican Republic, Argentina, Chile, Colombia, Ecuador, Tajikistan	Mitigation	Promotion of Energy Efficiency and Conservation	Training in a structured manner is provided which includes lectures and practical training on Japan's energy conservation policies, energy conservation law, energy conservation promotion, and energy conservation technologies in the commercial and residential, and industry sectors, and inspection of initiatives taken by local government level such as environment model cities and energy conservation cases of commercial and residential and industry sector activities. The target is countries which energy conservation potential and incentives are expected. Participants shall be administrative officials, public corporation staff, and private staff of the department in charge of energy conservation.
165	Multiple regions including Dominican Republic, Honduras, Argentina, Bolivia, Brazil, Peru, Ukraine, Egypt, Belize, Antigua-Barbuda, Kyrgyz Republic, Sri Lanka, Pakistan, Bangladesh	Mitigation	Energy Efficiency and Conservation in Commercial and Residential Sector	This project provides systematic and practical training through classrooms and practical training on Japan's policies and technologies related to the energy conservation of the commercial and residential sector (buildings, housing, commercial facilities, etc.). The training include learning technology subjects and inspection that are useful for the energy conservation of buildings and houses, such as "air-conditioning energy conservation" and "smart grids." The training is for the countries with potential and incentives for energy conservation in the living sector, and for those engineers and technical experts who are eligible to participate in the energy conservation of the commercial and residential sector in their own countries, and to have knowledge of basic technologies.
166	Multiple regions including Egypt, Mozambique, Jamaica, Afghanistan, Bangladesh, Kiribati, Federation of Micronesia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Argentina, Bolivia, Ecuador, Paraquay, Peru, Venezuela	Mitigation	Management of Composting Project	Since about 60% of the municipal waste in developing countries are organic waste, composting technologies are an effective way to carry out waste management in these countries. The training aims to transfer technologies and know-how for business operation, on the matters that become issues when promoting composting projects, such as quality control, promotion of public participation, and establishment of distribution systems, including the consideration of the roles of authorities and local areas.
167	Multiple regions including Malawi, Zimbabwe, Uganda, Timor-Leste, Marshall, Egypt, Ethiopia, Guinea, Rwanda, Peru, Iraq, Malaysia	Mitigation	Non-Revenue Water Management (Leakage Control)	Practical training curriculums, such as exercises, facility tours, lectures by practitioners, and information-sharing and discussions among participants, will be carried out to strengthen the capacity regarding management of water leakage (detection and prevention, water leakage analysis, water leakage prevention plan, etc.).
168	Multiple regions including Mozambique, Tanzania, Iran, Myanmar, and Papua New Guinea, Zambia, Myanmar, Sri Lanka, Bangladesh, Mongolia	Mitigation	Improvement of Maintenance Skills for Gas Turbine and Coal Fired Steam Turbine Power Engineering	This project aims for the thermal power generation engineers to learn how to improve operation management and maintenance technologies efficiently in their own countries, and examine measures for dissemination.
169	Multiple regions including Ukraine, Tajikistan, Turkmenistan, Uzbekistan, Afghanistan, Myanmar, Sri Lanka, Nepal, Pakistan, Indonesia, Mongolia, Philippines, Papua New Guinea, Egypt, South Africa, Carbovelde, Ghana, Kenya, Malawi, Nigeria, Tanzania, Uganda	Mitigation	Energy Policy	The project aims to deepen understanding of the global energy situation and Japan's energy policy trends and the current situation, and support policy formulation based on supply and demand forecasts and energy balance.
170	Myanmar	Multiple Areas	Agriculture and Rural Development Two Step Loan Project	Provision of two-step loans to farmers, etc. through medium-to long-term finance supplies to the Agricultural Development Bank of Myanmar (hereinafter referred to as the "MADB") and implementation of capacity-building support for MADB is carried out, thereby facilitating the financial intermediation capacity of agricultural and rural development finance in Myanmar, improving the productivity of farmers, and contributing to the balanced development of urban and rural areas and the modernization of the agricultural and rural finance sectors.
171	Myanmar	Adaptation	Disaster Reduction Project and Model Project for improving residents awareness of health and hygiene in the Ayeyarwady river delta	The Ayeyarwady region was severely damaged by the large-cyclone Nargis in 2008. One of the major reasons of the damage was the low awareness of disaster risk reduction among the public and private sectors, and the lack of disaster risk reduction infrastructures, such as shelters and warning systems. In particular, it is essential to establish an information transmission system in rural areas and in regions where a large number of poor people live. In addition, the region is unable to obtain health data such as weather forecasts and infectious diseases due to lack of basic electric infrastructure even during peacetime, and the impacts on the living activity and the deterioration of health and hygiene conditions are serious. This project aims to improve not only emergency disaster prevention measures but also the living environment of residents and raise public health and health awareness by establishing an information transmission system and a hazard map and establishing an operational system through measures to raise public health awareness.
172	Myanmar	Multiple Areas	Weather index insurance project for farmers	By enhancing weather index insurance for droughts, enhance the resilience of agriculture workers to natural disasters and contribute to income stabilization and productivity improvement.
173	Myanmar	Adaptation	Disaster Reduction Project and Model Project for improving residents awareness of health and hygiene in the Ayeyarwady river delta	Through the development of information transmission system and hazard map, and the establishment of operation system, improve the living environment of residents and raise public health awareness, in addition to emergency disaster prevention measures.
174	Myanmar	Adaptation	Enhancing Comprehensive School Safety in Collaboration with Community in Hinthada Township	Targeting schools which school buildings are constantly flooded in rainy seasons, and in poor conditions, such as the decay of several columns, the project implements the following: (a) establish safe educational environments and secure educational opportunities for children and students; (b) establish evacuation facilities for regions residents and their evacuation centers in preparation for enormous weather disasters; and (c) strengthen residents' disaster response capabilities to build disaster-resilient villages that utilize lessons learned from the past.
175	Myanmar	Multiple Areas	Project for Capacity building for sustainable natural resource management	In the capital city of Naypyidaw and Taunggyi County, Shan Province, improve forest management capacity, strengthen the management of the Inle Lake Integrated Basin Management, and develop the scientific infrastructure for biodiversity conservation, thereby contributing to the sustainable management of natural resources in the region.
176	Myanmar	Adaptation	Agriculture Income Improvement Project	Implement the development of agricultural production/distribution infrastructure and the diffusion of agricultural technologies and agricultural mechanization in the Shwebo Irrigation Area in Sagaing regions.
177	Myanmar	Mitigation	Study on feasibility of the building of low-carbon regional development and promotion of activities in Ayeyarwady region and Sagaing region.	Under the Low Carbonization Promotion Partnership between Ayeyarwady Region and Sagaing Region, in order to achieve low-carbon, resilient, and sustainable local cities, for the realization of low-carbon new industrial park, the possibility of commercialization of energy conservation and renewable energy technologies such as electricity generation and heat utilization using biomass such as rice husk is investigated, as well as support is provided for initiatives including capacity building for the low carbonization of industrial parks and the formulation of a master plan that contributes to the smooth implementation of the project.
178	Myanmar, Cambodia, Laos, Malaysia, the Philippines, Thailand, Micronesia, Papua New Guinea	Mitigation	Development of Quality and Sustainable Transport System	The government parties of each country learn "high-quality transportation" and its policies, technologies and good practices, and compiles action plans for improving urban public transportation systems in accordance with the conditions of each country.
179	Myanmar, Fiji, Kiribati, Papua New Guinea, Solomon	Multiple Areas	Coastal and Marine Ecosystem Conservation through Collaborative Management of Marine Protected Areas	When establishing a protected areas, it is essential to conduct sufficient coordination regarding the use of resources with the residents of the protected areas and surrounding regions. This training targets at coastal and marine ecosystem, and in addition to the management method of Japan's regional based natural park, the training provides understandings on the philosophy and activity of Japan's Satoyama and Satoumi which seeks for a society coexisting with nature, and provide knowledge and lessons for effective regional conservation management (conservation activity/dissemination education) and sustainable use of natural resources (ecotourism, etc.) through private sector participation or active participation (cooperation) of the region's residents.
180	Myanmar, Malawi, Zimbabwe, Afghanistan, Philippines, Marshall, Ethiopia, Guinea, Nigeria, Rwanda, Sri Lanka, Cambodia, Laos, Tanzania, Myanmar, Nepal, Fiji	Adaptation	Non-Revenue Water Management (Leakage Control)(A)(B)(C) (D)	Through practical training curriculums, such as exercises, facility tours, lectures by practitioners, and information-sharing and discussions among participants, the project strengthens participants' capacities for non-revenue water management measures (e.g., water leak detection and prevention, water leak analysis, and water leak prevention planning).

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181	Myanmar, Sri Lanka, Nepal, Bangladesh, Philippines, Fiji	Adaptation	Promotion of Mainstreaming Disaster Risk Reduction	Promote the mainstreaming of disaster risk reduction in participating countries by sharing Japan's experiences, lessons learned, outstanding practices, and case studies on disaster risk reduction mainstreaming.
182	Myanmar, Thailand, Philippines	Multiple Areas	Project for technical development for forest restoration in developing countries	Research and analysis of technologies that can contribute to forest revitalization in devastated areas and dissemination of those to developing country governments.
183	Nepal	Multiple Areas	Project on Capacity Development of KUKL to Improve Overall Water Supply Service in Kathmandu Valley	Support the improvement of water supply services in the basin by strengthening the operation capacity of the Kathmandu Basin Water Supply Public Corporation (Kathmandu Upatyaka Khanepani Limited :KUKL) for water supply business.
184	Nepal	Adaptation	Project for Recovery of Earthquake-affected Communities in Kavrepalanchok District through Improvement of Agriculture and Marketing	Implement reconstruction support projects in disaster-stricken area through agricultural promotion, including the improvement of cash crop cultivation techniques, the establishment of irrigation facilities, capacity building of agricultural cooperatives, and the construction of marketing systems.
185	Nepal	Adaptation	Strengthening Resilience of Earthquake Affected Schools in Nuwakot and Rasuwa district, Nepal	Disaster prevention capacity building projects is implemented in the disaster-stricken elementary schools by reconstructing school buildings in accordance with the earthquake resistance standards of the Ministry of Education, library activities by teachers of target schools, formulation of disaster prevention plans, implementation of disaster prevention education, and promotion of understanding of disaster prevention among teachers, school steering committee, region's residents, and administrative staffs of the target schools.
186	Nepal	Adaptation	Community and school disaster preparedness and resilience in Doti district	This project aims to improve the disaster prevention capabilities of schools and communities in Doti County, a poor regions located in the far west of Nepal. The following three activity will be implemented. 1. Development of safe school facilities 2. Improvement of disaster prevention systems of schools and communities 3. dissemination of initiatives of schools resilient to disasters.
187	Nepal	Adaptation	Disaster Risk Reduction (DRR) Strengthening Project in Chitwan District	Increase disaster prevention and disaster risk mitigation capabilities of communities and local governments in Chitwan County, where disaster risk is high. In Madi City, which is a flood-stricken area, in order to develop disaster-prevention capabilities of the city and reduce flood risks, support will be given for measures such as dissemination of the concepts of basin management of surrounding rivers to communities, management measures including infrastructure development, and trainings. In the case of landslide-prone regions, support will be made to include disaster prevention perspectives in region's development plans.
188	Nepal	Adaptation	Rehabilitating School and Building School Resilience to Disaster in Sindhupalchowk, Nepal	Reconstruct school facilities that collapsed due to a major earthquake and establish facilities for hand washing. At the same time, support the formulation of school disaster prevention plans centered on schools by school steering committee, and its operation. School reconstruction and the development and implementation of disaster prevention plans can ensure "child-friendly schools" and "child-friendly regions" in emergencies.
189	Nicaragua	Adaptation	Project For Strengthening Non-Revenue Water Management Capacity In Managua city	Support is given to strengthening ENACAL's non-revenue water management capacity and building the foundation for effective non-revenue water reduction measures to be implemented in the city of Managua.
190	Niger, Zimbabwe, Rwanda, Sudan, Tanzania, Uganda, Sri Lanka, Pakistan, Cambodia, Philippines	Mitigation	Maintenance, Operation and Management of Irrigation Facilities	While the development of irrigation facilities and other infrastructure has been promoted in many developing countries, the repair of aging facilities and the appropriate maintenance and operation management system of facilities have become challenges. Strengthening of the business planning capability of the executors for improving the legal system and the management system is required. This training aims to improve the planning and implementation capacity of administrative officials from central or local governments in charge of agriculture and rural development policies for the appropriate maintenance and management of irrigation facilities and for the transfer of technologies to farmers.
191	Nigeria, Tanzania, Mexico, Brazil, Colombia, Ecuador, Afghanistan, Indonesia, Thailand	Mitigation	Environmentally Sustainable Urban Transport Planning	Capacity building for central government agencies and local government's mid-level administrators is provided, on environmentally sustainable urban transportation and urban development planning and management based on the Green Economy (economic activity aiming at balancing environmental conservation and economic development).
192	Nigeria, Uganda, Afghanistan, India, Nepal, Tunisia, Benin, Rwanda, Eritrea, Sri Lanka, Pakistan	Adaptation	Operation and Maintenance of Urban Water Supply System(Water Quality and Purification)(A)(B)	Among the field engineers (engineer level) who carry out maintenance and management of urban water works, specifically for those engaged in "water purification and water quality", carry out transfer and dissemination of intensive and practical technologies.
193	Northern Macedonia, Morocco, Liberia, Brazil, Chile, Peru, Iran, Bhutan, Myanmar, Sri Lanka, Thailand, Viet Nam	Adaptation	Water Related Disaster Risk Reduction	The SDF will strengthen its capacity for policy formulation and implementation of flood disaster countermeasures through lectures and tours on Japan's systems and countermeasures for flood control and disaster prevention, and exercises to prepare action plans for flood control countermeasures in each country, for those who are in charge of the practical work of flood countermeasures in developing country (planning and implementation of policies).
194	Pakistan	Mitigation	The Project for Developing Effective Phasing Out Strategy/Program of Inefficient Appliances to Support Energy Standards & Labeling Regime	The project supports establishment and operation of a system to promote energy conservation throughout Pakistan through mandatory improvement, dissemination activity, and human resource development of energy conservation standards and the labeling system. By introducing Japanese expertise, which boasts outstanding achievements in the energy conservation field, in a form suitable for the Pakistani system, the project aims to improve the energy-efficiency of home electronics products and other products, and to make a contribution to the resolution of serious power supply-demand gaps in Pakistan.
195	Pakistan	Adaptation	Enhancing disaster resilience on droughts in Sindh Province, Pakistan	In order to create a system for local communities to maintain and management, conduct activities for the following output: provision of information to communities to improve water efficiency and raise awareness of water and disaster risk reduction, improve access to drinking water for the poor, and improve access to agricultural water and technologies in regions affected by drought.
196	Papua New Guinea	Mitigation	The Project for Enhancing Capacity to Develop a Sustainable GHG Inventory System for PNG	Papua New Guinea (PNG) has prepared and submitted a GHG inventory twice in order to fulfill its reporting requirement to the United Nations United Nations Framework Convention on Climate Change (UNFCCC). However, the Papua New Guinea (PNG) does not have a system to prepare it continuously and regularly, and there are challenges to the accuracy of emissions calculation and technical levels. In order to regularly develop an appropriate GHG inventory, the project aims to strengthen the capacity of the relevant government agencies responsible for the development of the PNG GHG inventory.
197	Philippines	Mitigation	Master Plan Study on Urban Transport System Development in Metro Cebu Project	It aims to improve relevant agencies' planning and coordination capacities through the support of Metro Cebu 's Master Plan for Urban Transportation and the implementation of pilots' projects, and to contribute to Metro Cebu 's urban traffic improvement.
198	Philippines	Adaptation	Project for Flood Control in Davao	In response to a request from the Ministry of Public Works and Roads (DPWH) in the Philippines, a project to formulate the Master Plan for Flood Control Measures in Davao City, to conduct feasibility studies for priority projects, and to strengthen DPWH capacities is carried out.
199	Philippines	Multiple Areas	Project for resilient Community protected by Forest	Create highly resilient communities through the revitalization of headwater forest and coastal forest conservation that suffered enormous damage from the typhoon Haien that hit the central Philippines in November 2013, and through the introduction of sustainable industries to improve livelihoods of victims and vulnerable people.
200	Philippines	Mitigation	FY2017 Subsidy for CO2 Emission Suppression Measures Project Expense etc. (Project for Assistance of Reduction of CO2 Emission by Strategic Overseas Development of Japanese Venous Industry) (Electricity Generation by Recycled Unrefined Waste Edible Oil in the Philippines)	A project in the metropolitan area of Manila, the Philippines, which utilizes waste cooking oil from business as a generator fuel using its own control technology. It contributes to reduce CO2 by replacing system power sources and by proper disposal of waste cooking oil.
201	Philippines	Mitigation	Support for low carbon promoting projects through Intercity Cooperation between Osaka City and Quezon City (Promoting solar power generation and industry energy saving technologies)	In this project, based on the cooperation between Osaka City and the metropolitan area of Manila, the project aims at the formulation and support of action plans related to solar energy generation and plant energy conservation, and the promotion of low-carbon business (solar and energy conservation (factories) field) in line with the plan.
202	Philippines	Adaptation	Enhancing disaster response capability through promoting collaboration among government, private sector and civil society organizations	Six regional platform will be established in Luzon, Visayans, and Mindanao, with the aim of further strengthening the platform hierarchy in order to achieve disaster prevention and disaster response through cross-sectoral collaboration at each regional level. In addition, national coordination committees are organized to strengthen emergency-response systems by holding workshops to improve platform capabilities.
203	Philippines	Mitigation	Technical Assistance Project to Establish of the Philippine Railway Institute	Implement support such as the establishment of the Philippine Railway Training Centre (PRI), development of training facilities, preparation of a human resources development guideline, and implementation of training.
204	Philippines	Adaptation	Project for Flood Control in Davao	As a flood countermeasure in Davao City, a master plan (basic plan) is formulated to cope with heavy rains caused by typhoons.
205	Philippines	Mitigation	Project to realize low carbon society in Davao City through a support for a development of local climate change action plan	Under the framework of "Environmental Sister Cities" newly agreed between Kitakyushu City and Davao City, prepare climate change action plans (LCCAP) in municipality level, conduct feasibility study of implementation of waste power generation projects and other low carbonization projects in Davao City, and applicability of JCM facility subsidy projects, and support the promotion of low-carbon societies in Davao City.

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206	Philippines, Papua New Guinea, Micronesia, Solomon Islands, Fiji, Palau	Mitigation	Workshop on capacity building for preparation of bankable concept notes for green climate fund (GCF) and discussion on mobilization of private sector finance, Male, Maldives	Workshops will be held in collaboration with the International Renewable Energy Agency (IRENA) to support small island states' renewable energy dissemination and small island states' access to Green Climate Fund (GCF).
207	Republic of Maldives	Mitigation	Project for Institutional Capacity Building for Sustainable Urban Transport System	Improve the traffic management and business execution capabilities of urban traffic administration entity personnel in Vientiane City by promoting coordination of traffic relevant agencies, formulating city traffic master plans, and implementing pilots project, thereby contributing to planned operation of city traffic systems and sustainable city traffic management.
208	Rwanda	Adaptation	Project for Water Management and Capacity Building	Support the maintenance and management of irrigation facilities in Rwanda.
209	Rwanda, Sudan, South Sudan, Tanzania, Uganda, Azerbaijan, Afghanistan	Adaptation	Irrigation and Drainage Technology based on Integrated Water Management	Provide training on the technologies required for investigating, designing, maintaining and managing irrigation wastewater, as well as the knowledge required for administrative officials to implement integrated water management, such as measures against global warming and project management.
210	Solomon	Multiple Areas	The Project on Capacity Development for Sustainable Forest Resource Management in Solomon Islands	For sustainable forestry in Solomon, the project aims to improve policymaking capacities of the Ministry of Forestry and Research, and support is provided for the implementation of pilots' activities by residents.
211	Somalia, South Sudan, Yemen, Nigeria	Adaptation	Emergency Grant Aid for four countries in the Middle East and Africa affected by the famine	Support to Somalia, South Sudan, Yemen, and northeastern Nigeria suffering from famines (humanitarian support in areas such as nutrition including cholera control, water/sanitation, health, and pest prevention/response capacity enhancement) is provided.
212	South Africa, Botswana, Ethiopia, Malawi, Zimbabwe, Namibia	Mitigation	Knowledge Co-Creation Program (Young Leaders) for African Countries (English)/Renewable Energy Course	Training aimed at developing knowledge and awareness among young people who are responsible for solving issues in the field of renewable energy as future leaders is carried out.
213	Sri Lanka	Adaptation	Resilience building through Disaster risk reduction education in Agriculture in Mullaitivu and Kilinochchi	This project aims to protect beneficiaries of prior projects of organizations living in Kilinochchi and Mullaitivu province from disaster damage and prevent the risks of re-poverty by acquiring knowledge and tools to cope with disasters and extreme weather that are increasing, and by building social safety nets.
214	Sri Lanka	Adaptation	Capacity Building Project for the establishment and Sustainable Management of a Multi-sector Platform for Disaster Risk Reduction at the National Level	Build a multi-actor disaster prevention platform and conduct capacity building for sustainable operation.
215	Sri Lanka	Adaptation	Promotion of Private Public partnership and Capacity Building Project for emergency responses for Disaster Risk Reduction in Sri Lanka	In order to further strengthen collaboration between the government and the private sector and create autonomous continuity of platform, capacity building, discussion of disaster-risk mitigation mechanisms, business reconstruction, and resilient communities, the project aims to achieve high quality collaboration with more private enterprises, youth volunteer organizations, NGOs, and the United Nations entities, as well as government entities.
216	Sri Lanka	Adaptation	The Project for Enhancement of Operational Efficiency and Asset Management Capacity of Regional Support Center-Western South of NWSDB in Sri Lanka	Enhances pipeline management operations by NWSDB (National water supply and sewerage system public building), by introducing asset management related to pipelines in NWSDB, by improving water leakage countermeasures capabilities in the southern regions of Western Province, and by enhancing training implementation capacities of the human resource development and training department.
217	Sri Lanka, Bangladesh	Adaptation	Study on Analysis of Flood-using type Irrigation Technology survey and analysis situation of climate change in Asia region	In order to adapt to flooding and drought, technologies for storing river water and flood water in an underground aquifer and irrigating it during drought will be examined.
218	Sri Lanka, Bangladesh, India	Adaptation	Drought Monitoring and Forecasting to Enhance Agriculture Resilience and Improving Food Security in South Asia	In Asian region, which is vulnerable to climate change, the project develops drought forecasting and warning systems using satellite-based data. It also examines effective water source planning, irrigation facility development plans, water management methods combined with irrigation facility development, etc. using Japanese technologies, and will provide stakeholder countries with recommendations and technical guidance on facility development and planning.
219	Sri Lanka, Pakistan, Bangladesh, Philippines, Thailand, Fiji	Adaptation	Reinforcement of Meteorological Services	Trainings are conducted to acquire numerical forecasts, weather satellites, climate information, and weather information development methods using these.
220	Tanzania	Mitigation	Project for Domestic Natural Gas Promotion and Supply System in Tanzania	Support is provided for the formulation of the Master Plan for the Promotion of Natural Gas diffusion (Domestic Natural Gas Promotion Plan:DNGPP) and the formulation of the Model Plan for Construction of Natural Gas Supply Systems in phase 1 of the Plan, and also for strengthening of the capacity so that the government of the recipient country can formulate and revise the Plan by its own.
221	Tanzania	Mitigation	Capacity Development Project for Improvement of Maintenance of Distribution and Transmission Systems Phase 2	In Tanzania, reliability, efficiencies, and energy access of electric power supplies will be improved by improving the capacity of personnel engaged in the operation, maintenance, and management of transmission and distribution systems, thereby contributing to the socio-economic development and development of Tanzania.
222	Tanzania, Brazil, Sri Lanka, India, Nepal, Pakistan, Bangladesh, Philippines, Viet Nam, Fiji	Adaptation	Flood disaster risk reduction	The project aims to develop capacity of trainees in developing countries from frequent flood disasters to reduce damage by practically coping with damage caused by flood disasters on-site.
223	Thailand	Multiple Areas	Project for Strengthening Institutional Capacity for the Implementation of Bangkok Master Plan on Climate Change 2013-2023	In five areas stipulated in the Master Plan, including transportation, energy, and waste and wastewater handling, urban greening, adaptation measures, the project aims to strengthen the capacity and institutional structure to implement climate-change measures, with the aim of contributing to the low-carbon and resilient development of Bangkok metropolitan area.
224	Thailand	Multiple Areas	Project for Capacity Development to accelerate Low Carbon and Resilient Society realization in the Southeast Asia region	This project will maintain, improve and develop CITC training courses in Thailand and other Southeast Asian countries, including training to support the formulation and implementation of plans for climate change countermeasures, and establishes a path to self-reliant development as a training center for regions, thereby improving the TGO's capacity to become a "regions one-stop training center" for CITC and contributing to the promotion of regions climate change countermeasures.
225	Thailand	Mitigation	The Project for Comprehensive Conversion of Biomass and Waste to Super Clean Fuels by New Solid Catalysts	This project aims to develop catalytic shift technology for high-quality biofuel that replaces fossil fuels by utilizing biomass/waste resources in Thailand, and to help achieve low-carbon societies and secure stable energies by dissemination of this technology in Thailand.
226	Thailand	Mitigation	The Project for e-Integrated Smart Transport to Dually Achieve CO2 Reduction and People's Well-Being to Support THAILAND 4.0	The project aims to overcome traffic congestion in developing country megacities, which is the cause for greenhouse gas emissions and atmosphere pollutants, economic losses and increased health risks, beyond the techniques of developed countries. Taking Bangkok as a whole, the attempt to implement an e-Smart Traffic Integration Strategy that fully utilizes ICTs by integrating and visualizing big data and 3D data on digital ground in a model area along the Sukhumvit roadside. In order to respond to THAILAND 4. 0, which aims at economic shift from product-base to value-base, we will develop methods for measuring quality of life (QOL) that reflects various values, and evaluating traffic systems using factor indicators that represent the efficiency of QOL with respect to CO2 emissions.
227	Thailand	Adaptation	The project on regional resilience enhancement through establishment of Area-BCM at industry complexes in Thailand	The objective of this research is to improve disaster resilience in industrial clusters using the Area-BCM (regions Business Continuity Management) framework, targeting the Thai kingdom, which is exposed to the rapid increase of disaster risks due to intensified climate change, while becoming increasingly important as a production and logistics base in Southeast Asia.
228	Thailand	Mitigation	The Project of Smart Transport Strategy for Thailand 4.0	By integrating and visualizing big data and 3D data on digital earth using ICT-technology, and by constructing policy assessment systems based on the Quality of Life of citizens, the project contributes to the implementation of policy formulation that achieves both the solution on traffic problems, low-carbon societies, and the improvement of the total happiness of citizens.
229	Thailand	Adaptation	The project on regional resilience enhancement through establishment of Area-BCM at industry complexes in Thailand	In Thailand, Area-BCM tools are developed to visualize the impacts of disaster risks on industries on a region by region basis, and support is made to build an operational system by introducing them into industrial parks and surrounding regions, thereby supporting an achievement of disaster-resilient regions community.
230	Thailand	Adaptation	Project for Development of Information Infrastructure in Thailand for Adaptation Planning	Build a collaborative and cooperative system among administrative entities, research entities and global entities in Thailand, support organization of climate-risk information and procurement of finance, and cooperate to implement adaptation plans and build an information base.

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231	Thailand, Lao People's Democratic Republic, Cambodia, Viet Nam	Mitigation	Project for improving irrigation facilities in Mekong River Basin	In order to promote the coexistence of irrigation facilities and inland water fisheries in the Mekong River Basin, technical considerations such as the establishment of appropriate fishway in irrigation facilities will be carried out, and recommendations on facility development will be made to stakeholder countries.
232	Thailand, Lao People's Democratic Republic, Cambodia, Viet Nam	Adaptation	Project for improving irrigation facilities in Mekong River Basin	In order to mitigate the transboundary effects of irrigation and to promote the coexistence of irrigation agriculture and inland water fisheries, the development and operation methods of irrigation facilities utilizing Japanese technology is examined, and recommendations and technical guidance on facility development, operation and management is provided to the stakeholder countries.
233	The former Yugoslav Republic of Macedonia	Adaptation	Project on Capacity Building for Ecosystem-Based Disaster Risk Reduction through Sustainable Forest Management in Macedonia (Project Eco-DRR in Macedonia)	In response to a request from the Iraqi Government, while utilizing the diverse benefits of forest ecosystem, the technical assistance project on disaster risk reduction and mitigation (Eco-DRR) using the ecosystem of forests, which aims to reduce the damage from soil erosion, landslides, floods, etc. is carried out. In Macedonia, many donors, including UNDP, are providing support in the field of disaster risk reduction, and this project is designed to carry out support from the approach of disaster risk reduction (Eco-DRR) using ecosystem such as forests, in cooperation with other project.
234	Tunisia	Mitigation	Project for Non-Revenue Water Reduction in the South Region	The water supply area of Water Resource Development Public Corporation [Société Nationale d'Exploitation et de Distribution des Eaux:SONEDE] is surveyed to understand the current state of non-revenue water rate increase, and measures to take appropriate measures is considered.
235	Turkey, Albania, Ethiopia, Malawi, Sudan, Peru, Myanmar, India, Philippines, Viet Nam, Fiji, Papua New Guinea, Solomon	Multiple Areas	Sustainable Forestry Management with Community Participation	Lectures are held on examples of forest management activities involving region's residents in Japan and abroad while giving consideration to the ecosystem, to promote management activities of forests in target countries.
236	Uganda	Adaptation	Project for improving responses to disasters and climate change adaptation capacity for vulnerable people in Kasese District (Year 3)	The project strengthens the foundation of disaster risk reduction organizations that implement activity (disaster mitigation), adaptation to climate change (adaptation), and disaster risk reduction activity for communities, in 18 villages in front of Calsandara sub-county and 8 schools in these villages.
237	Uganda	Adaptation	Project for improving capacity of communities to respond disasters and adapt climate change for vulnerable people in West Uganda	Focus on establishing disaster prevention organizations in communities, developing disaster prevention action plans, and then strengthening disaster preparedness and response capabilities. In addition, in the sub-county of Cassandra, monitoring will be strengthened in prefectural and sub-county administrative, and through disaster prevention organizations established in the communities during the project, and partial retraining to strengthen the sustainability of the project results.
238	Ukraine, Argentina, Colombia, Lebanon, Philippines	Mitigation	Sustainable development of rural area by biomass	In addition to introducing the characteristics of biological resources, cultivation plans, and effective use through lectures, practical sessions, and visits, trainees prepare utilization plans tailored to their countries, and share the knowledge and plans obtained through training with their institutions for the implementation of the plans.
239	Vanuatu, the Federation of Micronesia, Palau, Solomon, Samoa	Adaptation	Management of Water Resources and Water Supply Services	In addition to learning about water-related policies and management of water resources including drought countermeasures in Okinawa prefecture, which shares the same nature of being islands and subtropical regions, and learning about concepts of integrated water resource management, the project also aims to build network of stakeholder relevant to water supply businesses in Oceanian countries.
240	Viet Nam	Multiple Areas	Support Program to Respond to Climate Change (VII)	In Viet Nam, one of the most vulnerable countries to the impact of climate change, the "Climate Change Support Program (VII)" supports efforts for mitigation, adaptation, and cross-cutting issues on climate change through fiscal support and policy-based dialogues.
241	Viet Nam	Multiple Areas	Knowledge Co-Creation Program (Young Leaders) for Viet Nam/Nature Conservation Course	A training in which participants consider conservation efforts that can be applied in the home country and the activity of participation residents through examples of conservation and sustainable use of natural environments is carried out. It aims at understanding the importance of participation and collaboration among all level, including the national government, municipalities, regions, research entities, schools, and the private sector, in the conservation of natural environments.
242	Viet Nam	Adaptation	DRR/CCA project in Dong Thap province（Phase1）	The object is for residents and children to learn the appropriate knowledge about disaster risk reduction and climate change, and participate in the formulation of disaster risk reduction plans and implement disaster risk reduction and climate change responses initiated by communities. It also aims to improve the region's capacity to respond sustainably to disasters and climate-change.
243	Viet Nam	Mitigation	FY2017 Subsidy for CO2 Emission Suppression Measures Project Expense etc. (Project for Assistance of Reduction of CO2 Emission by Strategic Overseas Development of Japanese Venous Industry) (Methane Fermentation of Organic Waste in Ho Chi Minh City, Viet Nam)	A Methane fermentation test is conducted using organic waste disposed from Ho Chi Minh City as raw material. The fertilizer effects of biogas generation and fermentation liquid is checked, and a draft operation plan for 100 ton/day is formulated.
244	Viet Nam	Mitigation	Support for low carbon promoting projects through Intercity Cooperation between Osaka and Ho Chi Minh (Promoting energy saving technologies)	This project supports the progress management of the "Ho Chi Minh City Climate Change Action Plan" based on inter-city cooperation between Osaka City and Ho Chi Minh City. It also aims to promote low-carbon projects (energy conservation sectors) in line with these plans.
245	Viet Nam	Adaptation	DRR/CCA project in Dong Thap Province	To ensure that region's disaster prevention personnel accurately understand the needs of all residents, including those in vulnerable positions at the time of a disaster, plan and implement a disaster prevention and mitigation activity together with residents, develop human resources responsible for disaster management, establish a disaster management system, and support the activity. In addition, the project aims to establish the activities and disseminate in other regions by strengthening the capacities of district administrative staffs who are in position to manage and supervise these activities.
246	Viet Nam	Adaptation	The project for strengthening capacity in weather forecasting and flood early warning system	Improve maintenance and inspection and calibration capabilities for weather observation equipment, improve analysis and quality control capabilities for weather observation radar data, improve monitoring and forecasting capabilities for heavy rains and typhoons, and improve communication capabilities.
247	Viet Nam	Adaptation	Impact Assessment Project of Climate Change in Vietnam	Building a collaborative and cooperative system among administrative entities and research entities in Viet Nam, climate change impacts assessments is conducted in vulnerable areas (agriculture and natural disasters, etc.) in a particular regions, and cooperation is provided for the formulation of national adaptation plans.
248	Viet Nam, Lao People's Democratic Republic, Cambodia, Myanmar	Multiple Areas	Project for promoting forest conservation projects in developing countries	The rules required for the implementation of REDD+project in Joint Crediting Mechanism (JCM) are developed and disseminated.
249	Zambia, Honduras, Brazil, Guyana, Philippines, Timor-Leste, Papua New Guinea, Morocco, Democratic Republic of the Congo, Mexico, Iran, Georgia, Tajikistan, Nepal	Adaptation	Disaster Management on Infrastructure (River, Road and Port)(A)(B)	Learn about disaster-resilient infrastructure development from the perspective of disaster prevention, mitigation, and recovery through infrastructure case studies that take into account the risks of various natural disasters (earthquakes, landslides, wind and flood damage, etc.) in Japan.
250	Zimbabwe	Adaptation	Enhancing the resilience of drought and flood affected communities through a comprehensive set of life saving health, nutrition, food security and WASH interventions.	Provide food support for people affected by El Nino drought and flooding (including capacity building to enhance resilience to drought damage).
251	Zimbabwe, Sudan, India, Pakistan, Indonesia, Mongolia, Thailand, Viet Nam, Fiji, Federation of Micronesia, Papua New Guinea	Adaptation	Adaptation to Climate Change	This project aims to improve the capacity of administrative officials in charge of policy formulation of the climate change adaptation policy at national, regional, or sectoral level, or the central and local administrative entity in charge of adaptation policy formulation. In particular, in the first half of the training, training is provided on lectures, exercises, and tours related to policy-making, such as adaptation overviews, international frameworks, and Japanese policy-making. In the second half, training is provided on sector-specific approach, such as climate-change projection, impact assessment, vulnerability assessment, and municipalities initiatives.

Acronyms and Abbreviations

	Terms	Definition
A	AAUs	Assigned Amount Units
	ACE	Actions for Cool Earth
	ADB	Asian Development Bank
	AMICAF	Analysis and Mapping of Impacts under Climate Change for Adaptation and Food Security
	APAN	Asia Pacific Adaptation Network
	AR4	IPCC Fourth Assessment Report
	ARD	Afforestation, Reforestation and Deforestation
B	BAT	Best Available Technology
	BAU	Business As Usual
	BELS	Building-Housing Energy-efficiency Labelling System
	BEMS	Building Energy Management System
	BPT	Best Practice Technologies
	BR	Biennial Report
	BRT	Bus Rapid Transit
C	CAO	Cabinet Office
	CASBEE	Comprehensive Assessment System for Built Environment Efficiency
	CBIT	Capacity Building Initiative for Transparency
	CCPL	Climate Change Program Loan
	CCS	Carbon Capture and Storage
	CCU	Carbon Capture and Utilization
	CDV	Clean Diesel Vehicle
	CERs	Certified Emission Reductions
	CH_4	Methane
	CITC	Climate Change International Technical and Training Center
	CM	Cropland Management
	CMP	Conference of the Parties serving as the Meeting of the Parties
	CNF	Cellulose Nano Fiber
	CNGV	Compressed Natural Gas Vehicle
	CO	Carbon monoxide
	CO_2	Carbon dioxide
	CO_2 eq.	Gas Emission in CO_2 equivalent
	COP	Conference of Parties
	CP	Compliance Program
	CRF	Common Reporting Format
	CSPF	Cooling Seasonal Performance Factor
	CTF	Common Tabular Format
	CY	Calendar Year

	Terms	Definition
D	DAC	Development Assistance Committee
E	EC	Electronic Commerce
	EMS	Eco-drive Management Systems
	EMS	Energy Management System
	ERT	Expert Review Team
	ERUs	Emission Reduction Units
	ESCO	Energy Service Company
	ESG	Environmental, Social, Governance
	EST	Environmentally Sustainable Transport
	ETBE	Ethyl Tertiary-Butyl Ether
	ETC	Electronic Toll Collection System
	EV	Electric Vehicle
F	FCV	Fuel Cell Vehicle
	FM	Forest Management
	FEMS	Factory Energy Management System
	FY	Fiscal Year
G	GAN	Global Adaptation Network
	GCECA	Global Centre of Excellence on Climate Adaptation
	GCF	Green Climate Fund
	GDP	Gross Domestic Product
	GEF	Global Environment Facility
	GEOSS	Group on Earth Observations
	GHG	Greenhouse Gas
	GIO	Greenhouse Gas Inventory Office
	GM	Grazing Land Management
	GRA	Global Research Alliance
	GWP	Global Warming Potential
H	HCFC	Hydrochlorofluorocarbon
	HFCs	Hydrofluorocarbons
	HEMS	Home Energy Management System
	HHV	Higher Heating Value
	HV	Hybrid Vehicle
	HWP	Harvested Wood Products
I	ICAO	International Civil Aviation Organization
	ICEF	Innovation for Cool Earth Forum
	ICT	Information and Communication Technology
	IEA	International Energy Agency
	IGFC	Integrated coal gasification fuel cell combined cycle
	IMO	International Maritime Organization

	Terms	Definition
	INDC	Intended Nationally Determined Contribution
	IoT	Internet of Things
	IPCC	Intergovernmental Panel on Climate Change
	IPPU	Industrial Processes and Product Use
	IRENA	International Renewable Energy Agency
	ISO	International Organization for Standardization
	ITS	Intelligent Transport System
	ITTO	International Tropical Timber Organization
J	JAIF	Japan-ASEAN Integration Fund
	JBIC	Japan Bank of International Cooperation
	JCM	Joint Crediting Mechanism
	JICA	Japan International Cooperation Agency
	JNGI	Japanese National GHG Inventory
K	KP	Kyoto Protocol
L	LCCM	Life Cycle Carbon Minus
	LCEM	Life Cycle Energy Management
	LED	Light Emitting Diode
	LNG	Liquefied Natural Gas
	LRT	Light Rail Transit
	LULUCF	Land-Use, Land-Use Change and Forestry
M	MAFF	Ministry of Agriculture, Forestry and Fisheries
	METI	Ministry of Economy, Trade and Industry
	MHLW	Ministry of Health, Labor and Welfare
	MIC	Ministry of Internal Affairs and Communications
	MLIT	Ministry of Land, Infrastructure and Transport and Tourism
	MOE	Ministry of the Environment
	MOFA	Ministry of Foreign Affairs of Japan
	MRV	Measurement, Reporting and Verification
N	N_2O	Nitrous oxide
	NEDO	New Energy and Industrial Technology Development Organization
	NEXI	Nippon Export and Investment Insurance
	NC	National Communication
	NDC	Nationally Determined Contribution
	NEB	Non-Energy Benefit
	NF_3	Nitrogen trifluoride
	NIES	National Institute for Environmental Studies
	NIR	National Inventory Report
	NMVOC	Non-methane volatile organic compounds
	NOx	Nitrogen oxides

	Terms	Definition
	NPA	National Police Agency
O	O&M	Operation and Maintenance
	ODA	Official Development Assistance
	ODS	Ozone Depleting Substance
	OOF	Other Official Flow
	OTEC	Ocean Thermal Energy Conversion
P	PDCA	Plan–Do–Check–Act
	PF	Private Flows
	PFCs	Perfluorocarbons
	PHV	Plug-in Hybrid Vehicle
Q	QA/QC	Quality Assurance / Quality Control
	QAWG	Quality Assurance Working Group
R	REDD+	Reducing Emissions from Deforestation and Forest Degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
	RV	Revegetation
S	SBI	Subsidiary Body for Implementation
	SDGs	Sustainable Development Goals
	SF_6	Sulfur hexafluoride
	SIDS	Small Island Developing States
	SO_2	Sulfur dioxide
	SOx	Sulfur oxides
	SPREP	Secretariat of the Pacific Regional Environment Programme
U	UN	United Nations
	UNDP	United Nations Development Programme
	UNEP	United Nations Environment Programme
	UNFCCC	United Nations Framework Convention on Climate Change
	USD	United States Dollar
V	VOC	Volatile Organic Compounds
	VVVF	Variable Voltage Variable Frequency
W	WG	Working Group
	WGIA	Workshop on Greenhouse Gas Inventories in Asia
	WMO	World Meteorological Organization
Z	ZEB	(Net) Zero Energy Building
	ZEH	(Net) Zero Energy House

Notation Key	Definition
NO	Not Occurring
NE	Not Estimated
NA	Not Applicable
IE	Included Elsewhere
C	Confidential

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Annex I Trend of GHG emissions (CTF table 1)

Table A-1 Emission trends: summary（CTF Table 1）

GREENHOUSE GAS EMISSIONS	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	kt CO_2 eq															
CO_2 emissions without net CO_2 from LULUCF	1,158,514.91	1,158,514.91	1,170,047.50	1,179,751.45	1,172,720.94	1,227,635.68	1,239,998.16	1,252,070.92	1,245,319.79	1,205,590.47	1,242,191.84	1,264,977.89	1,250,344.42	1,279,555.49	1,287,781.82	1,283,043.57
CO_2 emissions with net CO_2 from LULUCF	1,095,736.62	1,095,736.62	1,099,232.00	1,105,856.38	1,095,788.64	1,151,010.47	1,162,437.59	1,169,862.68	1,160,705.84	1,119,577.60	1,155,863.04	1,176,792.51	1,161,623.57	1,189,366.50	1,187,407.79	1,186,237.49
CH_4 emissions without CH_4 from LULUCF	44,346.65	44,346.65	43,184.49	44,044.23	39,954.97	43,345.75	41,865.41	40,669.70	39,925.01	38,068.11	37,955.42	37,950.87	37,069.87	36,341.83	34,868.06	35,871.73
CH_4 emissions with CH_4 from LULUCF	44,432.08	44,432.08	43,266.88	44,123.81	40,057.43	43,440.16	41,948.52	40,775.74	40,037.44	38,152.01	38,032.49	38,030.55	37,154.55	36,435.78	34,942.08	35,955.16
N_2O emissions without N_2O from LULUCF	31,787.78	31,787.78	31,513.17	31,697.34	31,568.98	32,835.52	33,160.84	34,299.29	35,095.41	33,509.19	27,360.90	29,875.59	26,290.90	25,757.88	25,620.39	25,462.29
N_2O emissions with N_2O from LULUCF	32,005.38	32,005.38	31,728.63	31,910.97	31,782.43	33,047.05	33,368.65	34,505.63	35,299.63	33,709.84	27,560.21	30,073.86	26,488.31	25,954.59	25,813.33	25,653.56
HFCs	15,932.31	15,932.31	17,349.61	17,767.22	18,129.16	21,051.90	25,213.19	24,598.11	24,436.79	23,742.10	24,368.28	22,852.00	19,462.52	16,236.39	16,229.26	12,422.56
PFCs	6,539.30	6,539.30	7,506.92	7,617.29	10,942.80	13,443.46	17,609.92	18,258.18	19,984.28	16,568.48	13,118.06	11,873.11	9,878.47	9,199.44	8,854.21	9,216.64
Unspecified mix of HFCs and PFCs																
SF_6	12,850.07	12,850.07	14,206.04	15,635.82	15,701.97	15,019.96	16,447.52	17,022.19	14,510.54	13,224.10	9,176.62	7,031.36	6,066.02	5,735.48	5,406.31	5,258.70
NF_3	32.61	32.61	32.61	32.61	43.48	76.09	201.09	192.55	171.06	188.13	315.27	285.77	294.81	371.48	416.10	486.04
Total (without LULUCF)	1,270,003.62	1,270,003.62	1,283,840.34	1,296,545.97	1,289,062.30	1,353,408.36	1,374,496.14	1,387,110.94	1,379,442.88	1,330,890.59	1,354,486.38	1,374,846.59	1,349,407.01	1,373,198.00	1,379,176.14	1,371,761.54
Total (with LULUCF)	1,207,528.37	1,207,528.37	1,213,322.70	1,222,944.12	1,212,445.91	1,277,089.08	1,297,226.49	1,305,215.08	1,295,145.58	1,245,162.26	1,268,433.97	1,286,939.16	1,260,968.25	1,283,299.68	1,279,069.07	1,275,230.15
Total (without LULUCF, with indirect)	1,275,477.36	1,275,477.36	1,289,119.11	1,301,589.01	1,293,873.46	1,358,186.36	1,379,178.58	1,391,813.76	1,383,983.18	1,335,046.13	1,358,631.94	1,379,066.94	1,353,183.07	1,376,722.32	1,382,553.97	1,375,051.81
Total (with LULUCF, with indirect)	1,213,002.11	1,213,002.11	1,218,601.46	1,227,987.16	1,217,257.07	1,281,867.08	1,301,908.93	1,309,917.91	1,299,685.88	1,249,317.80	1,272,579.53	1,291,159.52	1,264,744.31	1,286,824.00	1,282,446.90	1,278,520.43

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	kt CO_2 eq															
1. Energy	1,091,949.91	1,091,949.91	1,102,187.78	1,110,605.61	1,104,545.66	1,155,275.97	1,167,367.36	1,178,176.03	1,173,423.47	1,139,418.23	1,175,980.20	1,197,996.46	1,185,732.55	1,217,352.92	1,226,137.65	1,221,820.73
2. Industrial processes and product use	111,068.97	111,068.97	115,420.45	117,278.28	119,520.97	127,046.18	137,171.93	139,488.97	136,534.38	123,752.79	111,119.66	109,163.67	98,130.98	91,183.94	89,793.80	86,430.90
3. Agriculture	37,252.76	37,252.76	36,516.29	37,790.96	34,574.42	38,190.86	36,899.98	36,140.67	35,820.10	34,454.96	34,666.22	35,203.96	34,748.81	34,966.00	33,894.59	35,062.07
4. Land Use, Land-Use Change and Forestryb	-62,475.25	-62,475.25	-70,517.65	-73,601.86	-76,616.39	-76,319.27	-77,269.65	-81,895.85	-84,297.30	-85,728.32	-86,052.41	-87,907.43	-88,438.76	-89,898.32	-100,107.07	-96,531.39
5. Waste	29,731.99	29,731.99	29,715.82	30,871.12	30,421.24	32,895.35	33,056.87	33,305.26	33,664.92	33,264.61	32,720.29	32,482.50	30,794.67	29,695.13	29,350.10	28,447.85
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)	1,207,528.37	1,207,528.37	1,213,322.70	1,222,944.12	1,212,445.91	1,277,089.08	1,297,226.49	1,305,215.08	1,295,145.58	1,245,162.26	1,268,433.97	1,286,939.16	1,260,968.25	1,283,299.68	1,279,069.07	1,275,230.15

GREENHOUSE GAS EMISSIONS	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
	kt CO_2 eq													(%)
CO_2 emissions without net CO_2 from LULUCF	1,290,309.65	1,267,157.77	1,302,894.34	1,232,231.92	1,162,961.28	1,214,423.82	1,264,518.18	1,305,885.64	1,315,077.07	1,264,880.42	1,224,538.51	1,206,165.68	1,188,122.47	2.56
CO_2 emissions with net CO_2 from LULUCF	1,198,701.52	1,180,986.36	1,221,659.11	1,161,248.30	1,095,708.34	1,143,623.92	1,194,397.20	1,232,762.90	1,248,663.53	1,200,075.86	1,164,707.28	1,151,393.20	1,130,387.03	3.16
CH_4 emissions without CH_4 from LULUCF	35,665.64	35,039.19	35,278.44	34,947.69	33,984.70	34,496.99	33,501.05	32,642.89	32,287.73	31,654.61	30,830.42	30,504.06	30,064.37	-32.21
CH_4 emissions with CH_4 from LULUCF	35,745.38	35,110.36	35,349.11	35,041.43	34,063.20	34,569.32	33,574.99	32,712.28	32,358.75	31,744.60	30,903.58	30,571.34	30,153.50	-32.14
N_2O emissions without N_2O from LULUCF	25,049.43	24,938.94	24,319.04	23,523.37	22,870.42	22,281.75	21,866.71	21,532.34	21,588.68	21,202.00	20,805.14	20,261.80	20,461.29	-35.63
N_2O emissions with N_2O from LULUCF	25,238.29	25,125.26	24,504.16	23,708.87	23,053.25	22,462.68	22,047.50	21,714.38	21,771.08	21,386.76	20,989.44	20,446.67	20,649.80	-35.48
HFCs	12,784.02	14,630.09	16,713.16	19,293.64	20,934.63	23,315.84	26,105.62	29,361.51	32,104.66	35,784.27	39,260.61	42,572.59	44,885.37	181.73
PFCs	8,623.35	8,998.78	7,916.85	5,743.40	4,046.87	4,249.54	3,755.45	3,436.33	3,280.06	3,361.43	3,308.10	3,375.33	3,512.15	-46.29
Unspecified mix of HFCs and PFCs														
SF_6	5,053.01	5,228.90	4,733.45	4,177.17	2,446.63	2,423.87	2,247.64	2,234.54	2,101.81	2,065.07	2,152.71	2,237.43	2,135.15	-83.38
NF_3	1,471.75	1,401.31	1,586.80	1,481.04	1,354.16	1,539.74	1,800.38	1,511.85	1,617.24	1,122.87	571.03	634.44	449.78	1,279.26
Total (without LULUCF)	1,378,956.85	1,357,394.99	1,393,442.09	1,321,398.23	1,248,598.70	1,302,731.55	1,353,795.03	1,396,605.10	1,408,057.25	1,360,070.65	1,321,466.53	1,305,751.33	1,289,630.58	1.55
Total (with LULUCF)	1,287,617.31	1,271,481.06	1,312,462.65	1,250,693.85	1,181,607.08	1,232,184.92	1,283,928.78	1,323,733.79	1,341,897.12	1,295,540.85	1,261,892.76	1,251,231.00	1,232,172.77	2.04
Total (without LULUCF, with indirect)	1,382,144.50	1,360,516.43	1,396,415.61	1,324,089.56	1,251,070.96	1,305,137.18	1,356,111.13	1,398,842.61	1,410,297.94	1,362,236.88	1,323,617.68	1,307,853.92	1,291,748.43	1.28
Total (with LULUCF, with indirect)	1,290,804.96	1,274,602.50	1,315,436.17	1,253,385.18	1,184,079.35	1,234,590.56	1,286,244.88	1,325,971.30	1,344,137.82	1,297,707.08	1,264,043.91	1,253,333.59	1,234,290.62	1.76

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
	kt CO_2 eq													(%)
1. Energy	1,228,506.17	1,205,645.14	1,241,786.12	1,174,187.19	1,112,586.42	1,162,548.40	1,213,240.26	1,253,703.92	1,261,050.85	1,211,880.44	1,172,979.24	1,155,376.66	1,137,031.07	4.13
2. Industrial processes and product use	87,674.09	90,616.04	89,733.80	85,255.93	77,834.12	81,138.40	83,059.32	85,656.08	89,999.72	92,585.80	93,640.99	96,645.65	99,294.16	-10.60
3. Agriculture	35,152.76	34,882.01	35,998.46	35,385.28	34,664.92	35,729.88	35,171.80	34,609.99	34,629.60	34,129.82	33,574.80	33,442.09	33,195.51	-10.89
4. Land Use, Land-Use Change and Forestryb	-91,339.53	-85,913.93	-80,979.44	-70,704.37	-66,991.62	-70,546.63	-69,866.25	-72,871.31	-66,160.13	-64,529.80	-59,573.77	-54,520.33	-57,457.81	-8.03
5. Waste	27,623.82	26,251.79	25,923.71	26,569.83	23,513.24	23,314.87	22,323.64	22,635.11	22,377.08	21,474.58	21,271.51	20,286.93	20,109.84	-32.36
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)	1,287,617.31	1,271,481.06	1,312,462.65	1,250,693.85	1,181,607.08	1,232,184.92	1,283,928.78	1,323,733.79	1,341,897.12	1,295,540.85	1,261,892.76	1,251,231.00	1,232,172.77	2.04

Table A-2 Emission trends (CO_2) (CTF Table 1(a))

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	kt															
1. Energy	1,079,030.22	1,079,030.22	1,089,517.12	1,098,290.95	1,092,728.54	1,143,640.83	1,155,397.32	1,166,345.90	1,161,578.76	1,127,965.19	1,164,454.93	1,186,544.32	1,174,566.88	1,207,010.75	1,216,073.41	1,211,916.80
A. Fuel combustion (sectoral approach)	1,078,838.65	1,078,838.65	1,089,302.25	1,098,082.64	1,092,516.88	1,143,409.77	1,154,875.87	1,165,775.23	1,160,998.40	1,127,466.58	1,163,915.61	1,186,032.76	1,174,018.72	1,206,486.19	1,215,567.66	1,211,439.14
1. Energy industries	368,528.62	368,528.62	369,426.95	374,331.79	357,044.74	391,464.21	378,904.04	381,215.55	377,451.03	364,972.90	386,944.41	395,495.11	386,562.84	413,437.71	432,547.60	430,225.48
2. Manufacturing industries and construction	349,702.97	349,702.97	346,246.22	341,133.75	342,048.78	350,798.17	357,555.93	360,487.82	356,807.01	332,227.47	336,624.40	346,635.22	340,556.97	346,294.84	344,191.24	343,688.03
3. Transport	200,985.63	200,985.63	212,718.27	219,416.49	223,245.99	232,601.80	241,992.72	248,776.42	250,677.06	248,905.67	253,026.84	252,656.44	256,848.92	253,207.44	249,170.79	243,245.62
4. Other sectors	159,621.42	159,621.42	160,910.81	163,200.62	170,177.38	168,545.60	176,423.18	175,295.44	176,063.31	181,360.53	187,319.96	191,245.99	190,049.99	193,546.20	189,658.02	194,280.00
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Fugitive emissions from fuels	191.57	191.57	214.87	208.31	211.66	231.05	521.46	570.68	580.36	498.62	539.32	511.56	548.17	524.57	505.76	477.66
1. Solid fuels	5.32	5.32	4.80	4.28	3.60	2.96	2.41	2.11	2.00	1.82	1.75	1.60	1.35	0.75	0.67	0.64
2. Oil and natural gas and other emissions from energy production	186.25	186.25	210.07	204.03	208.06	228.10	519.05	568.57	578.36	496.80	537.57	509.97	546.82	523.81	505.09	477.02
C. CO2 transport and storage	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE
2. Industrial processes	65,743.49	65,743.49	66,833.88	66,771.58	65,520.29	67,190.38	67,527.72	68,245.08	65,655.63	59,549.16	59,870.87	60,347.48	59,019.22	56,366.07	55,570.14	55,569.88
A. Mineral industry	49,230.45	49,230.45	50,548.37	50,964.27	50,252.45	51,265.73	51,145.78	51,489.50	48,840.19	43,863.25	43,579.97	43,918.61	42,970.48	40,482.92	40,145.77	39,819.62
B. Chemical industry	7,040.80	7,040.80	7,009.57	6,825.87	6,388.58	6,806.57	7,013.95	7,068.24	7,061.22	6,419.86	6,937.71	6,810.34	6,346.78	6,249.73	6,051.87	6,134.88
C. Metal industry	7,244.20	7,244.20	7,091.43	6,796.03	6,652.23	6,656.19	6,849.59	6,870.52	6,834.13	6,545.54	6,463.18	6,739.53	6,762.50	6,600.70	6,366.50	6,483.04
D. Non-energy products from fuels and solvent use	2,163.76	2,163.76	2,117.73	2,120.15	2,167.46	2,395.11	2,446.86	2,737.14	2,834.00	2,634.01	2,800.68	2,792.50	2,861.24	2,952.85	2,920.67	3,046.06
E. Electronic industry																
F. Product uses as ODS substitutes																
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	64.27	64.27	66.77	65.27	59.56	66.80	71.54	79.67	86.09	86.49	89.33	86.50	78.22	79.87	85.33	86.29
3. Agriculture	608.88	608.88	547.88	493.01	523.52	342.54	359.13	349.62	371.50	376.93	370.29	442.53	367.68	408.14	430.19	402.22
A. Enteric fermentation																
B. Manure management																
C. Rice cultivation																
D. Agricultural soils																
E. Prescribed burning of savannas																
F. Field burning of agricultural residues																
G. Liming	550.24	550.24	527.37	477.14	481.58	292.76	303.53	292.74	303.65	300.00	293.57	332.90	247.35	269.92	246.40	236.30
H. Urea application	58.64	58.64	20.51	15.87	41.94	49.79	55.60	56.88	67.85	76.93	76.73	109.63	120.34	138.22	183.79	165.92
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land Use, Land-Use Change and Forestry	-62,778.28	-62,778.28	-70,815.50	-73,895.07	-76,932.30	-76,625.21	-77,560.57	-82,208.24	-84,613.95	-86,012.87	-86,328.80	-88,185.38	-88,720.85	-90,188.99	-100,374.03	-96,806.08
A. Forest land	-79,074.44	-79,074.44	-86,229.15	-86,577.51	-86,923.35	-87,267.75	-87,612.49	-91,284.18	-91,124.24	-90,963.33	-90,803.06	-90,642.49	-90,482.95	-90,322.35	-99,042.85	-98,528.07
B. Cropland	11,718.18	11,718.18	10,598.85	7,169.62	5,469.75	6,281.79	5,485.31	3,843.28	3,188.48	3,165.46	2,044.89	71.92	21.42	146.30	-645.86	2,671.43
C. Grassland	1,052.93	1,052.93	817.17	90.60	-208.50	98.12	684.38	333.51	50.28	22.71	-400.81	40.55	-257.55	-526.25	-1,218.25	-940.12
D. Wetlands	90.39	90.39	80.68	253.61	140.82	116.56	358.27	636.17	120.57	483.39	455.44	425.51	386.44	94.83	62.72	56.36
E. Settlements	2,644.93	2,644.93	3,266.76	3,671.42	2,147.55	1,268.44	1,092.99	423.99	187.13	60.51	-272.45	-594.79	-799.16	-1,426.36	-1,518.07	-1,526.88
F. Other land	1,155.15	1,155.15	1,288.76	1,030.19	1,261.78	1,136.83	950.11	868.42	1,161.47	860.45	933.71	683.60	726.82	692.20	566.91	575.91
G. Harvested wood products	-365.43	-365.43	-638.57	467.00	1,179.66	1,740.80	1,480.87	2,970.58	1,802.35	357.93	1,713.46	1,830.33	1,684.13	1,152.65	1,421.39	885.28
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5. Waste	13,132.32	13,132.32	13,148.63	14,195.91	13,948.59	16,461.92	16,713.98	17,130.32	17,713.90	17,699.19	17,495.75	17,643.55	16,390.64	15,770.53	15,708.07	15,154.67
A. Solid waste disposal	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE
B. Biological treatment of solid waste																
C. Incineration and open burning of waste	12,429.49	12,429.49	12,462.18	13,497.01	13,267.85	15,760.01	16,046.16	16,489.85	17,058.67	17,090.07	16,843.18	16,987.64	15,760.11	15,193.48	15,191.55	14,647.97
D. Waste water treatment and discharge																
E. Other	702.83	702.83	686.45	698.90	680.75	701.91	667.83	640.47	655.23	609.12	652.58	655.91	630.53	577.05	516.53	506.70
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:																
International bunkers	30,648.25	30,648.25	32,396.42	32,756.82	34,704.57	35,873.60	37,918.27	30,844.20	35,283.04	37,151.91	35,832.05	36,274.76	33,191.18	36,273.50	37,066.48	38,595.40
Aviation	13,189.32	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	18,721.34	21,149.32	20,387.64	21,190.20
Navigation	17,458.93	17,458.93	18,477.30	18,540.06	20,848.38	20,807.11	20,995.27	12,402.30	16,148.67	17,150.36	16,255.59	16,732.15	14,469.83	15,124.18	16,678.84	17,405.20
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass	36,937.90	36,937.90	37,738.61	37,520.04	36,889.04	37,446.89	38,964.76	39,561.14	40,813.53	39,702.58	41,105.72	42,898.56	41,484.78	44,252.10	46,784.48	49,111.35
CO2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.04
Long-term storage of C in waste disposal sites	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Indirect N2O																
Indirect CO2 (3)	5,473.74	5,473.74	5,278.76	5,043.04	4,811.16	4,778.00	4,682.44	4,702.82	4,540.30	4,155.54	4,145.56	4,220.36	3,776.06	3,524.32	3,377.83	3,290.27
Total CO2 equivalent emissions without land use, land-use change and forestry	1,158,514.91	1,158,514.91	1,170,047.50	1,179,751.45	1,172,720.94	1,227,635.68	1,239,998.16	1,252,070.92	1,245,319.79	1,205,590.47	1,242,191.84	1,264,977.89	1,250,344.42	1,279,555.49	1,287,781.82	1,283,043.57
Total CO2 equivalent emissions with land use, land-use change and forestry	1,095,736.62	1,095,736.62	1,099,232.00	1,105,856.38	1,095,788.64	1,151,010.47	1,162,437.59	1,169,862.68	1,160,705.84	1,119,577.60	1,155,863.04	1,176,792.51	1,161,623.57	1,189,366.50	1,187,407.79	1,186,237.49
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	1,163,988.65	1,163,988.65	1,175,326.27	1,184,794.49	1,177,532.10	1,232,413.68	1,244,680.60	1,256,773.74	1,249,860.09	1,209,746.01	1,246,337.40	1,269,198.24	1,254,120.47	1,283,079.82	1,291,159.64	1,286,333.84
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	1,101,210.36	1,101,210.36	1,104,510.76	1,110,899.42	1,100,599.80	1,155,788.47	1,167,120.02	1,174,565.50	1,165,246.14	1,123,733.14	1,160,008.61	1,181,012.87	1,165,399.63	1,192,890.83	1,190,785.62	1,189,527.77

Annex I Trend of GHG emissions (CTF table 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
	kt													(%)
1. Energy	1,218,536.88	1,195,852.98	1,232,024.18	1,164,773.91	1,103,617.43	1,153,728.24	1,204,715.01	1,245,195.86	1,252,594.38	1,203,550.77	1,164,755.29	1,147,376.02	1,128,872.81	4.62
A. Fuel combustion (sectoral approach)	1,218,029.11	1,195,299.87	1,231,408.53	1,164,208.74	1,103,116.58	1,153,253.69	1,204,237.53	1,244,705.59	1,252,156.24	1,203,101.74	1,164,330.58	1,146,918.91	1,128,396.23	4.59
1. Energy industries	449,660.31	440,694.45	490,936.51	471,725.76	441,431.47	473,848.80	534,791.33	581,482.02	581,970.34	552,755.97	526,921.82	522,056.72	507,090.01	37.60
2. Manufacturing industries and construction	334,187.12	331,560.24	329,728.50	300,777.02	283,828.36	300,375.14	299,341.14	299,003.86	306,554.08	299,172.29	290,369.18	275,863.51	272,679.70	-22.03
3. Transport	237,777.13	235,129.28	232,383.82	224,773.40	221,488.25	221,968.63	217,137.95	218,004.15	215,114.70	210,129.94	208,852.98	206,954.65	205,225.72	2.11
4. Other sectors	196,404.55	187,915.90	178,359.70	166,932.55	156,368.51	157,061.11	152,967.11	146,215.57	148,517.13	141,043.54	138,186.60	142,044.03	143,400.80	-10.16
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Fugitive emissions from fuels	507.77	553.11	615.64	565.17	500.85	474.55	477.48	490.27	438.13	449.03	424.71	457.11	476.58	148.77
1. Solid fuels	0.61	0.59	0.56	0.54	0.53	0.52	0.51	0.50	0.49	0.49	0.48	0.48	0.48	-91.00
2. Oil and natural gas and other emissions from energy production	507.16	552.52	615.09	564.63	500.32	474.03	476.97	489.77	437.64	448.53	424.23	456.63	476.10	155.62
C. CO2 transport and storage	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NE,NO	NE,NO	NO,NE	NO,NE,NA	NO,NE,NA	0.00
2. Industrial processes	56,762.13	57,159.57	56,390.34	51,969.70	46,381.88	47,467.47	47,319.41	47,465.38	49,231.83	48,603.59	47,100.68	46,678.00	47,254.05	-28.12
A. Mineral industry	41,230.07	41,196.76	40,204.20	37,435.96	32,779.39	32,752.23	33,096.83	33,664.06	35,056.49	34,798.04	33,737.93	33,621.68	34,061.56	-30.81
B. Chemical industry	5,794.68	5,874.79	5,966.43	5,107.12	4,872.00	5,427.02	5,103.21	4,652.17	4,788.25	4,684.89	4,591.26	4,300.21	4,485.09	-36.30
C. Metal industry	6,496.64	6,567.97	6,694.93	6,236.57	5,468.35	6,100.70	5,964.62	6,060.79	6,180.58	6,106.82	5,916.00	5,801.49	5,723.09	-21.00
D. Non-energy products from fuels and solvent use	3,150.69	3,432.54	3,438.61	3,118.51	3,190.85	3,111.67	3,078.94	3,011.96	3,124.19	2,933.40	2,772.46	2,875.21	2,899.23	33.99
E. Electronic industry														
F. Product uses as ODS substitutes														
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	90.05	87.52	86.16	71.55	71.29	75.85	75.81	76.41	82.33	80.44	83.04	79.41	85.07	32.37
3. Agriculture	410.56	383.48	500.08	439.98	390.10	402.94	414.65	520.16	577.77	551.50	551.50	551.50	551.50	-9.42
A. Enteric fermentation														
B. Manure management														
C. Rice cultivation														
D. Agricultural soils														
E. Prescribed burning of savannas														
F. Field burning of agricultural residues														
G. Liming	231.29	230.36	325.00	305.74	270.15	242.88	246.78	369.97	379.58	362.50	362.50	362.50	362.50	-34.12
H. Urea application	179.27	153.12	175.08	134.24	119.95	160.06	167.88	150.19	198.19	188.99	188.99	188.99	188.99	222.27
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land Use, Land-Use Change and Forestry	-91,608.13	-86,171.42	-81,235.23	-70,983.62	-67,252.94	-70,799.90	-70,120.98	-73,122.74	-66,413.54	-64,804.56	-59,831.23	-54,772.48	-57,735.45	-8.03
A. Forest land	-92,664.68	-86,801.19	-85,543.49	-80,790.26	-75,893.35	-76,418.68	-78,134.55	-77,697.92	-70,005.68	-68,292.09	-63,119.76	-58,572.06	-60,854.28	-23.04
B. Cropland	2,302.23	1,454.21	5,002.68	10,474.78	8,002.77	5,504.33	5,917.74	4,965.08	3,680.90	4,436.14	4,336.64	4,811.45	4,521.72	-61.41
C. Grassland	-1,025.98	-422.85	-738.71	-1,031.02	-134.48	31.78	250.08	-25.13	-94.95	86.77	-39.33	-95.32	-156.54	-114.87
D. Wetlands	39.54	39.62	75.41	85.73	113.03	106.74	51.94	60.00	23.88	23.97	47.97	48.07	46.83	-48.19
E. Settlements	-1,033.53	-1,020.97	85.23	407.77	-211.42	-300.32	-901.29	-661.45	-498.42	-344.31	-75.70	14.09	-111.15	-104.20
F. Other land	155.86	150.21	285.92	313.61	226.94	212.02	174.51	177.18	159.80	158.94	182.43	180.76	188.01	-83.72
G. Harvested wood products	618.44	429.56	-402.27	-444.23	643.56	64.22	2,520.59	59.50	320.93	-873.99	-1,163.48	-1,159.47	-1,370.04	274.92
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5. Waste	14,600.08	13,761.74	13,979.75	15,048.33	12,571.88	12,825.17	12,069.10	12,704.24	12,673.09	12,174.57	12,131.04	11,560.17	11,444.12	-12.86
A. Solid waste disposal	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NE,NO	NO,NE	NO,NE	NO,NE	0.00
B. Biological treatment of solid waste														
C. Incineration and open burning of waste	14,093.27	13,239.38	13,418.55	14,517.91	12,058.19	12,298.26	11,544.98	12,176.14	12,068.40	11,557.54	11,506.11	10,941.33	10,807.65	-13.05
D. Waste water treatment and discharge														
E. Other	506.81	522.36	561.20	530.41	513.69	526.91	524.13	528.10	604.69	617.03	624.93	618.83	636.47	-9.44
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:														
International bunkers	40,883.54	38,383.50	36,650.20	34,259.78	30,233.94	30,732.99	31,095.50	32,027.88	32,993.64	31,706.36	33,495.03	35,007.84	35,103.93	14.54
Aviation	21,336.33	19,964.61	18,358.58	17,517.99	15,372.73	16,295.33	18,249.69	19,140.10	19,498.79	19,024.56	19,138.76	20,051.86	21,058.65	59.66
Navigation	19,547.22	18,418.88	18,291.61	16,741.79	14,861.21	14,437.66	12,845.81	12,887.78	13,494.86	12,681.80	14,356.28	14,955.98	14,045.28	-19.55
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 emissions from biomass	54,016.16	55,286.62	58,081.34	55,306.84	52,125.05	55,740.39	55,004.10	55,842.30	56,788.15	56,885.40	57,230.39	57,978.12	62,961.30	70.45
CO2 captured	0.00	0.36	0.37	NO	NO	NO	NO	NO	NO	NO	NO	29.22	110.68	100.00
Long-term storage of C in waste disposal sites	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00
Indirect N2O														
Indirect CO2 (3)	3,187.65	3,121.44	2,973.53	2,691.33	2,472.27	2,405.64	2,316.10	2,237.51	2,240.69	2,166.23	2,151.15	2,102.59	2,117.85	-61.31
Total CO2 equivalent emissions without land use, land-use change and forestry	1,290,309.65	1,267,157.77	1,302,894.34	1,232,231.92	1,162,961.28	1,214,423.82	1,264,518.18	1,305,885.64	1,315,077.07	1,264,880.42	1,224,538.51	1,206,165.68	1,188,122.47	2.56
Total CO2 equivalent emissions with land use, land-use change and forestry	1,198,701.52	1,180,986.36	1,221,659.11	1,161,248.30	1,095,708.34	1,143,623.92	1,194,397.20	1,232,762.90	1,248,663.53	1,200,075.86	1,164,707.28	1,151,393.20	1,130,387.03	3.16
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	1,293,497.30	1,270,279.21	1,305,867.87	1,234,923.25	1,165,433.55	1,216,829.45	1,266,834.27	1,308,123.15	1,317,317.77	1,267,046.65	1,226,689.66	1,208,268.27	1,190,240.32	2.26
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	1,201,889.17	1,184,107.80	1,224,632.64	1,163,939.63	1,098,180.61	1,146,029.55	1,196,713.30	1,235,000.41	1,250,904.23	1,202,242.09	1,166,858.43	1,153,495.79	1,132,504.87	2.84

Table A-3 Emission trends (CH_4) (CTF Table 1(b))

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	kt															
1. Energy	252.91	252.91	232.57	213.55	188.70	171.36	161.14	148.12	140.35	130.76	128.55	124.45	112.44	90.97	90.16	93.26
A. Fuel combustion (sectoral approach)	53.98	53.98	53.81	53.36	54.09	53.88	55.26	55.58	52.50	50.45	50.40	51.02	48.43	48.65	49.45	54.19
1. Energy industries	18.37	18.37	17.82	16.55	16.48	16.10	16.01	15.71	13.20	12.37	12.24	10.53	8.36	8.21	8.21	9.27
2. Manufacturing industries and construction	14.39	14.39	14.29	14.19	14.37	14.76	15.14	15.83	15.15	13.68	13.33	14.83	14.37	15.23	16.63	17.42
3. Transport	11.65	11.65	11.94	12.09	11.95	12.08	12.36	12.63	12.75	12.55	12.55	12.48	12.25	11.86	11.27	10.55
4. Other sectors	9.57	9.57	9.76	10.53	11.29	10.94	11.76	11.42	11.41	11.84	12.28	13.18	13.45	13.35	13.35	16.95
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Fugitive emissions from fuels	198.93	198.93	178.77	160.19	134.62	117.48	105.88	92.54	87.85	80.32	78.14	73.43	64.01	42.32	40.71	39.06
1. Solid fuels	190.42	190.42	169.71	151.12	125.25	107.95	95.76	82.40	77.32	69.99	67.72	62.52	53.19	30.73	28.85	26.87
2. Oil and natural gas and other emissions from energy production	8.51	8.51	9.06	9.07	9.37	9.52	10.12	10.14	10.53	10.33	10.42	10.91	10.82	11.58	11.86	12.20
C. CO_2 transport and storage																
2. Industrial processes	2.42	2.42	2.33	2.20	2.09	2.23	2.34	2.22	2.20	2.10	2.08	2.17	2.07	2.11	2.01	2.15
A. Mineral industry																
B. Chemical industry	1.50	1.50	1.46	1.35	1.29	1.40	1.48	1.35	1.33	1.34	1.31	1.37	1.32	1.32	1.22	1.34
C. Metal industry	0.92	0.92	0.87	0.85	0.80	0.83	0.85	0.87	0.87	0.77	0.77	0.80	0.75	0.79	0.79	0.81
D. Non-energy products from fuels and solvent use	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE
E. Electronic industry																
F. Product uses as ODS substitutes																
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	1,014.79	1,014.79	992.48	1,047.42	916.81	1,076.54	1,038.44	1,014.67	1,005.21	955.48	966.68	983.37	974.64	980.75	936.68	988.42
A. Enteric fermentation	374.04	374.04	381.39	384.00	380.04	374.34	370.30	366.64	365.26	363.11	361.55	357.41	358.55	355.17	350.45	342.31
B. Manure management	124.82	124.82	125.86	126.00	123.28	120.01	119.52	118.73	117.33	115.39	114.32	112.17	112.20	112.32	111.18	108.99
C. Rice cultivation	510.84	510.84	480.53	532.56	409.08	577.57	544.18	524.98	518.42	472.97	486.87	509.95	500.08	509.55	471.54	533.74
D. Agricultural soils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	5.08	5.08	4.69	4.86	4.41	4.63	4.44	4.33	4.21	4.02	3.94	3.84	3.81	3.69	3.51	3.38
G. Liming																
H. Urea application																
I. Other carbon-containing fertilizers																
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	3.42	3.42	3.30	3.18	4.10	3.78	3.32	4.24	4.50	3.36	3.08	3.19	3.39	3.76	2.96	3.34
A. Forest land	0.40	0.40	0.30	0.21	1.14	0.84	0.41	1.35	1.63	0.51	0.25	0.37	0.59	0.97	0.19	0.57
B. Cropland	2.42	2.42	2.40	2.38	2.36	2.34	2.32	2.29	2.27	2.25	2.24	2.22	2.20	2.19	2.18	2.17
C. Grassland	0.60	0.60	0.59	0.59	0.59	0.59	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
D. Wetlands	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,NA, NE	NO,NA, NE	NO,NA, NE	NO,NA, NE	NO,NA, NE	NO,NA, NE
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products																
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5. Waste	503.75	503.75	500.00	498.61	490.60	483.70	472.70	461.78	449.24	434.38	420.91	408.04	393.65	379.84	365.88	351.04
A. Solid waste disposal	382.82	382.82	380.08	379.62	373.66	369.10	359.38	349.99	339.03	326.30	314.16	302.81	291.68	280.27	268.46	255.78
B. Biological treatment of solid waste	2.16	2.16	2.14	2.14	2.15	2.13	2.14	2.14	2.15	2.14	2.15	2.16	2.18	2.77	3.26	3.36
C. Incineration and open burning of waste	1.11	1.11	1.09	1.11	1.11	1.16	1.18	1.20	1.00	0.95	0.94	0.82	0.67	0.97	0.83	0.75
D. Waste water treatment and discharge	117.66	117.66	116.69	115.74	113.69	111.30	110.00	108.45	107.06	104.98	103.66	102.25	99.12	95.83	93.33	91.15
E. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH_4 emissions without CH_4 from LULUCF	1,773.87	1,773.87	1,727.38	1,761.77	1,598.20	1,733.83	1,674.62	1,626.79	1,597.00	1,522.72	1,518.22	1,518.03	1,482.79	1,453.67	1,394.72	1,434.87
Total CH_4 emissions with CH_4 from LULUCF	1,777.28	1,777.28	1,730.68	1,764.95	1,602.30	1,737.61	1,677.94	1,631.03	1,601.50	1,526.08	1,521.30	1,521.22	1,486.18	1,457.43	1,397.68	1,438.21
Memo items:																
International bunkers	1.75	1.75	1.85	1.85	2.08	2.08	2.11	1.31	1.67	1.77	1.68	1.73	1.50	1.59	1.73	1.80
Aviation	0.09	0.09	0.10	0.10	0.10	0.11	0.12	0.13	0.14	0.14	0.14	0.14	0.13	0.15	0.14	0.15
Navigation	1.65	1.65	1.75	1.75	1.98	1.97	1.99	1.17	1.53	1.63	1.54	1.59	1.37	1.44	1.58	1.65
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass																
CO_2 captured																
Long-term storage of C in waste disposal sites																
Indirect N_2O																
Indirect CO_2																

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
	kt													(%)
1. Energy	96.44	98.66	99.03	96.42	91.42	93.00	80.73	80.83	77.39	76.53	73.96	74.08	74.21	-70.66
A. Fuel combustion (sectoral approach)	57.38	59.36	60.03	58.54	54.76	57.61	46.04	46.81	44.75	44.29	42.46	42.32	42.17	-21.88
1. Energy industries	9.94	10.50	10.68	10.81	10.31	10.78	11.59	12.01	9.56	9.00	8.55	8.87	8.38	-54.37
2. Manufacturing industries and construction	17.68	18.82	20.35	20.24	19.94	21.51	17.56	18.61	19.99	20.96	20.04	19.64	19.70	36.91
3. Transport	9.90	9.30	8.77	8.00	7.46	7.12	6.80	6.56	6.23	5.91	5.69	5.51	5.35	-54.05
4. Other sectors	19.86	20.74	20.23	19.50	17.05	18.20	10.09	9.63	8.97	8.42	8.19	8.29	8.73	-8.72
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Fugitive emissions from fuels	39.06	39.30	39.00	37.87	36.66	35.39	34.69	34.02	32.64	32.24	31.50	31.76	32.04	-83.89
1. Solid fuels	26.18	25.75	24.37	23.59	23.09	22.57	22.09	21.81	21.32	21.52	20.83	20.40	20.83	-89.06
2. Oil and natural gas and other emissions from energy production	12.88	13.54	14.63	14.28	13.57	12.82	12.59	12.21	11.32	10.72	10.66	11.36	11.21	31.68
C. CO_2 transport and storage														
2. Industrial processes	2.15	2.18	2.04	1.99	2.05	2.16	2.15	1.85	1.85	1.72	1.94	1.73	1.71	-29.48
A. Mineral industry														
B. Chemical industry	1.35	1.37	1.21	1.27	1.43	1.45	1.43	1.13	1.13	1.01	1.27	1.07	1.01	-32.63
C. Metal industry	0.80	0.82	0.82	0.72	0.62	0.71	0.72	0.72	0.73	0.71	0.67	0.66	0.70	-24.36
D. Non-energy products from fuels and solvent use	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	0.00
E. Electronic industry														
F. Product uses as ODS substitutes														
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Agriculture	990.69	978.98	1,002.95	1,007.50	990.16	1,023.76	1,007.41	983.76	982.75	968.42	946.68	942.79	931.98	-8.16
A. Enteric fermentation	340.80	338.34	338.94	334.16	329.69	318.67	316.98	309.30	301.00	293.55	293.21	290.98	291.30	-22.12
B. Manure management	108.69	106.66	105.19	103.96	102.93	100.52	100.32	98.61	96.25	94.57	94.47	92.85	92.92	-25.56
C. Rice cultivation	537.78	530.66	555.58	566.27	554.51	601.62	587.20	573.01	582.62	577.50	556.31	556.27	545.08	6.70
D. Agricultural soils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	3.43	3.32	3.23	3.11	3.02	2.94	2.91	2.83	2.88	2.80	2.68	2.68	2.68	-47.27
G. Liming														
H. Urea application														
I. Other carbon-containing fertilizers														
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry	3.19	2.85	2.83	3.75	3.14	2.89	2.96	2.78	2.84	3.60	2.93	2.69	3.57	4.33
A. Forest land	0.43	0.12	0.10	1.02	0.41	0.20	0.25	0.08	0.16	0.91	0.24	0.05	0.93	132.70
B. Cropland	2.16	2.15	2.14	2.13	2.12	2.10	2.09	2.08	2.07	2.07	2.05	2.04	2.04	-15.83
C. Grassland	0.60	0.58	0.59	0.60	0.62	0.59	0.61	0.62	0.61	0.62	0.63	0.59	0.59	-0.22
D. Wetlands	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	NE,NA, NO	NO,NE, NA	NO,NE, NA	NO,NE, NA	0.00
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Harvested wood products														
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
5. Waste	337.34	321.75	307.12	292.00	275.76	260.97	249.76	239.28	229.52	219.51	210.64	201.56	194.68	-61.35
A. Solid waste disposal	243.62	231.05	219.28	205.63	193.41	180.84	170.87	162.33	154.20	145.38	137.59	129.68	123.23	-67.81
B. Biological treatment of solid waste	3.82	3.94	3.81	4.28	4.24	3.71	4.09	4.05	4.01	4.00	4.07	4.12	4.13	91.37
C. Incineration and open burning of waste	0.70	0.65	0.60	0.57	0.51	0.46	0.43	0.45	0.48	0.41	0.41	0.37	0.38	-65.54
D. Waste water treatment and discharge	89.21	86.11	83.44	81.52	77.60	75.96	74.37	72.44	70.83	69.72	68.57	67.39	66.93	-43.11
E. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH_4 emissions without CH_4 from LULUCF	1,426.63	1,401.57	1,411.14	1,397.91	1,359.39	1,379.88	1,340.04	1,305.72	1,291.51	1,266.18	1,233.22	1,220.16	1,202.57	-32.21
Total CH_4 emissions with CH_4 from LULUCF	1,429.82	1,404.41	1,413.96	1,401.66	1,362.53	1,382.77	1,343.00	1,308.49	1,294.35	1,269.78	1,236.14	1,222.85	1,206.14	-32.14
Memo items:														
International bunkers	2.01	1.89	1.86	1.71	1.52	1.48	1.35	1.36	1.35	1.26	1.42	1.48	1.40	-19.70
Aviation	0.15	0.14	0.13	0.12	0.11	0.12	0.13	0.14	0.13	0.13	0.13	0.14	0.14	55.19
Navigation	1.86	1.75	1.73	1.59	1.41	1.37	1.22	1.22	1.21	1.13	1.29	1.34	1.26	-23.93
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass														
CO_2 captured														
Long-term storage of C in waste disposal sites														
Indirect N_2O														
Indirect CO_2														

Table A-4 Emission trends (N_2O) (CTF Table 1(c))

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	kt															
1. Energy	22.14	22.14	23.01	23.41	23.82	24.67	26.65	27.27	27.97	27.46	27.89	27.99	28.04	27.07	26.21	25.41
A. Fuel combustion (sectoral approach)	22.14	22.14	23.01	23.41	23.82	24.67	26.65	27.27	27.97	27.46	27.89	27.99	28.04	27.07	26.21	25.41
1. Energy industries	2.98	2.98	3.05	3.02	3.14	3.32	4.54	4.69	4.86	4.88	5.23	5.41	6.00	6.16	6.30	6.34
2. Manufacturing industries and construction	4.22	4.22	4.47	4.62	4.97	5.42	5.72	5.92	6.26	5.99	6.13	6.30	6.27	6.33	6.26	6.32
3. Transport	12.55	12.55	13.02	13.27	13.16	13.40	13.77	14.02	14.16	13.83	13.76	13.41	12.86	12.03	11.16	10.23
4. Other sectors	2.38	2.38	2.46	2.50	2.55	2.53	2.61	2.64	2.70	2.77	2.78	2.86	2.90	2.55	2.49	2.53
5. Other	NO	NO	NO	NO	NO	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	0.00	0.00	0.00	0.00	0.00
1. Solid fuels	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE
2. Oil and natural gas and other emissions from energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C. CO_2 transport and storage																
2. Industrial processes	33.26	33.26	31.65	31.54	30.64	34.26	33.94	37.31	39.33	34.99	14.16	22.55	11.27	10.81	10.97	11.49
A. Mineral industry																
B. Chemical industry	32.28	32.28	30.44	30.14	29.24	32.76	32.43	35.84	37.91	33.66	12.86	21.30	10.02	9.55	9.69	10.27
C. Metal industry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Non-energy products from fuels and solvent use	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE
E. Electronic industry																
F. Product uses as ODS substitutes																
G. Other product manufacture and use	0.98	0.98	1.21	1.40	1.40	1.49	1.51	1.46	1.42	1.33	1.29	1.25	1.25	1.26	1.27	1.22
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	37.83	37.83	37.44	37.29	37.35	36.69	35.50	34.98	34.63	34.20	33.99	34.15	33.61	33.69	33.72	33.39
A. Enteric fermentation																
B. Manure management	13.81	13.81	13.92	13.93	13.72	13.43	13.23	13.10	13.05	12.84	12.71	12.76	12.86	13.04	13.22	13.25
C. Rice cultivation																
D. Agricultural soils	23.89	23.89	23.39	23.24	23.52	23.14	22.16	21.76	21.47	21.26	21.18	21.29	20.65	20.56	20.41	20.05
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0.13	0.13	0.12	0.13	0.11	0.12	0.12	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.09	0.09
G. Liming																
H. Urea application																
I. Other carbon containing fertlizers																
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	0.73	0.73	0.72	0.72	0.72	0.71	0.70	0.69	0.69	0.67	0.67	0.67	0.66	0.66	0.65	0.64
A. Forest land	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
B. Cropland	0.10	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.05	0.05
C. Grassland	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
D. Wetlands	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE
E. Settlements	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE
F. Other land	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02
G. Harvested wood products																
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5. Waste	13.44	13.44	13.65	14.13	14.12	14.57	15.19	15.54	15.84	15.79	15.78	15.56	15.31	14.86	15.08	15.16
A. Solid waste disposal																
B. Biological treatment of solid waste	0.61	0.61	0.60	0.60	0.60	0.60	0.60	0.60	0.61	0.60	0.60	0.61	0.61	0.78	0.92	0.94
C. Incineration and open burning of waste	4.83	4.83	4.96	5.41	5.41	5.94	6.40	6.81	7.05	7.06	7.30	7.23	7.00	6.41	6.40	6.37
D. Waste water treatment and discharge	8.01	8.01	8.09	8.12	8.11	8.03	8.18	8.13	8.19	8.13	7.87	7.72	7.70	7.67	7.77	7.84
E. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N_2O emissions without N_2O from LULUCF	106.67	106.67	105.75	106.37	105.94	110.19	111.28	115.10	117.77	112.45	91.82	100.25	88.22	86.44	85.97	85.44
Total direct N_2O emissions with N_2O from LULUCF	107.40	107.40	106.47	107.08	106.65	110.90	111.98	115.79	118.46	113.12	92.48	100.92	88.89	87.10	86.62	86.09
Memo items:																
International bunkers	0.85	0.85	0.89	0.90	0.96	0.99	1.05	0.86	0.98	1.03	0.99	1.01	0.92	1.01	1.03	1.07
Aviation	0.37	0.37	0.39	0.40	0.39	0.43	0.48	0.52	0.54	0.57	0.55	0.55	0.53	0.60	0.58	0.60
Navigation	0.47	0.47	0.50	0.50	0.57	0.56	0.57	0.34	0.44	0.47	0.44	0.45	0.39	0.41	0.45	0.47
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass																
CO_2 captured																
Long-term storage of C in waste disposal sites																
Indirect N_2O	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indirect CO_2																

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
	kt													(%)
1. Energy	25.36	24.58	24.45	23.50	22.43	21.80	21.84	21.77	21.88	21.53	21.39	20.63	21.15	-4.46
A. Fuel combustion (sectoral approach)	25.36	24.58	24.45	23.50	22.43	21.80	21.84	21.77	21.88	21.53	21.39	20.63	21.15	-4.46
1. Energy industries	7.10	7.09	7.27	7.14	6.99	6.95	7.60	7.68	7.90	7.87	7.88	7.31	7.83	162.32
2. Manufacturing industries and construction	6.27	6.14	6.37	6.16	5.91	5.78	5.77	5.83	5.93	5.80	5.80	5.56	5.54	31.13
3. Transport	9.45	8.84	8.39	7.87	7.32	6.86	6.52	6.26	6.02	5.83	5.74	5.66	5.65	-55.00
4. Other sectors	2.54	2.51	2.42	2.32	2.20	2.20	1.95	2.00	2.03	2.04	1.98	2.11	2.14	-10.28
5. Other	NO	NO	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	0.00	0.00	-26.08
1. Solid fuels	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NE,NO	NO,NE	NO,NE	NO,NE	0.00
2. Oil and natural gas and other emissions from energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-26.08
C. CO_2 transport and storage														
2. Industrial processes	9.82	10.55	7.86	8.53	8.79	7.01	5.96	5.37	5.43	5.39	4.02	3.71	3.41	-89.76
A. Mineral industry														
B. Chemical industry	8.58	9.22	6.73	7.53	7.92	6.08	5.06	4.34	4.22	3.28	2.68	2.27	2.01	-93.77
C. Metal industry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Non-energy products from fuels and solvent use	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	NE,IE	0.00
E. Electronic industry														
F. Product uses as ODS substitutes														
G. Other product manufacture and use	1.23	1.33	1.13	1.00	0.87	0.92	0.91	1.03	1.20	2.10	1.35	1.44	1.40	42.95
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Agriculture	33.47	33.64	34.98	32.74	31.95	32.66	32.12	31.87	31.82	31.44	31.40	31.28	31.36	-17.12
A. Enteric fermentation														
B. Manure management	13.47	13.81	14.07	14.31	14.33	13.95	13.80	13.54	13.31	13.13	13.12	13.13	13.14	-4.83
C. Rice cultivation														
D. Agricultural soils	19.92	19.74	20.83	18.35	17.54	18.63	18.24	18.25	18.43	18.23	18.21	18.08	18.15	-24.05
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	-47.27
G. Liming														
H. Urea application														
I. Other carbon containing fertlizers														
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry	0.63	0.63	0.62	0.62	0.61	0.61	0.61	0.61	0.61	0.62	0.62	0.62	0.63	-13.37
A. Forest land	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.43	7.63
B. Cropland	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-70.78
C. Grassland	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.05	0.05	0.05	0.05	-0.63
D. Wetlands	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NO,NA, NE,IE	NE,NA, NO,IE	NO,NE,I E,NA	NO,NE,I E,NA	NO,NE,I E,NA	0.00
E. Settlements	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NO,NA, IE	NA,NO, IE	NO,IE,N A	NO,IE,N A	NO,IE,N A	0.00
F. Other land	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-75.22
G. Harvested wood products														
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
5. Waste	15.40	14.92	14.32	14.17	13.58	13.31	13.46	13.25	13.31	12.79	13.00	12.37	12.75	-5.17
A. Solid waste disposal														
B. Biological treatment of solid waste	1.07	1.11	1.07	1.20	1.19	1.04	1.15	1.14	1.12	1.12	1.14	1.15	1.15	90.27
C. Incineration and open burning of waste	6.59	6.19	5.69	5.46	5.27	5.08	5.09	5.11	5.15	4.77	5.03	4.40	4.77	-1.21
D. Waste water treatment and discharge	7.74	7.63	7.56	7.50	7.13	7.19	7.22	7.00	7.03	6.90	6.84	6.82	6.83	-14.78
E. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N_2O emissions without N_2O from LULUCF	84.06	83.69	81.61	78.94	76.75	74.77	73.38	72.26	72.45	71.15	69.82	67.99	68.66	-35.63
Total direct N_2O emissions with N_2O from LULUCF	84.69	84.31	82.23	79.56	77.36	75.38	73.98	72.87	73.06	71.77	70.43	68.61	69.29	-35.48
Memo items:														
International bunkers	1.13	1.07	1.02	0.95	0.84	0.85	0.86	0.89	0.88	0.85	0.90	0.94	0.94	11.00
Aviation	0.60	0.57	0.52	0.50	0.44	0.46	0.52	0.54	0.54	0.52	0.53	0.55	0.58	55.19
Navigation	0.53	0.50	0.50	0.45	0.40	0.39	0.35	0.35	0.35	0.32	0.37	0.38	0.36	-23.93
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass														
CO_2 captured														
Long-term storage of C in waste disposal sites														
Indirect N_2O	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Indirect CO_2														

Table A-5 Emission trends (HFCs, PFCs, SF_6 and NF_3) (CTF Table 1(d))

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	kt															
	22,471.61	22,471.61	24,856.54	25,384.52	29,071.96	34,495.36	42,823.11	42,856.28	44,421.08	40,310.58	37,486.34	34,725.11	29,340.99	25,435.83	25,083.46	21,639.20
Emissions of HFCs - (kt CO_2 equivalent)	15,932.31	15,932.31	17,349.61	17,767.22	18,129.16	21,051.90	25,213.19	24,598.11	24,436.79	23,742.10	24,368.28	22,852.00	19,462.52	16,236.39	16,229.26	12,422.56
HFC-23	1.08	1.08	1.17	1.19	1.13	1.24	1.45	1.33	1.26	1.18	1.21	1.06	0.80	0.52	0.43	0.09
HFC-32	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00	0.01	0.02	0.05	0.08	0.14	0.21
HFC-41	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-43-10mee	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA
HFC-125	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00	0.01	0.02	0.05	0.08	0.14	0.22
HFC-134	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-134a	0.00	0.00	NO,IE,NA	0.08	0.63	1.30	2.01	2.79	3.49	3.87	4.05	4.31	4.38	4.61	4.76	4.32
HFC-143	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-143a	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-152	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-152a	0.00	0.00	NO,NA	0.00	0.01	0.01	0.01	0.01	0.00	NO,NA	NO,NA	0.02	0.08	0.16	0.40	0.84
HFC-161	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-227ea	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.04
HFC-236cb	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-236ea	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-236fa	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-245ca	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-245fa	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.19
HFC-365mfc	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00	0.08
Unspecified mix of HFCs - (kt CO_2 equivalent)	2.24	2.24	NO,IE,NA	67.54	440.93	768.60	876.60	877.75	854.74	763.92	705.37	899.09	1,141.08	1,510.75	2,356.16	3,542.91
Emissions of PFCs - (kt CO_2 equivalent)	6,539.30	6,539.30	7,506.92	7,617.29	10,942.80	13,443.46	17,609.92	18,258.18	19,984.28	16,568.48	13,118.06	11,873.11	9,878.47	9,199.44	8,854.21	9,216.64
CF_4	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
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	0.00	0.00	0.00	0.00	0.00
C_3F_8	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA
C_4F_{10}	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
c-C_4F_8	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA
C_5F_{12}	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
C_6F_{14}	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00	0.00	0.00
C10F18	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
c-C3F6	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
Unspecified mix of PFCs - (kt CO_2 equivalent)	6,335.64	6,335.64	7,336.00	7,502.73	10,837.28	13,338.18	17,506.37	18,160.35	19,896.03	16,495.12	13,074.82	11,846.70	9,855.58	9,177.57	8,831.96	9,194.74
Unspecified mix of HFCs and PFCs - (kt CO_2 equivalent)																
Emissions of SF_6 - (kt CO_2 equivalent)	12,850.07	12,850.07	14,206.04	15,635.82	15,701.97	15,019.96	16,447.52	17,022.19	14,510.54	13,224.10	9,176.62	7,031.36	6,066.02	5,735.48	5,406.31	5,258.70
SF_6	0.56	0.56	0.62	0.69	0.69	0.66	0.72	0.75	0.64	0.58	0.40	0.31	0.27	0.25	0.24	0.23
Emissions of NF_3 - (kt CO_2 equivalent)	32.61	32.61	32.61	32.61	43.48	76.09	201.09	192.55	171.06	188.13	315.27	285.77	294.81	371.48	416.10	486.04
NF_3	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
	kt													(%)
	21,407.37	23,628.86	24,630.01	25,037.05	24,981.50	27,565.38	29,861.07	32,797.83	35,384.72	39,145.69	42,568.72	45,947.92	48,397.52	115.37
Emissions of HFCs - (kt CO_2 equivalent)	12,784.02	14,630.09	16,713.16	19,293.64	20,934.63	23,315.84	26,105.62	29,361.51	32,104.66	35,784.27	39,260.61	42,572.59	44,885.37	181.73
HFC-23	0.04	0.06	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-99.71
HFC-32	0.30	0.39	0.49	0.61	0.72	0.85	1.02	1.21	1.41	1.68	2.01	2.32	2.62	100.00
HFC-41	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
HFC-43-10mee	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	NO,NE,IE,NA	0.00
HFC-125	0.31	0.40	0.50	0.62	0.74	0.86	1.04	1.23	1.40	1.58	1.75	1.89	1.99	100.00
HFC-134	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
HFC-134a	3.59	2.91	2.85	2.85	2.83	2.78	2.64	2.63	2.64	2.60	2.54	2.46	2.43	259,478.85
HFC-143	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
HFC-143a	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.05	100.00
HFC-152	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
HFC-152a	1.22	1.41	1.44	1.68	1.58	1.30	1.26	0.99	0.68	0.52	0.42	0.37	0.39	1,033,257.14
HFC-161	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
HFC-227ea	0.05	0.04	0.04	0.05	0.04	0.03	0.03	0.03	0.03	0.02	0.03	0.04	0.04	100.00
HFC-236cb	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
HFC-236ea	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
HFC-236fa	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
HFC-245ca	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
HFC-245fa	0.48	0.67	0.85	0.93	1.01	1.11	1.24	1.36	1.47	1.58	1.67	1.80	1.92	100.00
HFC-365mfc	0.17	0.25	0.32	0.36	0.41	0.48	0.56	0.61	0.67	0.72	0.76	0.80	0.82	100.00
Unspecified mix of HFCs - (kt CO_2 equivalent)	4,826.92	6,722.74	8,786.08	10,353.97	11,995.32	13,794.72	15,890.35	18,209.99	20,057.77	22,848.50	25,457.26	27,983.45	29,628.11	1,320,862.39
Emissions of PFCs - (kt CO_2 equivalent)	8,623.35	8,998.78	7,916.85	5,743.40	4,046.87	4,249.54	3,755.45	3,436.33	3,280.06	3,361.43	3,308.10	3,375.33	3,512.15	-46.29
CF_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00
C_2F_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00
C_3F_8	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00
C_4F_{10}	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
c-C_4F_8	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00
C_5F_{12}	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
C_6F_{14}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NO,NA	0.00	0.00	0.00	0.00	0.00	100.00
C10F18	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
c-C3F6	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
Unspecified mix of PFCs - (kt CO_2 equivalent)	8,601.30	8,976.33	7,893.84	5,719.50	4,027.52	4,229.93	3,734.27	3,423.06	3,260.11	3,350.51	3,300.28	3,354.52	3,492.62	-44.87
Unspecified mix of HFCs and PFCs - (kt CO_2 equivalent)	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
Emissions of SF_6 - (kt CO_2 equivalent)	5,053.01	5,228.90	4,733.45	4,177.17	2,446.63	2,423.87	2,247.64	2,234.54	2,101.81	2,065.07	2,152.71	2,237.43	2,135.15	-83.38
SF_6	0.22	0.23	0.21	0.18	0.11	0.11	0.10	0.10	0.09	0.09	0.09	0.10	0.09	-83.38
Emissions of NF_3 - (kt CO_2 equivalent)	1,471.75	1,401.31	1,586.80	1,481.04	1,354.16	1,539.74	1,800.38	1,511.85	1,617.24	1,122.87	571.03	634.44	449.78	1,279.26
NF_3	0.09	0.08	0.09	0.09	0.08	0.09	0.10	0.09	0.09	0.07	0.03	0.04	0.03	1,279.26

Annex II Outline of Long-term Strategy under the Paris Agreement

Outlines of Japan's Long-term Strategy under the Paris Agreement (Cabinet decision, June 11, 2019)

Provisional Translation

Chapter 1: Basic Concepts

- Proclaiming a "decarbonized society" as the ultimate goal and aiming to accomplish it ambitiously as early as possible in the second half of this century, while boldly taking measures towards the reduction of GHGs emissions by 80% by 2050
  * an unconventional vision of an "ideal future model" * contributing to the achievement of the long-term goals of the Paris Agreement, including efforts to limit the temperature increase to 1.5℃
- Realizing "a virtuous cycle of environment and growth" towards the vision with business-led disruptive innovation, Swift implementation of actions from now, contributing to the world, Action Towards a bright Society with Hope for the Future
  [Factors: Achievement of SDGs; "Co-innovation", Society 5.0; the "Circulating and Ecological Economy"; and leading country in solving problems]

Chapter 2: The Vision of Each Sector and the Direction of Measures

Section 1: Measures for Emissions Reductions

1.Energy: For energy transition/decarbonization, pursuing every option
- Utilizing renewable energy as the major power source
- Reducing CO_2 emissions from the thermal power in line with the long-term goals of the Paris Agreement
- Promoting CCS&CCU/Carbon Recycling
- Realizing a "Hydrogen Society"/battery/nuclear/energy efficiency

2.Industry: Decarbonized manufacturing
- Use of CO_2-free hydrogen (e.g. a challenge towards "zero-carbon steel")
- Feedstock change (e.g. CCU including artificial photosynthesis and biomass utilization)
- Achieving drastic energy efficiency, and complete transition from fluorocarbons in mid-long term

3.Transport: the challenge of "Well-to-Wheel Zero Emission"
- Achieving the highest level of environmental performance of Japanese vehicles supplied worldwide by 2050
- Road/transport systems using big data and IoT

4.Community and Living: Achieving carbon neutral, resilient and comfortable communities and living by 2050/ creating the "Circulating and Ecological Economy"
- Capable communities and corporations to achieve carbon neutrality even before 2050
- Shift to carbon neutral living (encouraging technology development and dissemination to achieve net Zero Energy Buildings, equivalency in stock average of housing and office buildings/ shift of lifestyles)
- Carbon-neutral community building (urban city building, farming/forestry/fishing villages building, and development of distributed energy systems)

Section 2: Measures for Carbon Sinks

Chapter 3: Cross-sectoral Measures for Achieving a Virtuous Cycle of Environment and Growth

Section 1: Promotion of Innovation
- Promoting innovation for practical application and wide usage of cross-sectoral decarbonization technologies leading to drastic reduction of GHG, achieving cost that allows commercialization for social application

(1) Progressive Environment Innovation Strategy
- Setting clear goals such as costs, maximizing investment of public and private resources, discovering and creating technological seeds in and outside Japan, setting issues from demands, strengthening support that leads to commercialization
- Challenging R&D, and enhancing alliances among R&D institutes with facilitation of international joint R&D activities [Research and Development 20 for clean energy technologies(RD20)]
- Target setting and visualizing challenges for the practical use
  - Realizing hydrogen cost equivalent to existing energy: e.g. lowering manufacturing cost of CO_2-free hydrogen to 1/10
  - CCU/carbon recycled products to be provided with costs equivalent to existing products, nuclear power(such as Reactor, Fusion)

(2) Innovation in Economic and Social Systems/lifestyle

Section 2: Promotion of Green Finance
- Appropriately "visualizing" corporate efforts in innovation etc. and mobilizing finance for innovation by financial institutions

(1) Mobilizing green finance through TCFD※ disclosures and dialogues ※Task Force on Climate-related Financial Disclosures
- Industry: improving TCFD Guidance & Scenario Analysis Guide / Financial sector: Formulating a guidance on green investment
- Facilitating dialogue between industry and financial sector (TCFD Consortium)
- Promoting discussion and share the above initiatives with the world (TCFD Summit)

(2) Promoting initiatives to expand ESG finance
- Initiatives for ESG finance (Support to the issuance of green bonds, encouraging local ESG finance), development of ESG Dialogue Platform, enhancing ESG finance literacy, ESG Finance High-Level Panel

Section 3: Business-led Promotion of International Application, and International Cooperation
- Promoting competitive technologies and products with high environmental performance/ promoting co-innovation benefiting participants from both countries

(1) Promoting international application of decarbonization technologies together with policy/institutional development and international rule-making
- Promoting international application of decarbonization technologies and reductions of GHG emissions through development of business environment by improving business environment including working for institutional development in partner countries leading international rule-making cooperating in building policy and institutional framework in partner countries and by international rule-making (e.g. establishing public and private-sector initiatives in ASEAN, and developing appropriate international frameworks for utilizing market-based mechanisms)

(2) Strengthening Development and Investment of infrastructure that contributes to CO_2 emission reductions
- Development and investment of energy and city/transport infrastructure that contributes to CO_2 emission reductions in line with the long-term goals of the Paris Agreement (e.g. renewable energy such as offshore wind power and geothermal power, hydrogen, CCS&CCU/Carbon Recycling, smart cities)

(3) Creating platforms for global scale decarbonized society building
- Supporting partner countries in the formulation of NDCs and mitigation measures, enhancing transparency in the overall supply chains

Chapter 4: Other Measures

- Human Resource Development
- Just transition
- Government-led initiatives
- Integrating climate change adaptation with development of a resilient society
- Carbon Pricing (Expert/technical level discussions)

Chapter 5: Review and Implementation of the Long Term Strategy

- **Review:** Re-examining policies and measures flexibly every about 6 years with reference to situations, and improving the Long-term strategy if necessary
- **Implementation:** Analysing relevant factors responding to future changes in the situations / collaborating and having dialogues with stakeholders including the youth