Japan's Second Biennial Report under the United Nations Framework Convention on Climate Change

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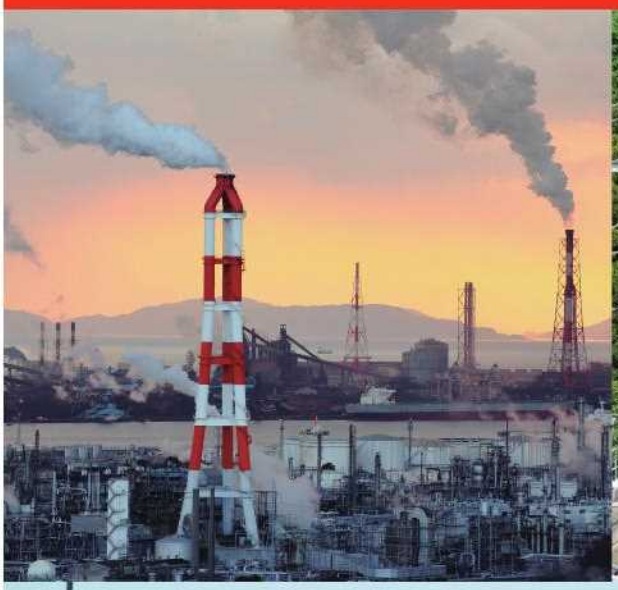
Foreword

The 16th Conference of Parties (COP16) under the United Nations Framework Convention on Climate Change (UNFCCC) decided that developed country Parties should submit biennial reports (BR) on their progress in achieving emission reductions, including information on mitigation actions to achieve their quantified economy-wide emission reduction targets and emission reductions achieved, projected emissions and the provision of financial, technology and capacity-building support to developing country Parties (Decision 1/CP.16). The COP17 decided that developed country Parties shall submit their first BRs to the UNFCCC by 1 January 2014, and their subsequent BRs every two years, and it also adopted "UNFCCC biennial reporting guidelines for developed country Parties" (Decision 2/CP.17, Annex I) which prescribed the reporting matters that should be reported in the BR. The COP18 adopted the Common tabular format (CTF) which developed country Parties shall use to report information required in the BR (Decision 19/CP.18, Annex).
In accordance with the decisions above, Japan submits its second biennial report (BR2).

The structure of the report is in line with the reporting elements which are prescribed in the UNFCCC biennial reporting guidelines. Chapter 1 "Information on Greenhouse gas emissions and trends" presents greenhouse gas emissions and trends between FY1990 and FY2013 which is consistent with Japan's Greenhouse gas inventories 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" describes Japan's greenhouse gas emission reduction target in FY (fiscal year) 2020. Chapter 3 "Progress in achievement of quantified economy-wide emission reduction targets and relevant information" presents information on the progress in achieving the greenhouse gas emission reduction target in FY2020 and mitigation actions which Japan is implementing toward the achievement of the target. Chapter 4 "Projections" presents the projected estimates of greenhouse gas emissions and removals in FY2020 and FY2030. Chapter 5 "Provision of financial technological and capacity-building support to developing country Parties" outlines the information on financial technological and capacity-building support to developing country Parties provided by Japan in order to support climate change measures in developing countries. Chapter 6 "Other reporting matters" describes the other related information.

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

1.1.1.1 Background Information on Japan's Greenhouse Gas Inventory

Japan has reported the greenhouse gas (GHG) inventory, which contains the information on emissions and removals of GHGs, including indirect GHGs and SO_2 in Japan from FY1990 to FY2013[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 was developed by the Intergovernmental Panel on Climate Change (IPCC), and Japan's estimation methodologies are in line with these guidelines. In order to enhance transparency, consistency, comparability, completeness and accuracy of inventory, Japan also applies the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: 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 is 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.

1.1.1.2 Brief General Description of Methodologies

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

Results of the actual measurements or estimates based on research conducted in Japan are used to determine the emissions factors (country-specific emissions factors). The default values given in the 2006 IPCC Guidelines are used for estimation of emissions, which are assumed to be quite low (e.g., "1.B.2.a.ii fugitive emissions from fuel (oil and natural gas (CO_2 and CH_4)" etc.).

1.1.1.3 Sectors

Japan's national GHG inventory is composed of 5 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 three main categories: fuel combustion, fugitive emissions from fuels and CO_2 transport and storage. Fuel combustion includes emissions released into the atmosphere when fossil fuels (e.g., coal, oil products, and natural gas) are combusted. Fugitive emissions are intentional or unintentional releases of gases from fossil fuels by anthropogenic activities. CO_2 transport and storage includes fugitive emissions from transport, injection and storage of captured CO_2. In Japan, fossil fuels are used to produce energy for a wide variety of purposes (e.g., production, transportation, shipment, and consumption of energy products), and not only CO_2 but also CH_4, N_2O and indirect GHGs such as NOx (Nitrogen Oxide), CO (Carbon Monoxide) and NMVOC (Non-Methane Volatile Organic Compounds) are emitted in the process.

[1] "FY (fiscal year)" is used because the major part of CO_2 emission estimate is not on the calendar year basis but on the fiscal year basis (April to March).

(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 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 emission 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 to 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—forest land, cropland, grassland, wetlands, settlements, and other land—and subdivides each of these into two subcategories by distinguishing them on the basis of whether or not land conversion has occurred, in accordance with the 2006 IPCC guidelines. 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) in forest land, direct N_2O emissions from N fertilization in forest land, 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 other processes, in accordance with each treatment process. The waste to be covered in this sector is waste as defined in the 2006 IPCC Guidelines. In the case of Japan, waste not only includes municipal waste and industrial waste as defined by the Waste Disposal and Pubic Cleansing Law (Act No.137 of 1970), but also recyclables and valuables that are re-used within a company.

1.1.2 Trends in GHG Emissions and Removals

Total GHGs emissions in FY2013[2] (excluding LULUCF) were 1,408 million tonnes CO_2 eq. They increased by 10.8% compared to the emissions in FY1990 and 0.8% compared to FY2005 (excluding LULUCF).

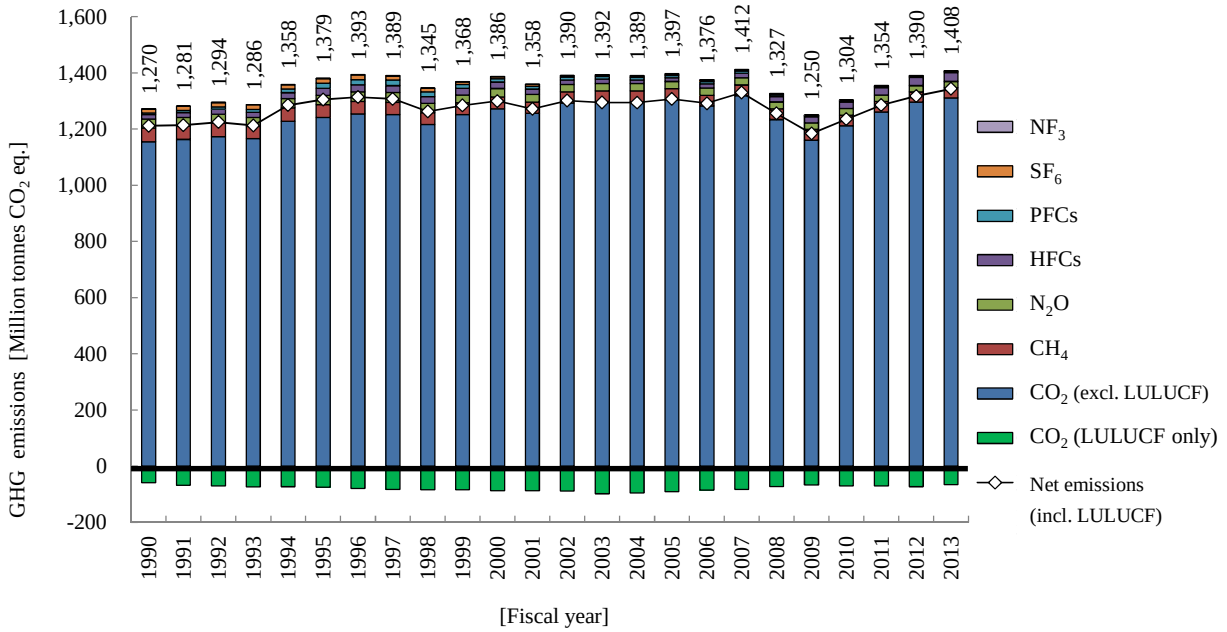


Figure 1-1 Trends in GHG emissions and removals in Japan

Carbon dioxide emissions in FY2013 were 1,311 million tonnes (excluding LULUCF), accounting for 93.1% of total GHGs emissions. They increased by 13.5% since FY1990 and by 0.5% compared to FY2005. Carbon dioxide removals[3] in FY2013 were 64.9 million tonnes, which were equivalent to 4.6% of total GHGs emissions. They increased by 10.2% since FY1990 and decreased by 27.8% compared to FY2005. Methane emissions in FY2013 (excluding LULUCF) were 36.0 million tonnes CO_2 eq., accounting for 2.6% of total GHGs emissions. They decreased by 25.8% since FY1990 and by 7.5% compared to FY2005. Nitrous oxide emissions in FY2013 (excluding LULUCF) were 22.5 million tonnes CO_2 eq., accounting for 1.6% of total GHGs emissions. They decreased by 29.6% since FY1990 and by 12.0% compared to FY2005. Hydrofluorocarbons emissions in CY2013 were 31.8 million tonnes CO_2 eq., accounting for 2.3% of total GHGs emissions. They increased by 99.4% since CY1990 and by 149.7% compared to CY2005. Perfluorocarbons emissions in CY2013 were 3.3 million tonnes CO_2 eq., accounting for 0.2% of total GHGs emissions. They decreased by 49.8% since CY1990 and by 62.0% compared to CY2005. Sulfur hexafluoride emissions in CY2013 were 2.2 million tonnes CO_2 eq., accounting for 0.2% of total GHGs emissions. They decreased by 83.1% since CY1990 and by 57.2% compared to CY2005. Nitrogen trifluoride emissions in CY2013 were 1.4 million tonnes CO_2 eq., accounting for 0.1% of total GHGs emissions. They increased to 41 times since CY1990 and by 8.9% compared to CY2005.

[2] 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 Intergovernmental Panel on Climate Change (IPCC).

[3] Since the inventory to be submitted under the UNFCCC reports all GHG emissions and removals from the LULUCF sector, these values do not correspond to emissions and removals under the Kyoto Protocol.

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

[Million tonnes CO_2 eq.]	GWP	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO_2 (excl. LULUCF)	1	1,154.4	1,163.0	1,172.8	1,166.4	1,227.2	1,240.8	1,253.8	1,251.3	1,216.7	1,251.7
CO_2 (incl. LULUCF)	1	1,095.5	1,096.0	1,103.2	1,092.8	1,154.3	1,166.3	1,174.7	1,168.9	1,133.1	1,167.6
CO_2 (LULUCF only)	1	-58.9	-67.0	-69.6	-73.6	-72.9	-74.5	-79.1	-82.4	-83.6	-84.1
CH_4 (excl. LULUCF)	25	48.6	46.9	48.1	42.8	47.9	45.8	44.5	43.7	41.4	41.5
CH_4 (incl. LULUCF)	25	48.7	46.9	48.2	42.9	48.0	45.9	44.6	43.8	41.5	41.5
N_2O (excl. LULUCF)	298	31.9	31.6	31.7	31.6	32.9	33.2	34.4	35.1	33.6	27.5
N_2O (incl. LULUCF)	298	32.2	31.9	32.0	31.9	33.2	33.5	34.7	35.4	33.9	27.8
HFCs	HFC-134a: 1,430 etc.	15.9	17.3	17.8	18.1	21.1	25.2	24.6	24.4	23.7	24.4
PFCs	PFC-14: 7,390 etc.	6.5	7.5	7.6	10.9	13.4	17.6	18.3	20.0	16.6	13.1
SF_6	22,800	12.9	14.2	15.6	15.7	15.0	16.4	17.0	14.5	13.2	9.2
NF_3	17,200	0.03	0.03	0.03	0.04	0.1	0.2	0.2	0.2	0.2	0.3
Gross total (excl. LULUCF)		1,270.2	1,280.6	1,293.7	1,285.6	1,357.6	1,379.3	1,392.7	1,389.3	1,345.4	1,367.6
Net total (incl. LULUCF)		1,211.8	1,213.9	1,224.5	1,212.5	1,285.1	1,305.2	1,314.1	1,307.3	1,262.2	1,283.8

[Million tonnes CO_2 eq.]	GWP	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CO_2 (excl. LULUCF)	1	1,272.5	1,255.8	1,292.8	1,297.9	1,296.8	1,304.4	1,282.2	1,318.2	1,234.0	1,161.1
CO_2 (incl. LULUCF)	1	1,185.8	1,168.9	1,204.2	1,199.9	1,201.4	1,214.4	1,197.7	1,235.7	1,162.3	1,094.3
CO_2 (LULUCF only)	1	-86.7	-86.9	-88.5	-98.0	-95.4	-90.0	-84.5	-82.6	-71.7	-66.8
CH_4 (excl. LULUCF)	25	41.5	40.3	39.5	37.6	39.0	39.0	38.2	38.5	38.3	37.2
CH_4 (incl. LULUCF)	25	41.6	40.3	39.6	37.7	39.1	39.0	38.3	38.5	38.3	37.3
N_2O (excl. LULUCF)	298	30.1	26.5	26.0	25.9	25.9	25.5	25.5	25.0	24.1	23.6
N_2O (incl. LULUCF)	298	30.3	26.8	26.3	26.1	26.2	25.8	25.8	25.2	24.3	23.9
HFCs	HFC-134a: 1,430 etc.	22.8	19.5	16.2	16.2	12.4	12.7	14.5	16.6	19.2	20.8
PFCs	PFC-14: 7,390 etc.	11.9	9.9	9.2	8.9	9.2	8.6	9.0	7.9	5.7	4.0
SF_6	22,800	7.0	6.1	5.7	5.4	5.3	5.1	5.2	4.8	4.2	2.5
NF_3	17,200	0.2	0.2	0.3	0.3	0.4	1.2	1.1	1.2	1.2	1.2
Gross total (excl. LULUCF)		1,386.0	1,358.2	1,389.8	1,392.1	1,389.0	1,396.5	1,375.8	1,412.2	1,326.6	1,250.4
Net total (incl. LULUCF)		1,299.6	1,271.6	1,301.6	1,294.4	1,293.9	1,306.9	1,291.7	1,329.9	1,255.2	1,183.9

[Million tonnes CO_2 eq.]	GWP	2010	2011	2012	2013	Changes in emissions/removals (2013)	
						1990	Previous year
CO_2 (excl. LULUCF)	1	1,211.5	1,260.8	1,295.5	1,310.7	13.5%	1.2%
CO_2 (incl. LULUCF)	1	1,141.9	1,191.3	1,222.5	1,245.8	13.7%	1.9%
CO_2 (LULUCF only)	1	-69.6	-69.5	-73.0	-64.9	10.2%	-11.1%
CH_4 (excl. LULUCF)	25	38.3	37.3	36.4	36.0	-25.8%	-1.0%
CH_4 (incl. LULUCF)	25	38.3	37.3	36.5	36.1	-25.8%	-1.0%
N_2O (excl. LULUCF)	298	23.3	22.8	22.5	22.5	-29.6%	-0.1%
N_2O (incl. LULUCF)	298	23.5	23.0	22.7	22.7	-29.7%	-0.1%
HFCs	HFC-134a: 1,430 etc.	23.1	25.8	29.1	31.8	99.4%	9.2%
PFCs	PFC-14: 7,390 etc.	4.2	3.8	3.4	3.3	-49.8%	-4.5%
SF_6	22,800	2.5	2.3	2.3	2.2	-83.1%	-5.8%
NF_3	17,200	1.4	1.6	1.3	1.4	4038.1%	8.4%
Gross total (excl. LULUCF)		1,304.3	1,354.3	1,390.5	1,407.8	10.8%	1.2%
Net total (incl. LULUCF)		1,234.9	1,285.1	1,317.7	1,343.1	10.8%	1.9%

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

1.1.3 Trends in GHG Emissions and Removals by Gas

1.1.3.1 CO_2

(1) Trends in CO_2 Emissions

Carbon dioxide emissions in FY2013 were 1,311 million tonnes (excluding LULUCF), accounting for 93.1% of total GHGs emissions. They increased by 13.5% since FY1990 and by 0.5% compared to FY2005.

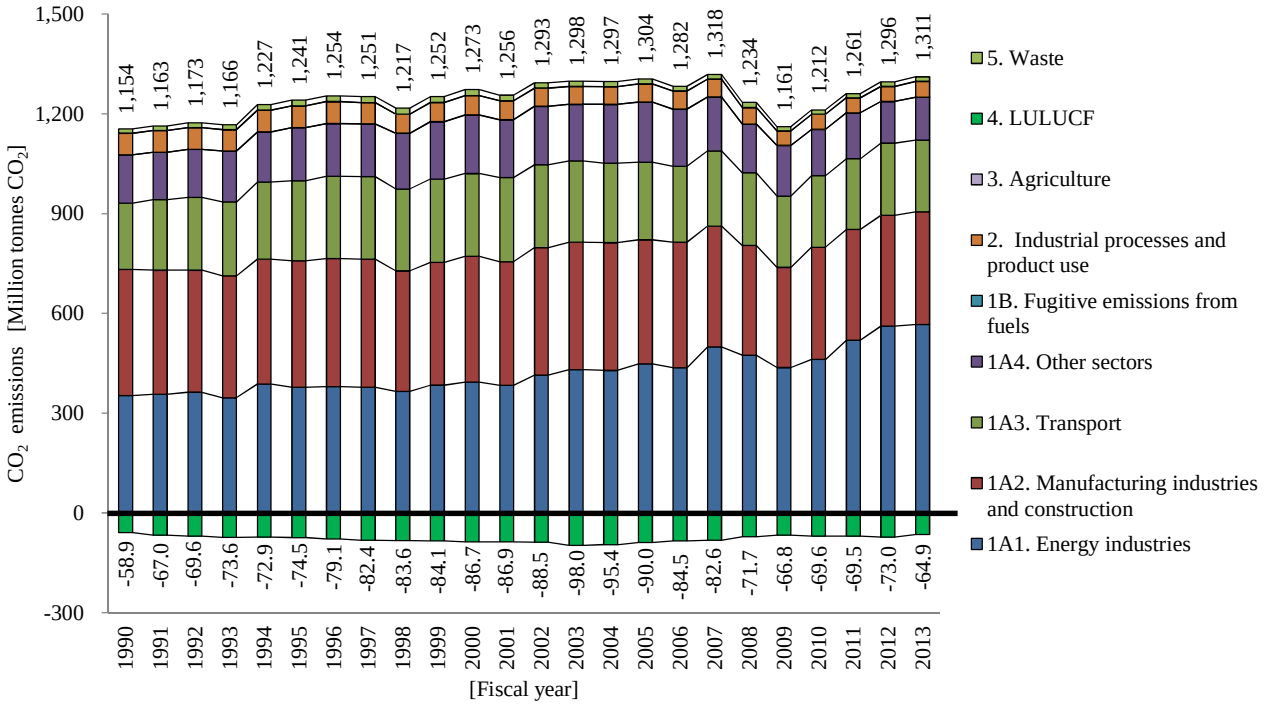


Figure 1-2 Trends in CO_2 emissions

The breakdown of CO_2 emissions in FY2013 shows that fuel combustion accounts for 95.4%, and is followed by industrial processes and product use (3.6%) and waste sectors (1.0%). As for the breakdown of CO_2 emissions within the fuel combustion category, energy industries accounts for 43.2% and is followed by manufacturing industries and construction at 25.8%, transport at 16.5%, and other sectors[4] at 9.9%. The main driving factor for the increase in CO_2 emissions compared to FY2005 is the increased solid fuel consumption for electricity power generation.

By looking at the changes in emissions by sector, emissions from fuel combustion in the energy industries increased by 60.6% since FY1990 and by 26.5% compared to FY2005. The main driving factor for the increase compared to the emissions in FY1990 is the increased fossil fuel consumption for electricity power generation. Emissions from manufacturing industries and construction decreased by 10.7% since FY1990 and by 9.4% compared to FY2005. Emissions from transport increased by 7.8% compared to FY1990 and decreased by 7.3% compared to FY2005. The main driving factor for the increase compared to the emissions in FY1990 is the increase in emissions from passenger vehicles, compensating for the decrease in emissions from freight transportation. Emissions from other sectors decreased by 10.8% since FY1990 and by 28.7% compared to FY2005.

Carbon dioxide removals in FY2013 were 64.9 million tonnes, which were equivalent to 4.6% of total GHGs emissions. They increased by 10.2% since FY1990 and decreased by 27.8% compared to FY2005.

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

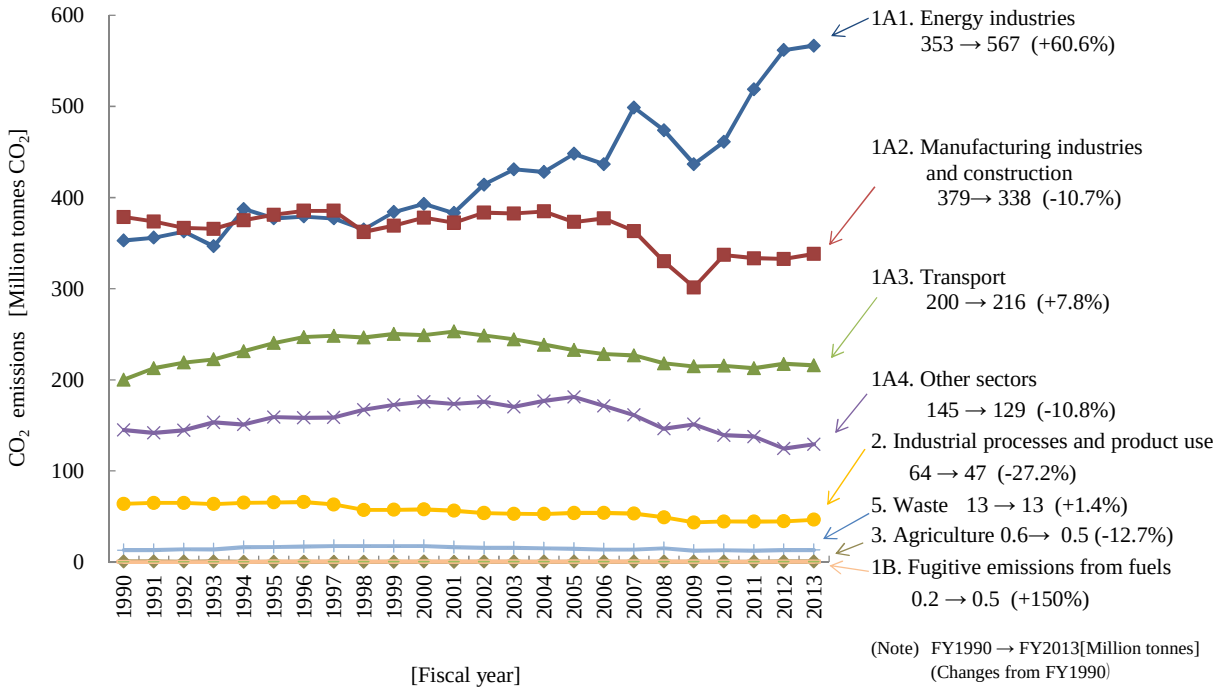


Figure 1-3 Trends in CO_2 emissions by sector/subsector

(Figures in brackets indicate relative increase or decrease to the FY1990 values)

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

[Thousand tonnes CO_2]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1A. Fuel combustion	1,076,548	1,157,786	1,196,028	1,227,964	1,234,928	1,213,435	1,250,204	1,168,545	1,104,197	1,152,910	1,202,748	1,236,533	1,249,822
1A1. Energy industries	352,783	377,029	393,060	427,939	447,958	436,467	498,749	473,840	436,771	461,181	518,821	561,648	566,644
Public electricity and heat production	300,173	318,716	334,091	366,638	382,795	374,117	428,018	399,444	360,397	383,263	444,694	490,499	495,733
Petroleum refining	37,150	41,766	47,377	48,500	50,884	49,754	48,426	46,987	47,307	49,627	46,429	45,375	47,447
Manufacture of solid fuels and other energy industries	15,460	16,546	11,592	12,802	14,279	12,597	22,305	27,409	29,067	28,290	27,698	25,775	23,464
1A2. Manufacturing industries and construction	378,578	381,196	377,905	384,665	373,027	377,190	363,274	330,170	301,476	336,976	333,428	332,669	338,130
Iron and steel	167,331	155,182	163,244	174,613	172,177	179,460	173,629	148,781	139,438	159,485	153,690	159,109	162,324
Non-ferrous metals	8,409	7,080	5,536	5,494	5,389	5,640	5,536	4,942	4,389	3,073	3,177	3,169	3,415
Chemicals	63,684	73,044	65,825	62,537	59,926	59,299	58,858	54,003	55,790	55,741	54,606	52,390	57,071
Pulp, paper and print	28,247	33,041	32,272	31,311	30,010	29,233	28,117	25,707	23,537	24,013	25,063	23,340	25,036
Food processing, beverages and tobacco	17,039	19,828	23,810	27,463	25,905	24,862	23,003	23,887	17,666	24,818	24,494	23,298	17,813
Non-metallic minerals	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
Other	93,868	93,021	87,218	83,247	79,620	78,696	74,131	72,850	60,655	69,847	72,399	71,364	72,471
1A3. Transport	200,215	240,453	249,014	238,588	232,727	228,263	226,722	218,193	214,764	215,467	212,651	217,612	215,804
Domestic aviation	7,162	10,278	10,677	10,663	10,799	11,178	10,876	10,277	9,781	9,193	9,001	9,524	10,149
Road transportation	178,442	214,684	222,613	214,253	208,267	203,739	203,061	196,002	193,931	194,956	192,661	196,765	194,039
Railways	935	822	711	652	647	614	594	604	590	574	555	554	557
Domestic navigation	13,675	14,669	15,012	13,020	13,014	12,732	12,191	11,310	10,462	10,745	10,434	10,769	11,058
1A4. Other sectors	144,973	159,108	176,049	176,771	181,216	171,515	161,459	146,342	151,187	139,285	137,847	124,603	129,245
Commercial/institutional	80,186	86,868	102,040	107,743	109,061	103,365	94,445	83,597	89,123	73,851	74,603	61,896	69,161
Residential	58,366	68,310	71,037	66,341	69,614	65,479	64,553	60,897	59,611	62,883	60,670	60,039	57,660
Agriculture/forestry/fishing	6,421	3,931	2,972	2,687	2,540	2,671	2,461	1,847	2,453	2,551	2,574	2,669	2,423
1A5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
1B. Fugitive emissions from fuels	192	521	512	478	508	553	616	565	501	475	477	490	480
1C. CO_2 transport and storage	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
2. Industrial processes and product use	63,927	65,387	57,880	52,834	53,920	54,047	53,261	49,136	43,491	44,672	44,542	44,785	46,551
3. Agriculture	609	359	443	402	411	383	500	440	390	403	409	532	532
4. LULUCF	-58,891	-74,466	-86,747	-95,419	-89,960	-84,466	-82,564	-71,662	-66,847	-69,642	-69,497	-73,017	-64,927
5. Waste	13,127	16,709	17,642	15,154	14,610	13,770	13,651	15,264	12,554	13,075	12,584	13,161	13,307
Total (including LULUCF)	1,095,512	1,166,297	1,185,758	1,201,413	1,214,416	1,197,723	1,235,668	1,162,289	1,094,286	1,141,893	1,191,262	1,222,484	1,245,764
Total (excluding LULUCF)	1,154,403	1,240,763	1,272,505	1,296,832	1,304,376	1,282,189	1,318,232	1,233,951	1,161,133	1,211,535	1,260,760	1,295,500	1,310,691

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

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

Carbon dioxide emissions (excluding LULUCF) per capita in FY2013 were 10.30 tonnes. They increased by 10.3% since FY1990 and increased by 0.9% compared to FY2005.

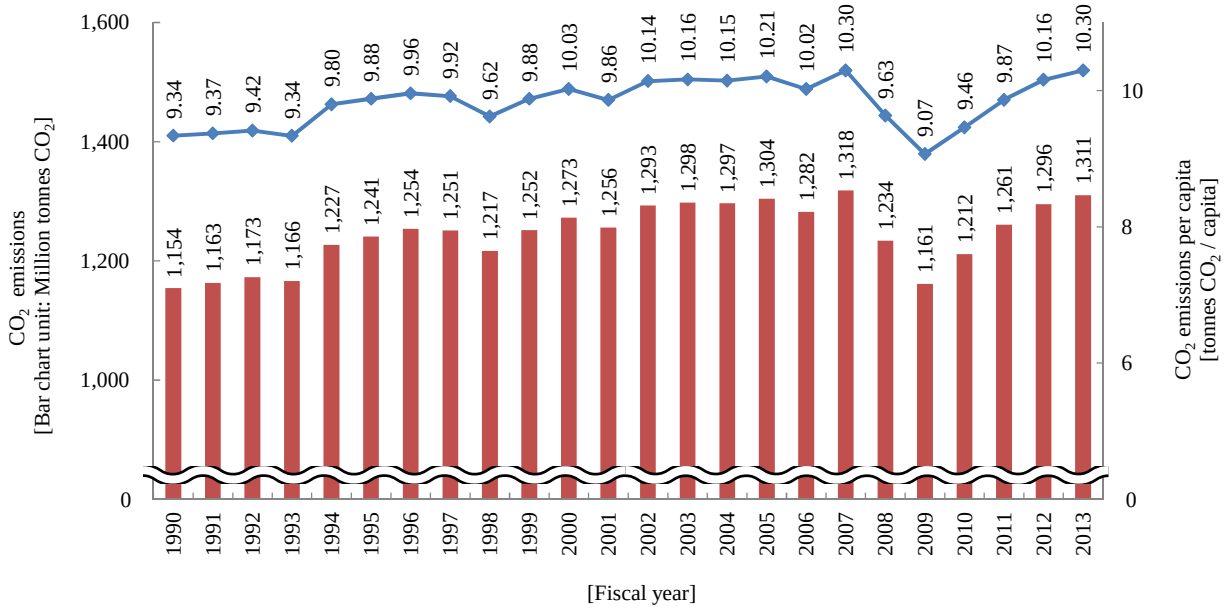


Figure 1-4 Trends in total CO_2 emissions and CO_2 emissions per capita

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

Carbon dioxide emissions per unit of GDP (million yen) in FY2013 were 2.47 tonnes. They decreased by 8.0% since FY1990 and decreased by 4.0% compared to FY2005.

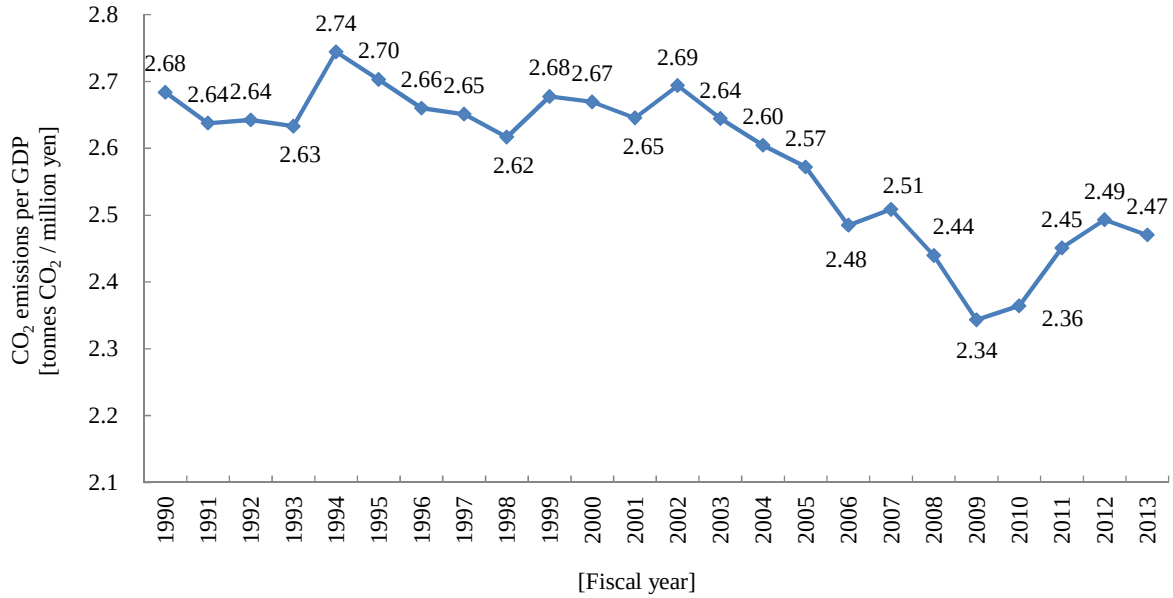


Figure 1-5 Trend in CO_2 emissions per unit of GDP

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

1.1.3.2 CH_4

Methane emissions in FY2013 were 36.1 million tonnes CO_2 eq. (including LULUCF), accounting for 2.6% of total GHGs emissions. They decreased by 25.8% since FY1990 and by 7.5% compared to FY2005. Their decrease since FY1990 is mainly a result of a 54.8% decrease in emissions from the waste sector (solid waste disposal).

Breakdown of the FY2013 emissions shows that the largest source is rice cultivation accounting for 50%. It is followed by enteric fermentation (21%) and solid waste disposal (10%).

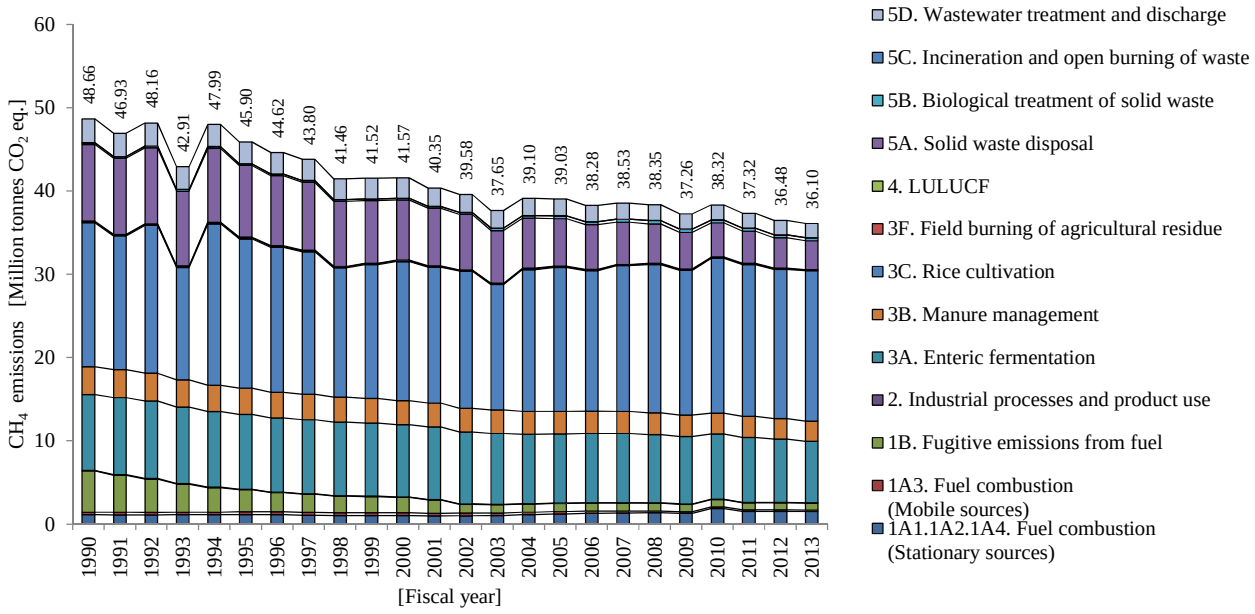


Figure 1-6 Trends in CH_4 emissions

Table 1-3 Trends in CH_4 emissions

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1A. Fuel combustion	1,425	1,473	1,353	1,422	1,487	1,535	1,540	1,544	1,459	2,047	1,685	1,687	1,668
1A1. Energy industries	434	407	260	217	218	220	249	318	314	318	330	348	293
1A2. Manufacturing industries and construction	441	437	427	512	522	569	577	551	546	600	479	495	493
1A3. Transport	307	326	330	279	262	246	232	212	198	188	179	176	170
1A4. Other sectors	243	304	336	413	485	500	482	464	402	940	696	668	712
1B. Fugitive emissions from fuels	4,973	2,647	1,836	977	976	982	975	947	916	885	867	851	817
1B1. Solid fuels	4,760	2,394	1,563	672	655	644	609	590	577	564	552	545	533
1B2. Oil and natural gas and other emissions	213	253	273	305	322	339	366	357	339	321	315	305	284
2. Industrial processes and product use	60	58	54	54	54	55	51	50	51	54	54	46	46
3. Agriculture	29,837	30,190	28,382	28,187	28,380	27,929	28,554	28,711	28,116	29,017	28,642	28,071	27,958
3A. Enteric fermentation	9,064	8,993	8,682	8,319	8,287	8,305	8,320	8,204	8,094	7,829	7,794	7,607	7,401
3B. Manure management	3,354	3,146	2,880	2,755	2,733	2,677	2,635	2,597	2,570	2,519	2,522	2,472	2,411
3C. Rice cultivation	17,294	17,942	16,726	17,029	17,275	16,865	17,520	17,833	17,377	18,596	18,254	17,921	18,077
3F. Field burning of agricultural residue	125	109	94	83	85	82	80	77	75	73	72	70	69
4. LULUCF	73	70	67	70	67	59	58	81	65	60	61	56	58
5. Waste	12,291	11,458	9,880	8,390	8,066	7,715	7,350	7,017	6,650	6,261	6,015	5,766	5,553
5A. Solid waste disposal	9,220	8,621	7,239	6,010	5,703	5,383	5,079	4,728	4,421	4,114	3,866	3,658	3,464
5B. Biological treatment of solid waste	195	191	194	300	340	350	337	380	377	329	362	359	360
5C. Incineration and open burning of waste	16	18	16	18	17	16	14	14	12	12	11	12	12
5D. Wastewater treatment and discharge	2,860	2,628	2,432	2,062	2,006	1,967	1,919	1,895	1,839	1,806	1,776	1,738	1,717
Total (including LULUCF)	48,659	45,895	41,572	39,100	39,029	38,275	38,528	38,350	37,258	38,323	37,324	36,476	36,100
Total (excluding LULUCF)	48,586	45,825	41,505	39,030	38,962	38,216	38,470	38,269	37,193	38,263	37,263	36,420	36,042

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

1.1.3.3 N_2O

Nitrous oxide emissions in FY2013 were 22.7 million tonnes CO_2 eq. (including LULUCF), accounting for 1.6% of total GHGs emissions. They decreased by 29.7% since FY1990 and by 12.0% compared to FY2005. Their decrease since FY1990 is mainly a result of a 85.6% 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 FY1998 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 FY2000 because of a decrease in the equipment's efficiency, the emissions decreased again in FY2001 with the resumption of normal operation.

Breakdown of the FY2013 emissions shows that the largest source is agricultural soils accounting for 29%. It is followed by fuel combustion (stationary sources) (21%) and manure management (20%).

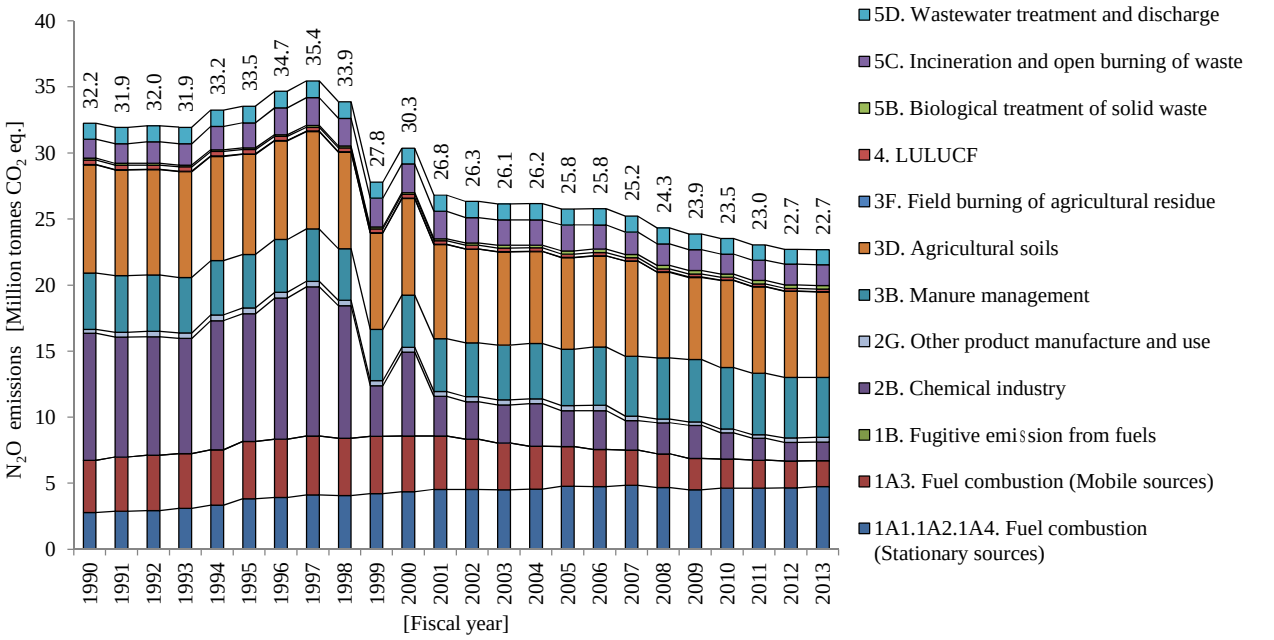


Figure 1-7 Trends in N_2O emissions

Table 1-4 Trends in N_2O emissions

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1A. Fuel combustion	6,732	8,153	8,574	7,783	7,772	7,549	7,511	7,216	6,867	6,827	6,737	6,681	6,712
1A1. Energy industries	1,197	1,737	2,056	2,220	2,442	2,424	2,489	2,442	2,356	2,374	2,559	2,574	2,631
1A2. Manufacturing industries and construction	1,372	1,807	1,984	2,012	2,001	1,986	2,030	1,953	1,832	1,861	1,805	1,829	1,854
1A3. Transport	3,951	4,328	4,219	3,229	2,990	2,811	2,679	2,530	2,372	2,220	2,111	2,039	1,974
1A4. Other sectors	212	282	315	322	339	328	313	292	308	372	263	239	253
1B. Fugitive emissions from fuels	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2. Industrial processes and product use	9,911	10,114	6,720	3,600	3,093	3,339	2,564	2,647	2,777	2,270	1,931	1,727	1,748
2B. Chemical industry	9,620	9,665	6,348	3,237	2,726	2,944	2,228	2,350	2,518	1,995	1,661	1,420	1,389
2G. Other product manufacture and use	291	449	371	364	368	395	336	297	259	275	270	308	359
3. Agriculture	12,479	11,662	11,279	11,171	11,225	11,328	11,757	11,124	10,958	11,277	11,209	11,133	11,041
3B. Manure management	4,249	4,038	3,936	4,188	4,278	4,422	4,524	4,625	4,710	4,650	4,654	4,597	4,543
3D. Agricultural soils	8,192	7,591	7,314	6,958	6,921	6,880	7,209	6,475	6,225	6,605	6,533	6,514	6,476
3F. Field burning of agricultural residue	39	34	29	26	26	25	25	24	23	22	22	22	21
4. LULUCF	336	314	281	257	249	241	234	228	221	216	213	210	209
5. Waste	2,781	3,297	3,489	3,345	3,421	3,318	3,139	3,104	3,028	2,926	2,949	2,944	2,957
5B. Biological treatment of solid waste	139	137	139	215	243	250	241	271	269	236	259	256	257
5C. Incineration and open burning of waste	1,435	1,905	2,155	1,898	1,963	1,843	1,694	1,629	1,571	1,517	1,524	1,561	1,568
5D. Wastewater treatment and discharge	1,207	1,256	1,195	1,232	1,214	1,224	1,204	1,204	1,188	1,174	1,166	1,127	1,132
Total (including LULUCF)	32,240	33,541	30,344	26,157	25,760	25,775	25,206	24,320	23,851	23,516	23,040	22,694	22,667
Total (excluding LULUCF)	31,903	33,227	30,062	25,900	25,511	25,534	24,972	24,092	23,631	23,301	22,827	22,485	22,458

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

1.1.3.4 HFCs

Hydrofluorocarbons emissions in CY2013[5] were 31.8 million tonnes CO_2 eq., accounting for 2.3% of total GHGs emissions. They increased by 99.4% since CY1990, and by 149.7% compared to CY2005. Their increase since CY1990 is mainly a result of an increase in emissions from refrigeration and air conditioning (+28.7 million tonnes CO_2 eq.) substituting HCFC (an ozone depleting substance), despite a decrease in emissions of HFC-23 (-99.9%) 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.

Breakdown of the CY2013 emissions shows that the largest source is refrigerants of refrigeration and air conditioning equipment accounting for 90%. It is followed by foam blowing agents (7%).

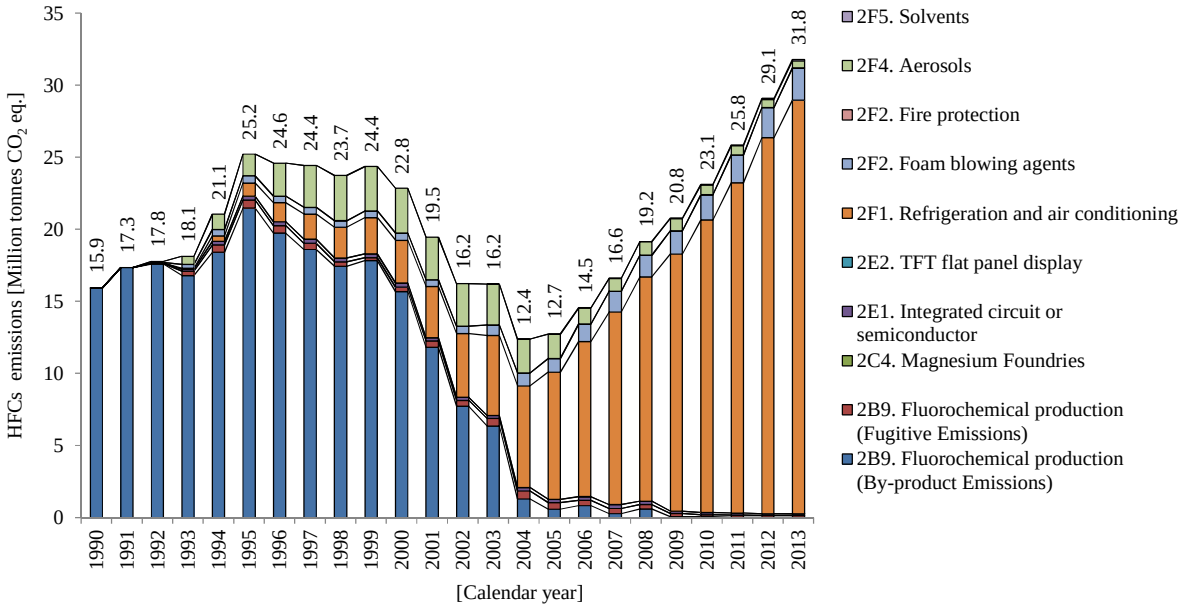


Figure 1-8 Trends in HFCs emissions

Table 1-5 Trends in HFCs emissions

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2B9. Fluorochemical production	15,930	22,019	15,984	1,853	1,035	1,198	632	900	284	181	168	138	147
By-product Emissions	15,929	21,460	15,688	1,288	586	831	275	593	50	53	16	18	16
Fugitive Emissions	2	559	296	565	449	367	357	306	234	128	151	120	131
2C4. Magnesium production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	1	1
2E. Electronics industry	1	271	285	236	227	246	266	237	152	168	145	124	112
2E1. Integrated circuit or semiconductor	1	271	283	233	224	243	263	234	150	165	142	122	109
2E2. TFT flat panel display	0.001	0.3	2	3	3	3	3	3	2	3	3	2	2
2F. Product uses as substitutes for ODS	1	2,922	6,578	10,291	11,462	13,105	15,705	18,016	20,343	22,765	25,533	28,824	31,516
2F1. Refrigeration and air conditioning	NO	924	2,972	7,040	8,818	10,775	13,364	15,553	17,841	20,292	22,915	26,093	28,693
2F2. Foam blowing agents	1	497	484	901	937	1,194	1,429	1,510	1,608	1,749	1,923	2,081	2,229
2F2. Fire protection	NO	NO	5	7	7	7	8	8	8	8	8	9	9
2F4. Aerosols	NO	1,502	3,117	2,341	1,695	1,123	895	931	845	666	634	561	489
2F5. Solvents	NO	NO	NO	3	4	5	10	14	42	50	52	81	96
Total	15,932	25,212	22,847	12,379	12,724	14,548	16,603	19,153	20,780	23,114	25,847	29,088	31,777

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

1.1.3.5 PFCs

Perfluorocarbons emissions in CY2013 were 3.3 million tonnes CO_2 eq., accounting for 0.2% of total GHGs emissions. They decreased by 49.8% since CY1990, and by 62.0% compared toFY2005. Their decrease since CY1990 is mainly a result of a decrease in emissions from the solvents. (-66.6%)

Breakdown of the CY2013 emissions shows that the largest source is semiconductor for manufacture accounting for 47%. It is followed by solvents such as those for washing metals (46%) and fugitive emissions from fluorochemical production (PFCs) (3%).

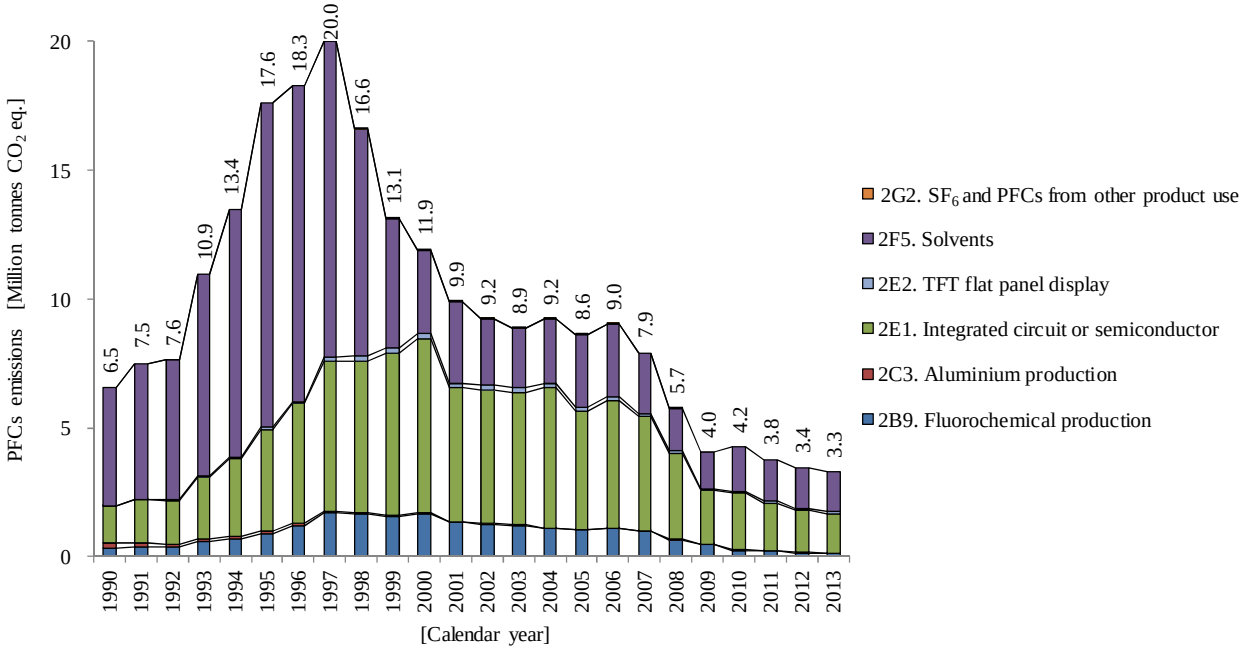


Figure 1-9 Trends in PFCs emissions

Table 1-6 Trends in PFCs emissions

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2B9. Fluorochemical production	331	914	1,661	1,086	1,041	1,091	977	649	459	248	206	148	111
2C3. Aluminium production	204	104	26	22	22	22	22	22	16	15	15	13	10
2E. Electronics industry	1,455	4,020	6,986	5,612	4,746	5,092	4,540	3,422	2,148	2,261	1,922	1,692	1,631
2E1. Integrated circuit or semiconductor	1,423	3,933	6,771	5,433	4,594	4,935	4,433	3,339	2,109	2,214	1,863	1,624	1,556
2E2. TFT flat panel display	31	87	214	179	152	158	107	83	39	46	59	68	76
2F5. Solvents	4,550	12,572	3,200	2,496	2,815	2,793	2,377	1,648	1,420	1,721	1,605	1,583	1,518
2G2. SF_6 and PFCs from other product use	NO	NO	NO	0.2	0.3	0.6	1.4	2	3	4	6	NO	10
Total	6,539	17,610	11,873	9,217	8,623	8,999	7,917	5,743	4,047	4,250	3,755	3,436	3,280

1.1.3.6 SF_6

Sulfur hexafluoride emissions in CY2013 were 2.2 million tonnes CO_2 eq., accounting for 0.2% of total GHGs emissions. They decreased by 83.1% since CY1990, and by 57.2% compared to CY2005. Their decrease since CY1990 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. (-92.1%)

Breakdown of the CY2013 emissions shows that the largest source is other product use (e.g. accelerator, etc.) accounting for 42%. It is followed by electrical equipment (30%) and integrated circuit and semiconductor manufacture (8%).

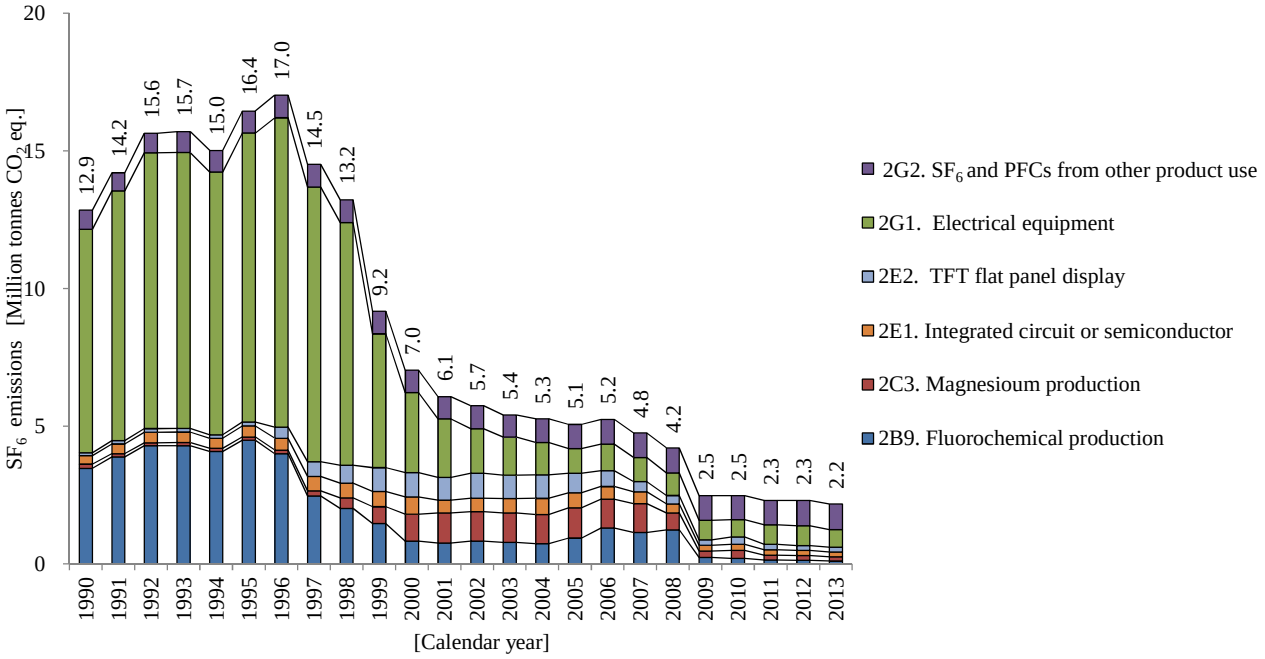


Figure 1-10 Trends in SF_6 emissions

Table 1-7 Trends in SF_6 emissions

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2B9. Fluorochemical production	3,471	4,492	821	730	930	1,303	1,144	1,229	233	189	132	123	93
2C3. Magnesioum production	147	114	980	1,060	1,104	1,041	1,039	622	228	294	182	182	160
2E. Electronics industry	419	542	1,506	1,438	1,252	1,036	796	625	410	494	394	356	351
2E1. Integrated circuit or semiconductor	309	400	629	588	540	463	431	329	211	225	196	184	181
2E2. TFT flat panel display	110	142	877	850	712	572	366	296	199	269	198	172	170
2G. Other product manufacture and use	8,814	11,300	3,724	2,031	1,778	1,864	1,776	1,730	1,604	1,492	1,590	1,638	1,562
2G1. Electrical equipment	8,112	10,498	2,910	1,179	899	967	880	828	711	622	707	719	643
2G2. SF_6 and PFCs from other product use	702	802	815	852	878	897	896	902	893	870	884	919	919
Total	12,850	16,448	7,031	5,259	5,064	5,244	4,755	4,206	2,475	2,468	2,300	2,299	2,166

1.1.3.7 NF_3

Nitrogen trifluoride emissions in CY2013 were 1.4 million tonnes CO_2 eq., accounting for 0.1% of total GHGs emissions. They increased to 41 times since CY1990, and by 9.1% compared to CY2005. Their increase since CY1990 (to 400 times) is mainly a result of an increase in fugitives from florocarbon production (NF_3).

Breakdown of the CY2013 emissions shows that the largest source is fluorochemical production accounting for 90%. It is followed by semiconductor manufacture (8%) and liquid crystal manufacture (2%).

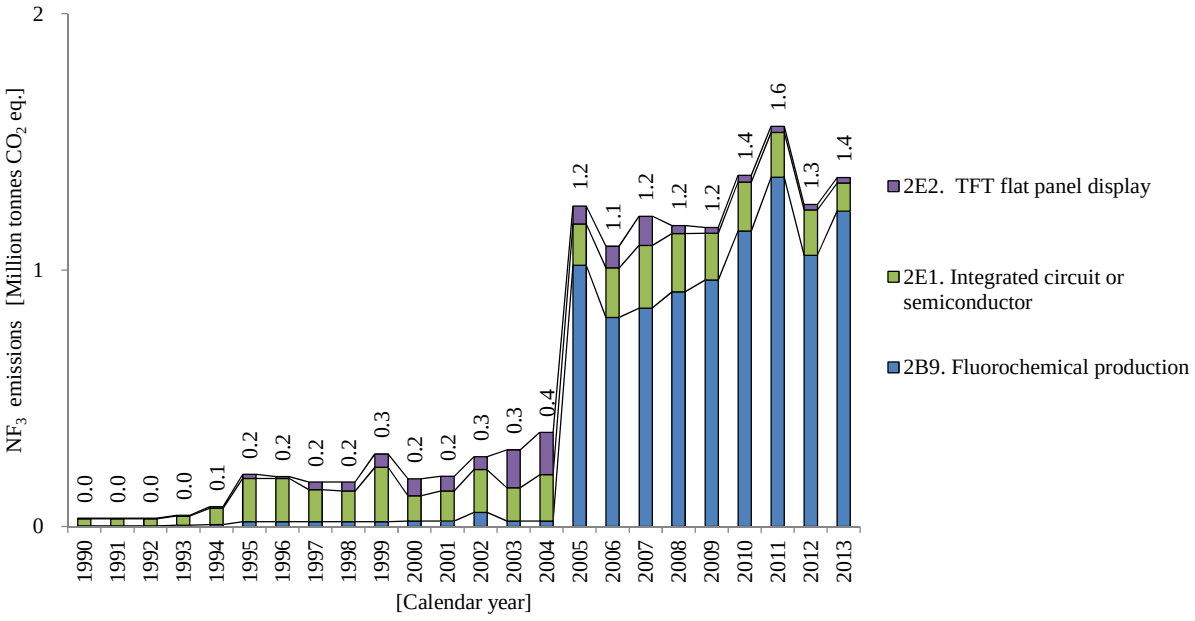


Figure 1-11 Trends in NF_3 emissions

Table 1-8 Trends in NF_3 emissions

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2B9. Fluorochemical production	3	19	21	21	1,018	815	851	915	961	1,152	1,362	1,058	1,230
2E. Electronics industry	30	184	165	347	232	278	359	258	205	217	199	198	131
2E1. Integrated circuit or semiconductor	27	168	100	182	161	193	245	227	182	191	175	177	110
2E2. TFT flat panel display	3	16	66	165	71	85	114	31	23	26	24	21	21
Total	33	203	186	367	1,250	1,093	1,210	1,173	1,167	1,369	1,561	1,256	1,361

1.1.4 Trends in GHG Emissions and Removals by Sectors

The breakdown of GHGs emissions and removals in FY2013 by sector[6] shows that energy accounts for 89.5% of total GHGs emissions. It is followed by industrial processes and product use (6.2%), agriculture (2.8%) and waste (1.5%).

Removals from LULUCF sector in FY2013 account for 4.6% of total GHGs emissions.

[6] It implies "Sector" indicated in the 2006 IPCC Guidelines and CRF.

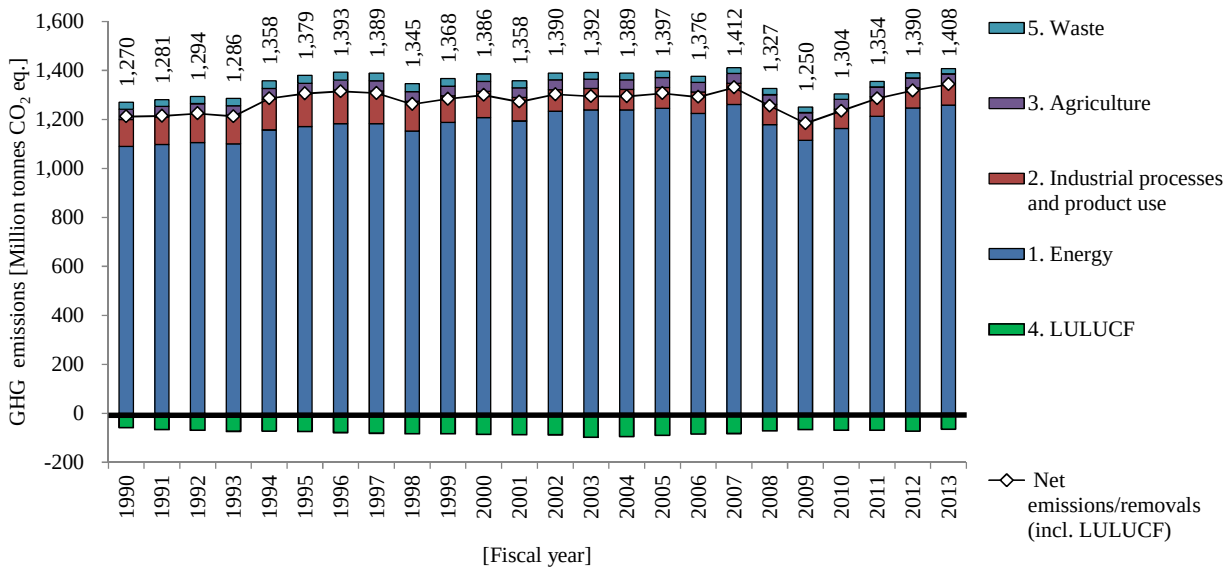


Figure 1-12 Trends in GHG emissions and removals by sector

Table 1-9 Trends in GHG emissions and removals by sector

[Million tonnes CO_2 eq.]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1. Energy	1,089.9	1,097.2	1,105.6	1,100.3	1,157.2	1,170.6	1,182.5	1,182.2	1,153.1	1,188.2
2. Industrial processes and product use	109.3	113.6	115.5	117.7	125.0	135.0	137.1	134.1	121.5	108.6
3. Agriculture	42.9	41.6	43.3	38.8	44.1	42.2	41.3	40.9	39.1	39.5
4. LULUCF	-58.5	-66.6	-69.2	-73.2	-72.5	-74.1	-78.7	-82.0	-83.2	-83.7
5. Waste	28.2	28.1	29.3	28.8	31.3	31.5	31.7	32.1	31.7	31.2
Net emissions/removals (incl. LULUCF)	1,211.8	1,213.9	1,224.5	1,212.5	1,285.1	1,305.2	1,314.1	1,307.3	1,262.2	1,283.8
Emissions (excl. LULUCF)	1,270.2	1,280.6	1,293.7	1,285.6	1,357.6	1,379.3	1,392.7	1,389.3	1,345.4	1,367.6

[Million tonnes CO_2 eq.]	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1. Energy	1,208.3	1,194.0	1,233.5	1,239.1	1,238.6	1,245.7	1,224.1	1,260.8	1,178.8	1,113.9
2. Industrial processes and product use	106.6	95.5	88.4	87.0	83.7	84.7	87.3	86.4	82.1	74.8
3. Agriculture	40.1	39.5	39.6	38.2	39.8	40.0	39.6	40.8	40.3	39.5
4. LULUCF	-86.4	-86.6	-88.2	-97.7	-95.1	-89.6	-84.2	-82.3	-71.4	-66.6
5. Waste	31.0	29.2	28.1	27.8	26.9	26.1	24.8	24.1	25.4	22.2
Net emissions/removals (incl. LULUCF)	1,299.6	1,271.6	1,301.6	1,294.4	1,293.9	1,306.9	1,291.7	1,329.9	1,255.2	1,183.9
Emissions (excl. LULUCF)	1,386.0	1,358.2	1,389.8	1,392.1	1,389.0	1,396.5	1,375.8	1,412.2	1,326.6	1,250.4

[Million tonnes CO_2 eq.]	2010	2011	2012	2013
1. Energy	1,163.1	1,212.5	1,246.2	1,259.5
2. Industrial processes and product use	78.2	80.0	82.6	86.9
3. Agriculture	40.7	40.3	39.7	39.5
4. LULUCF	-69.4	-69.2	-72.8	-64.7
5. Waste	22.3	21.5	21.9	21.8
Net emissions/removals (incl. LULUCF)	1,234.9	1,285.1	1,317.7	1,343.1
Emissions (excl. LULUCF)	1,304.3	1,354.3	1,390.5	1,407.8

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

1.1.4.1 Energy

Emissions from the energy sector in FY2013 were 1,259 million tonnes CO_2 eq. They increased by 15.6% since FY1990 and by 1.1% compared to FY2005.

Breakdown of the FY2013 emissions shows that CO_2 from fuel combustion accounts for 99.2%. The largest source within fuel combustion[7] is liquid fuel CO_2, which accounted for 41%, and is then followed by solid fuel CO_2 (37%) and gaseous fuel CO_2 (21%).

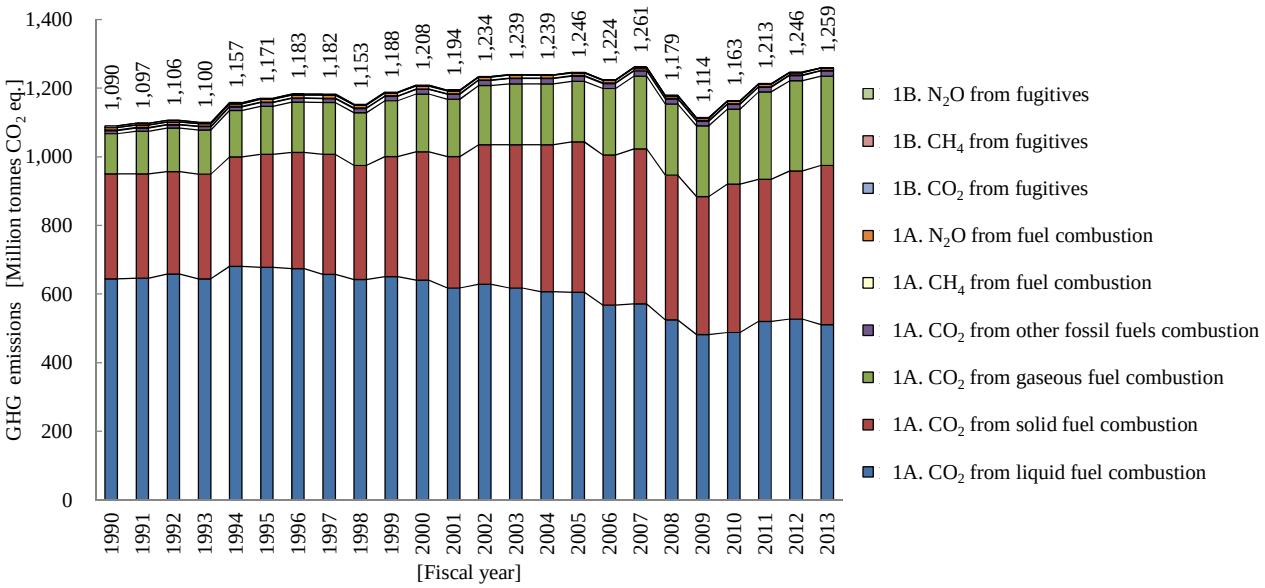


Figure 1-13 Trends in GHG emissions from the energy sector

Table 1-10 Trends in GHG emissions from the energy sector

[Thousand tonnes CO_2 eq.]

Source category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1A. Fuel combustion	1,084,706	1,167,412	1,205,955	1,237,169	1,244,187	1,222,520	1,259,256	1,177,305	1,112,524	1,161,783	1,211,170	1,244,901	1,258,202
Liquid fuel CO_2	644,730	677,734	640,355	607,178	605,901	567,701	571,149	525,131	481,800	488,214	520,447	527,127	510,640
Solid fuel CO_2	305,968	329,370	374,429	427,969	437,445	437,076	451,963	420,978	402,354	432,060	414,290	431,434	464,191
Gaseous fuel CO_2	116,536	139,951	167,825	176,916	176,128	194,146	211,905	207,523	206,203	218,823	253,920	262,639	260,216
Other fossil fuels (Waste) CO_2	9,315	10,732	13,419	15,901	15,455	14,511	15,188	14,914	13,841	13,812	14,090	15,333	14,774
CH_4	1,425	1,473	1,353	1,422	1,487	1,535	1,540	1,544	1,459	2,047	1,685	1,687	1,668
N_2O	6,732	8,153	8,574	7,783	7,772	7,549	7,511	7,216	6,867	6,827	6,737	6,681	6,712
1B. Fugitive emissions from fuel	5,165	3,169	2,347	1,454	1,484	1,536	1,591	1,512	1,417	1,360	1,345	1,341	1,297
CO_2	192	521	512	478	508	553	616	565	501	475	477	490	480
CH_4	4,973	2,647	1,836	977	976	982	975	947	916	885	867	851	817
N_2O	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1C. CO_2 transport and storage	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
Total	1,089,871	1,170,581	1,208,303	1,238,623	1,245,671	1,224,056	1,260,847	1,178,818	1,113,942	1,163,143	1,212,514	1,246,242	1,259,499

1.1.4.2 Industrial Processes and Product Use

Emissions from the industrial processes and product use sector in FY2013 were 86.9 million tonnes CO_2 eq. They decreased by 20.4% since FY1990, and increased by 2.6% compared to FY2005.

The breakdown of GHGs emissions from this sector in FY2013 shows that the largest source is the mineral industry such as CO_2 emissions from limestone in the cement production accounting for 40%. It is followed by HFCs emissions from product uses as ODS (Ozone Depleting Substance) substitutes (36%) and CO_2 emissions from the metal industry (7%).

The main driving factors for decrease in emissions since FY1990 are 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

[7] Fuel types are categorized in accordance with classification indicated in the 2006 IPCC Guidelines and the CRF.

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, the decrease in N_2O emissions from adipic acid production (chemical industry) as the N_2O abatement equipment came on stream.

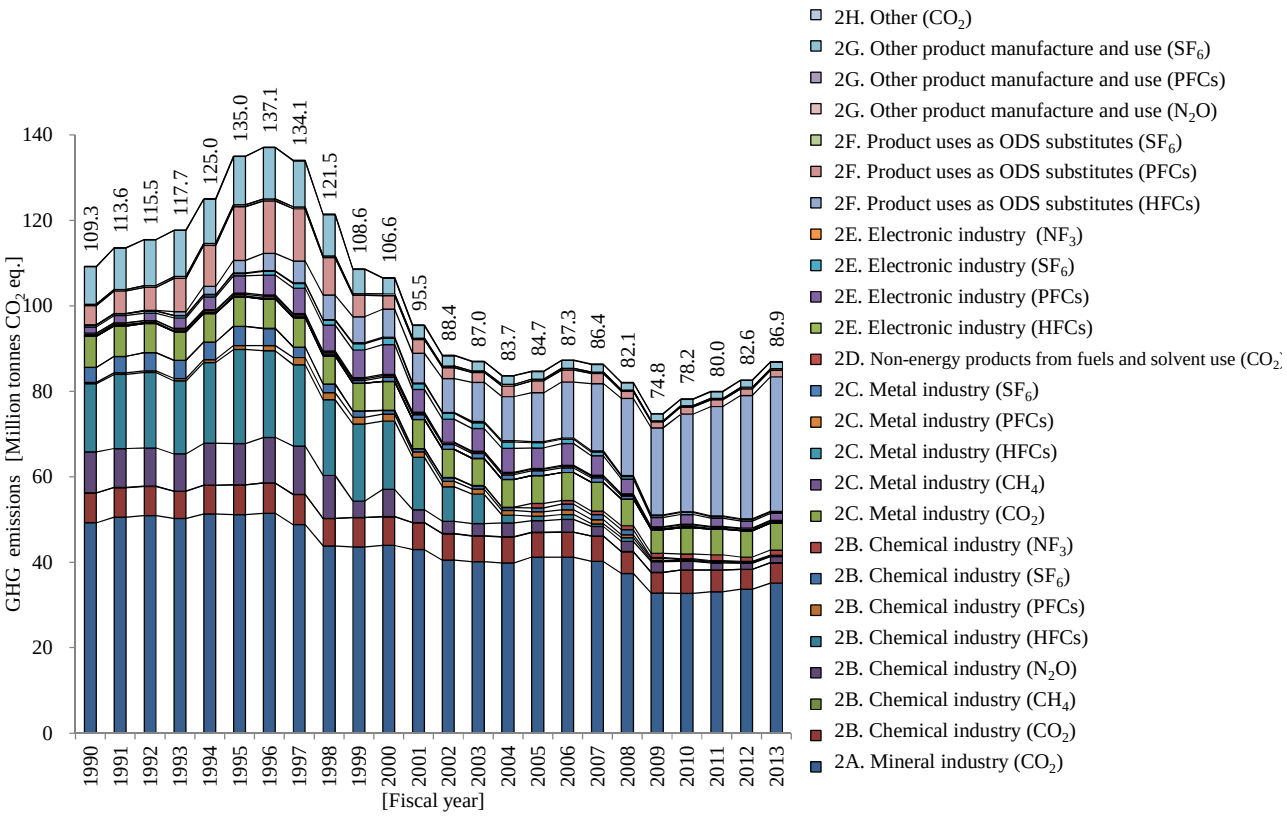


Figure 1-14 Trends in GHG emissions from the industrial processes sector

Table 1-11 Trends in GHG emissions from the industrial processes sector

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2A. Mineral industry (CO_2)	49,221	51,135	43,897	39,805	41,214	41,180	40,182	37,413	32,770	32,754	33,103	33,699	35,112
2B. Chemical industry	36,368	44,087	31,641	13,056	12,541	13,224	11,794	11,149	9,328	9,192	8,633	7,532	7,756
CO_2	6,977	6,941	6,771	6,097	5,757	5,838	5,931	5,074	4,837	5,390	5,067	4,618	4,757
CH_4	37	37	34	33	34	34	30	32	36	36	36	28	28
N_2O	9,620	9,665	6,348	3,237	2,726	2,944	2,228	2,350	2,518	1,995	1,661	1,420	1,389
HFCs	15,930	22,019	15,984	1,853	1,035	1,198	632	900	284	181	168	138	147
PFCs	331	914	1,661	1,086	1,041	1,091	977	649	459	248	206	148	111
SF_6	3,471	4,492	821	730	930	1,303	1,144	1,229	233	189	132	123	93
NF_3	3	19	21	21	1,018	815	851	915	961	1,152	1,362	1,058	1,230
2C. Metal industry	7,646	7,088	7,767	7,585	7,644	7,657	7,786	6,910	5,739	6,440	6,196	6,317	6,489
CO_2	7,273	6,849	6,740	6,484	6,498	6,574	6,705	6,248	5,479	6,114	5,980	6,102	6,301
CH_4	23	21	20	20	20	20	21	18	15	18	18	18	18
HFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	1	1
PFCs	204	104	26	22	22	22	22	22	16	15	15	13	10
SF_6	147	114	980	1,060	1,104	1,041	1,039	622	228	294	182	182	160
2D. Non-energy products from fuels and solvent use (CO_2)	392	390	385	363	361	368	356	329	333	339	316	289	299
2E. Electronic industry	1,904	5,016	8,941	7,633	6,457	6,652	5,960	4,542	2,916	3,140	2,661	2,370	2,225
HFCs	1	271	285	236	227	246	266	237	152	168	145	124	112
PFCs	1,455	4,020	6,986	5,612	4,746	5,092	4,540	3,422	2,148	2,261	1,922	1,692	1,631
SF_6	419	542	1,506	1,438	1,252	1,036	796	625	410	494	394	356	351
NF_3	30	184	165	347	232	278	359	258	205	217	199	198	131
2F. Product uses as ODS substitutes	4,551	15,495	9,778	12,787	14,276	15,898	18,082	19,664	21,764	24,485	27,138	30,407	33,034
HFCs	1	2,922	6,578	10,291	11,462	13,105	15,705	18,016	20,343	22,765	25,533	28,824	31,516
PFCs	4,550	12,572	3,200	2,496	2,815	2,793	2,377	1,648	1,420	1,721	1,605	1,583	1,518
SF_6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2G. Other product manufacture and use	9,105	11,749	4,096	2,395	2,146	2,260	2,112	2,029	1,866	1,771	1,867	1,946	1,931
N_2O	291	449	371	364	368	395	336	297	259	275	270	308	359
PFCs	NO	NO	NO	0.2	0.3	1	1	2	3	4	6	NO	10
SF_6	8,814	11,300	3,724	2,031	1,778	1,864	1,776	1,730	1,604	1,492	1,590	1,638	1,562
2H. Other (CO_2)	64	72	87	86	90	88	86	72	71	76	76	76	82
Total	109,252	135,032	106,591	83,710	84,729	87,325	86,360	82,108	74,787	78,197	79,990	82,637	86,929

1.1.4.3 Agriculture

Emissions from the agriculture sector in FY2013 were 39.5 million tonnes CO_2 eq. They decreased by 7.9% since FY1990 and by 1.2% compared to FY2005.

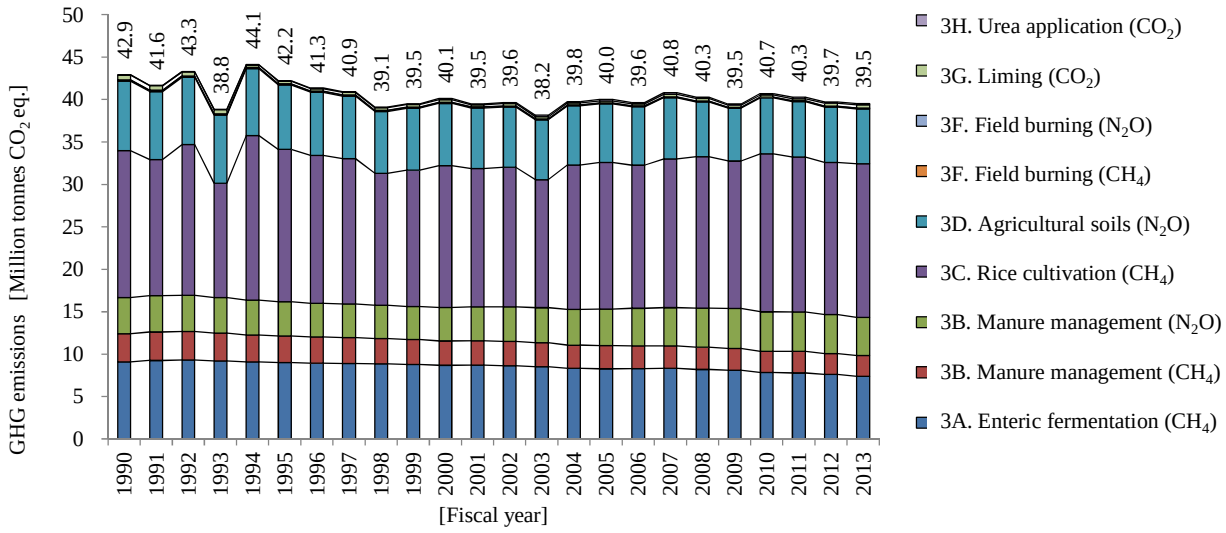


Figure 1-15 Trends in GHG emissions from the agriculture sector

Breakdown of the FY2013 emissions from this sector shows that the largest source is the rice cultivation (CH_4) accounting for 46%. It is followed the enteric fermentation (CH_4) by (19%), and the agricultural soils (N_2O) (16%) as a result of the nitrogen-based fertilizer applications.

The main driving factor for decrease in emissions since FY1990 is the decrease in N_2O emissions from the agricultural soils, because the amount of nitrogen fertilizers applied to cropland had decreased, and the decrease in CH_4 emissions from enteric fermentation due to the decrease in the number of dairy cattle.

Table 1-12 Trends in GHG emissions from the agriculture sector

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
3A. Enteric fermentation (CH_4)	9,064	8,993	8,682	8,319	8,287	8,305	8,320	8,204	8,094	7,829	7,794	7,607	7,401
3B. Manure management	7,603	7,184	6,815	6,943	7,011	7,099	7,158	7,222	7,279	7,169	7,176	7,070	6,955
CH_4	3,354	3,146	2,880	2,755	2,733	2,677	2,635	2,597	2,570	2,519	2,522	2,472	2,411
N_2O	4,249	4,038	3,936	4,188	4,278	4,422	4,524	4,625	4,710	4,650	4,654	4,597	4,543
3C. Rice cultivation (CH_4)	17,294	17,942	16,726	17,029	17,275	16,865	17,520	17,833	17,377	18,596	18,254	17,921	18,077
3D. Agricultural soils (N_2O)	8,192	7,591	7,314	6,958	6,921	6,880	7,209	6,475	6,225	6,605	6,533	6,514	6,476
3F. Field burning of agricultural residues	163	142	124	109	111	107	104	101	98	95	94	92	91
CH_4	125	109	94	83	85	82	80	77	75	73	72	70	69
N_2O	39	34	29	26	26	25	25	24	23	22	22	22	21
3G. Liming (CO_2)	550	304	333	236	231	230	325	306	270	243	247	370	370
3H. Urea application (CO_2)	59	56	110	166	179	153	175	134	120	160	162	162	162
Total	42,925	42,211	40,104	39,761	40,015	39,640	40,812	40,275	39,464	40,697	40,260	39,735	39,531

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

Net removals (including CO_2, CH_4 and N_2O emissions) from the LULUCF sector in FY2013 was 64.7 million tonnes CO_2 eq. They increased by 10.6% since FY1990 and decreased by 27.9% compared to FY2005. The decline trend in removals in recent years is largely due to maturity of Japanese forest. The emissions from cropland and settlements have decreased since FY1990, because the land-use conversions to those land-use categories became less due to economic depression and the decline of agriculture, etc.

Breakdown of the FY2013 emissions and removals from this sector shows that the largest sink is the forest land and its removals were 68.2 million tonnes accounting for 105% of this sector's net total emissions / removals.

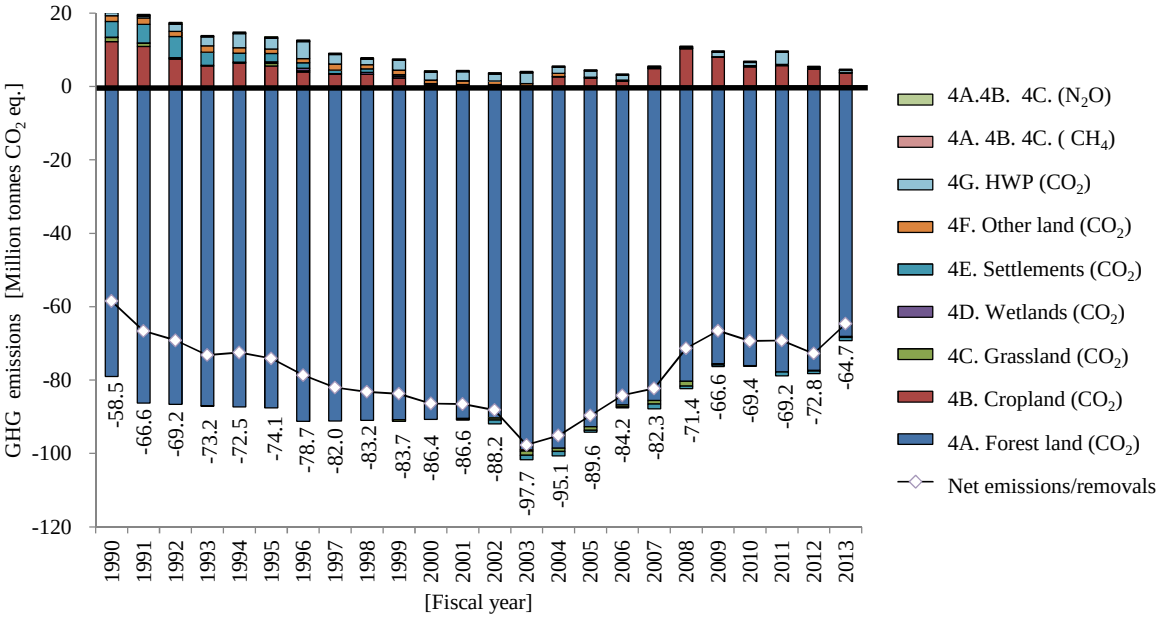


Figure 1-16 Trends in GHG emissions and removals from the LULUCF sector

Table 1-13 Trends in GHG emissions and removals from the LULUCF sector

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
4A. Forest land	-78,902	-87,441	-90,472	-98,352	-92,492	-86,656	-85,392	-80,163	-75,336	-75,878	-77,641	-77,226	-67,996
CO_2	-79,073	-87,612	-90,642	-98,528	-92,664	-86,820	-85,556	-80,351	-75,507	-76,044	-77,808	-77,389	-68,162
CH_4	10	10	9	14	11	3	2	26	10	5	6	2	4
N_2O	161	161	161	162	162	161	161	163	161	161	161	161	162.2
4B. Cropland	12,448	5,795	359	2,796	2,425	1,610	4,974	10,378	8,009	5,464	5,775	4,827	3,733
CO_2	12,237	5,611	209	2,670	2,307	1,499	4,869	10,280	7,917	5,376	5,690	4,745	3,652
CH_4	61	57	55	54	54	54	53	53	53	52	52	52	52
N_2O	149	127	95	72	65	58	51	45	39	35	33	31	30
4C. Grassland	1,144	714	59	-922	-1,016	-459	-974	-1,322	-252	-141	177	-165	-219
CO_2	1,129	698	44	-936	-1,031	-473	-988	-1,336	-266	-156	163	-179	-233
CH_4	2	2	2	2	2	2	2	2	2	2	2	2	2
N_2O	13	13	13	12	12	12	12	12	12	12	12	12	12
4D. Wetlands	90	358	425	56	57	41	33	34	69	51	45	32	45
CO_2	90	358	425	56	57	41	33	34	69	51	45	32	45
CH_4	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
N_2O	,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
4E. Settlements	4,235	2,292	92	-1,222	-488	-260	-1,260	-681	-490	19	-1,025	-681	-900
CO_2	4,235	2,292	92	-1,222	-488	-260	-1,260	-681	-490	19	-1,025	-681	-900
CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
N_2O	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
4F. Other land	1,557	1,307	968	794	168	201	122	173	147	212	128	154	107
CO_2	1,544	1,293	955	782	157	191	112	164	139	205	121	148	101
CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
N_2O	13	14	13	11	11	10	9	9	8	7	7	6	6
4G. HWP (CO_2)	947	2,894	2,170	1,758	1,702	1,356	226	226	1,291	907	3,317	308	570
4H. Other (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	-58,481	-74,082	-86,399	-95,092	-89,644	-84,165	-82,272	-71,353	-66,561	-69,367	-69,224	-72,751	-64,660

1.1.4.5 Waste

Emissions from the waste sector in FY2013 were 21.8 million tonnes CO_2 eq. They decreased by 22.6% since FY1990 and by 16.4% compared to FY2005.

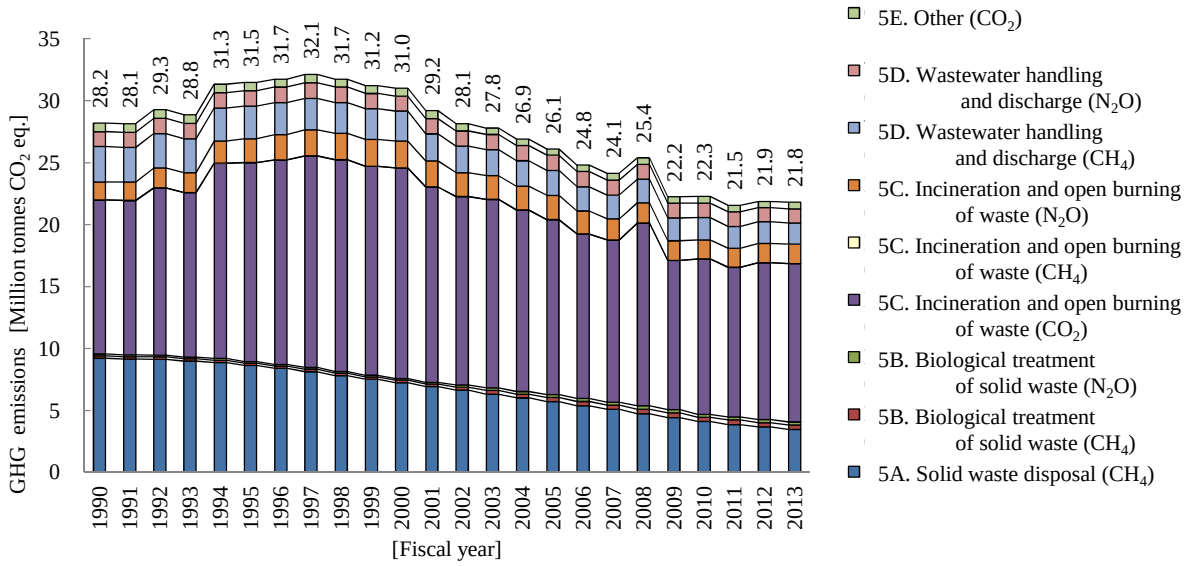


Figure 1-17 Trends in GHG emissions from the waste sector

Breakdown of the FY2013 emissions from this sector shows that the largest is CO_2 emissions from the waste incineration (58%), associated with waste derived from fossil fuels such as waste plastic and waste oil, followed by CH_4 emissions from solid waste disposal (16%) and from wastewater treatment and discharge (8%).

The main driving factor for decrease in emissions since FY1990 is the decrease in CH_4 emissions from the solid waste disposal on land as a result of decrease in the amount of disposal of biodegradable waste due to improvement of volume reduction ratio by intermediate treatment under Waste Management and Public Cleansing Act, Basic Law for Establishing the Recycling-based Society and other recycling laws.

Table 1-14 Trends in GHG emissions from the waste sector

[Thousand tonnes CO_2 eq.]

Category	1990	1995	2000	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
5A. Solid waste disposal (CH_4)	9,220	8,621	7,239	6,010	5,703	5,383	5,079	4,728	4,421	4,114	3,866	3,658	3,464
5B. Biological treatment of solid waste	334	328	333	515	582	600	579	651	646	565	621	615	617
CH_4	195	191	194	300	340	350	337	380	377	329	362	359	360
N_2O	139	137	139	215	243	250	241	271	269	236	259	256	257
5C. Incineration and open burning of waste	13,876	17,963	19,157	16,564	16,083	15,107	14,798	16,377	13,623	14,077	13,596	14,219	14,340
CO_2	12,424	16,041	16,986	14,647	14,103	13,248	13,090	14,734	12,040	12,549	12,060	12,646	12,760
CH_4	16	18	16	18	17	16	14	14	12	12	11	12	12
N_2O	1,435	1,905	2,155	1,898	1,963	1,843	1,694	1,629	1,571	1,517	1,524	1,561	1,568
5D. Wastewater treatment and discharge	4,067	3,884	3,627	3,294	3,220	3,191	3,123	3,099	3,027	2,980	2,941	2,865	2,849
CH_4	2,860	2,628	2,432	2,062	2,006	1,967	1,919	1,895	1,839	1,806	1,776	1,738	1,717
N_2O	1,207	1,256	1,195	1,232	1,214	1,224	1,204	1,204	1,188	1,174	1,166	1,127	1,132
5E. Other (CO_2)	703	668	656	507	507	522	561	530	514	527	524	515	547
Total	28,199	31,464	31,011	26,889	26,096	24,803	24,140	25,385	22,232	22,263	21,549	21,871	21,816

1.1.5 Factor Analysis of Trend of Energy-related CO_2 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 greenhouse gas emissions. Japan conducted a factor analysis of the trend of energy-related CO_2 regarding contribution of each factor to changes in emissions and utilize it for planning and implementation of mitigation policies and measures. Specifically, CO_2 emissions could be basically divided into three factors, "Factor of carbon intensity", "Factor of energy intensity" and "factor of activity". Emissions are shown as the product of several factors in each sector to calculate changes in emissions caused by changes of each factor in a quantitative manner. 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 measures so it is not consistent with emissions by sector in Greenhouse Gas Inventory and BR submitted to the UNFCCC. Carbon dioxide emissions with electricity and heat allocated to each end-use sector are shown in 1-15.

This section shows the summary of results of factor analysis of energy-related CO_2 for the period from FY2005 to FY2013.

Table 1-15 Energy-related CO_2 emissions with electricity and heat allocated by sector

	FY1990 [Share]	FY2005 [Share]	FY2013 (Compared to FY2005) [Share]
Total	1,067 [100%]	1,219 [100%]	1,235 (+1.3%) [100%]
Industries (factories, etc)	503 [47.2%]	457 [37.5%]	429 (-6.0%) [34.8%]
Transport (cars, etc)	206 [19.3%]	240 [19.7%]	225 (-6.3%) [18.2%]
Commercial and other (commerce, service, office, etc)	134 [12.5%]	239 [19.6%]	279 (+16.7%) [22.6%]
Residential	131 [12.3%]	180 [14.8%]	201 (+11.9%) [16.3%]
Energy Industries (power plants, etc)	92.4 [8.7%]	104 [8.5%]	101 (-2.9%) [8.2%]

(Unit: Mt-CO_2)

1.1.5.1 Total energy-related CO_2 emissions

Energy-related CO_2 emissions in FY2013 were 1,235 million t-CO_2, which was an increase by 1.3% compared to FY2005 and by 1.1% compared to the FY2012. The largest increase factors from FY2005 is "Factor of Carbon intensity" due to the changes of energy mix and CO_2 emission factor, followed by "Per unit of GDP factor" by economic development. On the other hand, the largest decrease factor is "Factor of Energy intensity" due to energy saving activities. Particularly after FY2011, the suspension of all nuclear power plants in Japan due to Fukushima Daiichi nuclear power plant accident caused by the Great East Japan Earthquake on March 11th, 2011 leads to the increase in fired power generation and the decrease of "Factor of Carbon intensity". However, energy intensity per unit of GDP improves due to the conversion of industrial structure and energy and power saving activities.

The formula for factor analysis of energy-related CO_2 emissions is shown in Figure 1-18. Please refer to "(Reference) Factor analysis of energy-related CO_2 emissions (Japanese only)"[8] for formula for factor analysis from Figure 1-21 to Figure 1-27.

[8] http://www.env.go.jp/earth/ondanka/ghg/2013yoinsankou.pdf

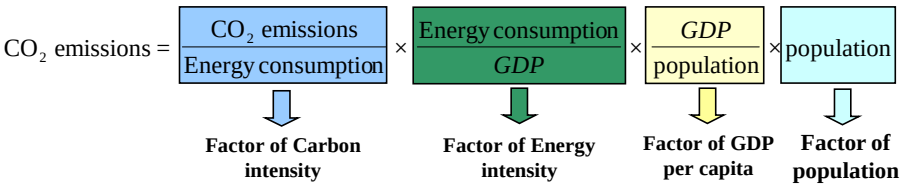


Figure 1-18 Formula for Factor analysis of energy-related CO_2 emissions

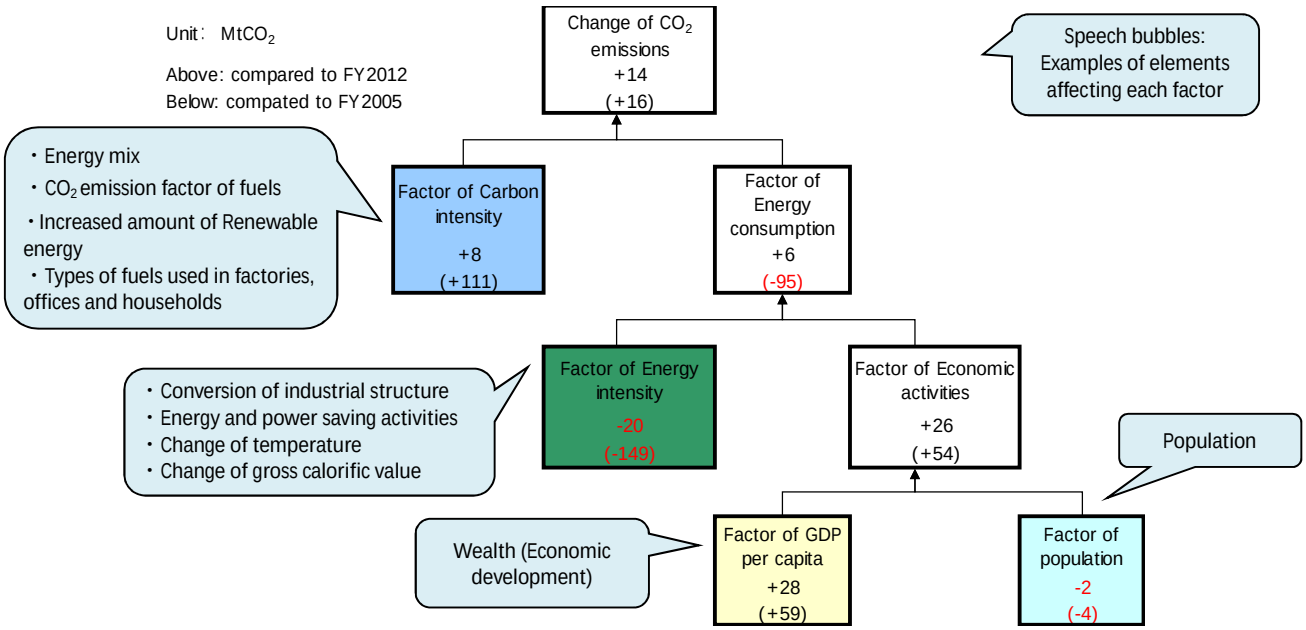


Figure 1-19 Factor of change of energy-related CO_2 emissions

Trends in increase or decrease factors of each FY from FY1990 to FY 2013 are shown in Figure 1-20. The largest increase factor in energy-related CO_2 emissions was “Per unit of GDP factor” due to the vitalization of production activities, followed by “Factor of CO_2 emission intensity” due to changes in CO_2 emission factor. On the other hand, the largest decrease factor is “Factor of energy intensity “accounting for most of decrease factor due to reduction of energy consumption such as saving electricity.

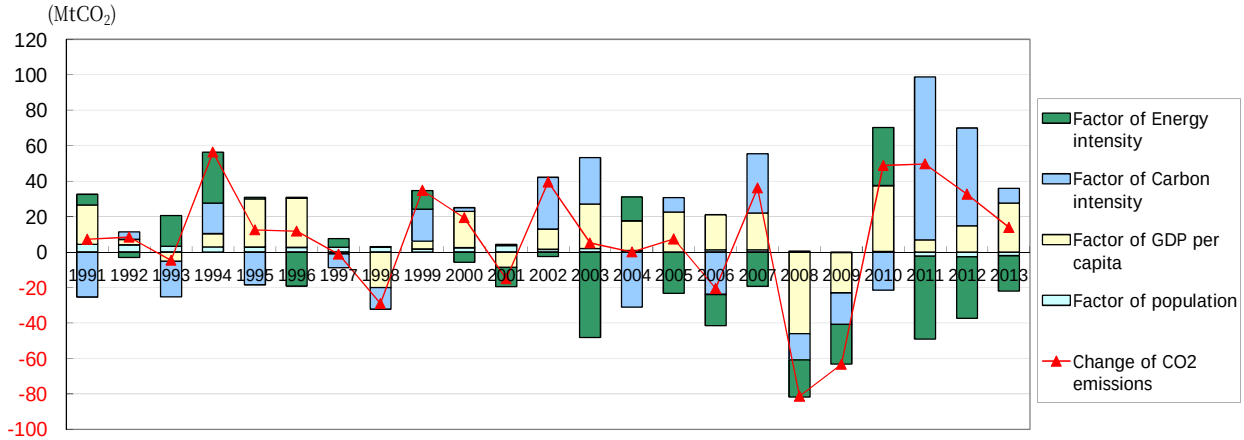


Figure 1-20 Trends of Factor of change of energy-related CO_2 emissions

1.1.5.2 Energy transformation sector (Power generation)

Carbon dioxide emissions (without electricity and heat allocated) in Energy transformation sector in FY2013 were 539million tonnes. They increased by 28.8% compared to FY2005 and by 0.7% compared to FY2012. Since emissions from power generation accounted for 90% of emissions, the result of factor analysis for power generation sector is shown below.

The increase factor from FY2005 is "Factor of energy mix" due to the increase of the share of fired power generation to total power generation caused by the decrease of the operating rate of nuclear plants. All the others are decrease factors. The largest decrease factor is "Factor of fuel mix" due to the change in types of fuels consumed for power generation, followed by "Factor of Power generation efficiency" due to the improvement of power generation efficiency and "Factor of Carbon intensity" due to changes in CO_2 emission factor.

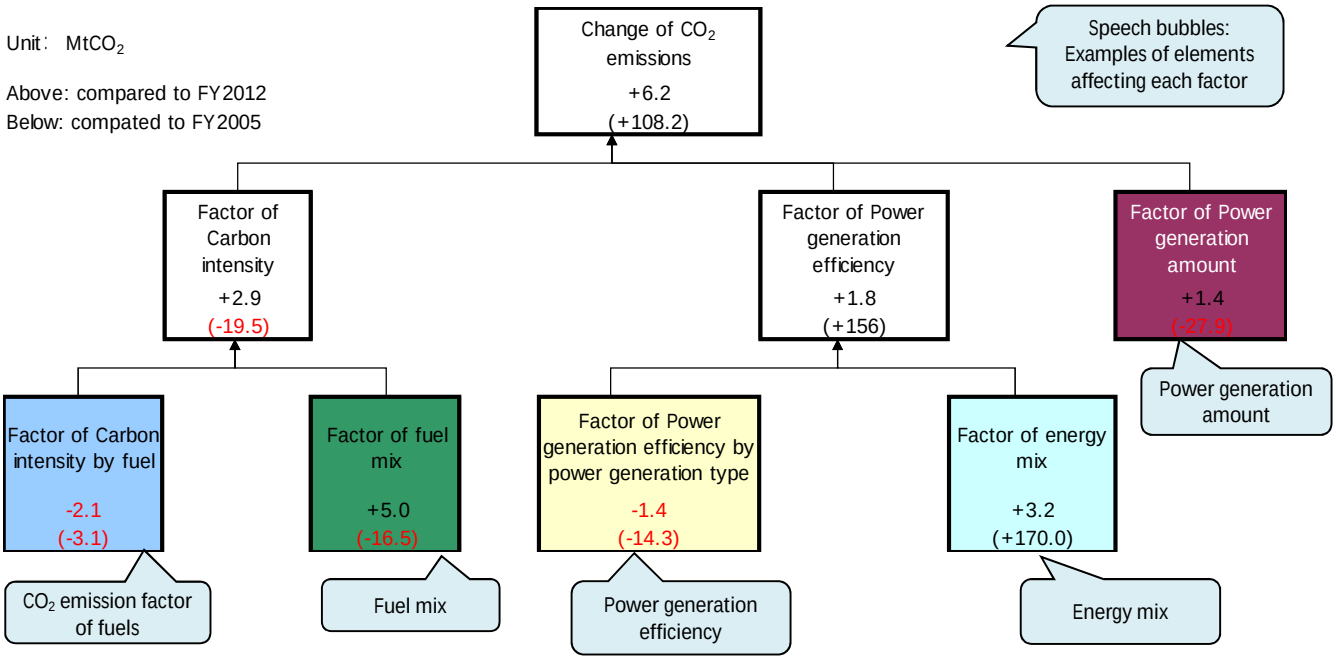


Figure 1-21 Factor of change of CO_2 emissions from Energy transformation sector (Power generation)

1.1.5.3 Industrial sector

(1) Manufacturing industry

Carbon dioxide emissions in the manufacturing industries in FY2013 were 413 million tonnes. They decreased by 6.2% compared to FY2005 and by 0.5% compared to FY2012.

The largest decrease factor from FY2005 is “Factor of Economic activity” due to the decrease of production activities, followed by “Factor of Energy intensity” due to the expansion of energy and power saving activities in factories.

The largest increase factor is “Factor of Carbon intensity (Purchased Electricity)” due to the change of energy mix.

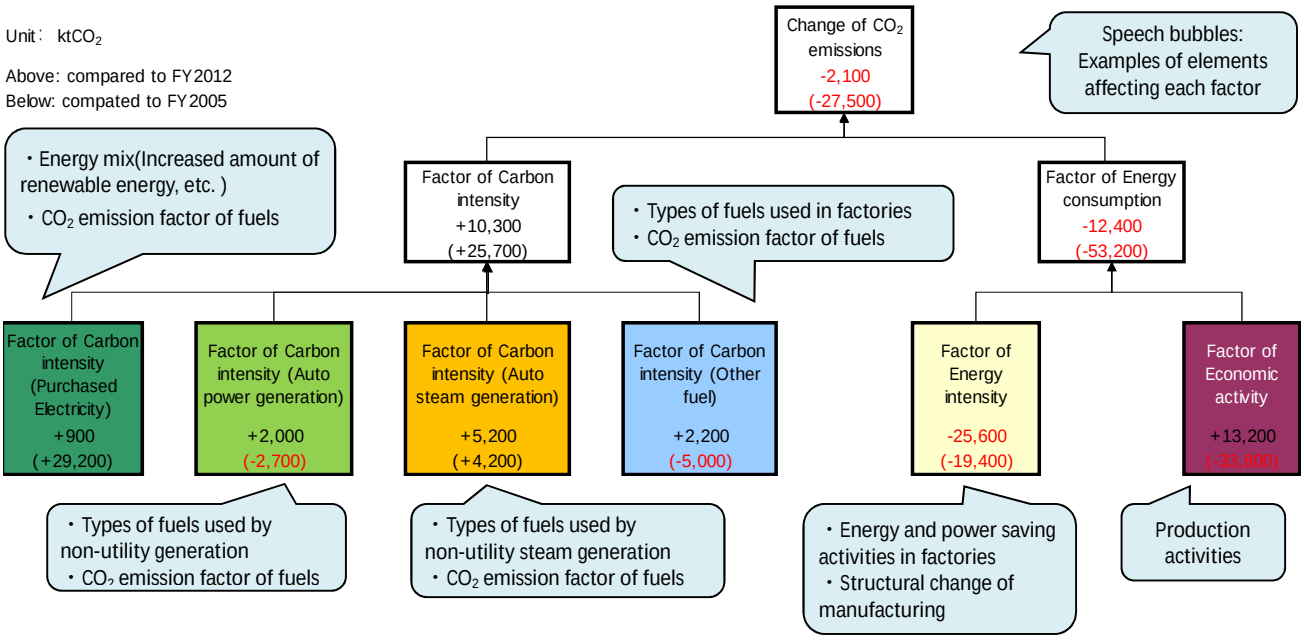


Figure 1-22 Factor of change of CO_2 emissions from Manufacturing sector

(2) Non-manufacturing industry

Carbon dioxide emissions in the non-manufacturing industries in FY2013 were 16.8 million tonnes. They increased by 0.4% compared to FY2005 and decreased by 4.7% compared to FY2012.

The largest increase factor from FY2005 is “Factor of Energy intensity”, followed by “Factor of Carbon intensity (Electricity)”. On the other hand, the decrease factor is “Factor of Economic activity” due to the decrease of production activities.

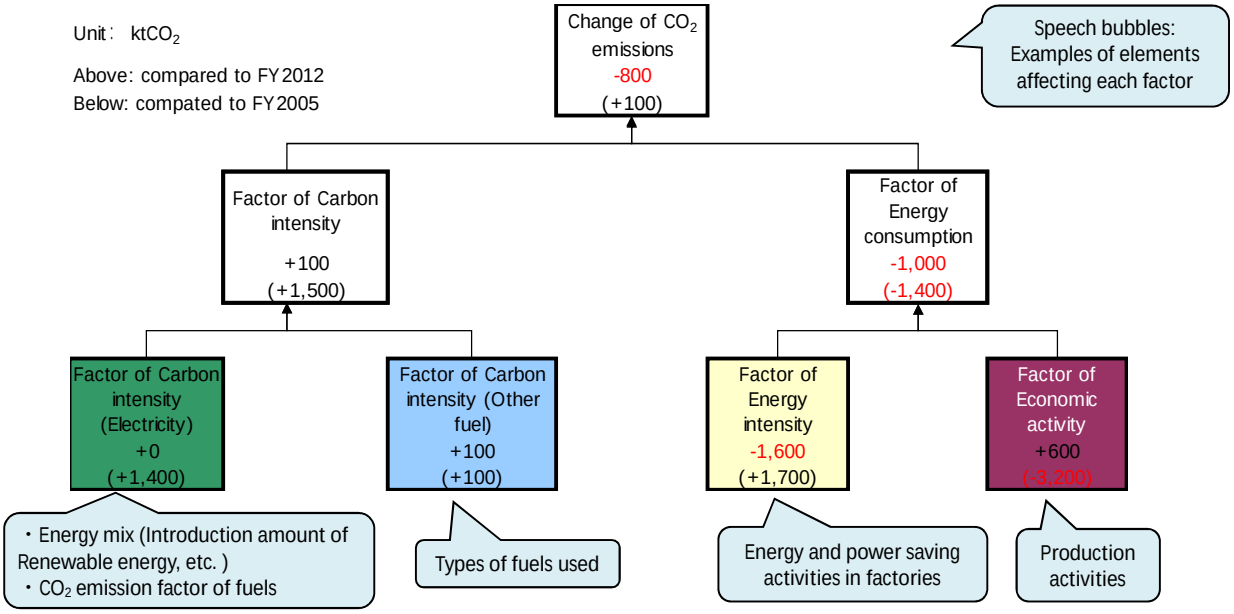


Figure 1-23 Factor of change of CO_2 emissions from Non-manufacturing sector

1.1.5.4 Transportation sector

(1) Passenger

Carbon dioxide emissions in the transportation sector (Passenger) in FY2013 were 138 million tonnes. They decreased by 3.5% compared to FY2005 and by 1.2% compared to FY2012.

Compared with FY2005, the largest decrease factor is “Factor of Energy intensity” due to the improvement of fuel efficiency. On the other hand, the largest increase factor is “Factor of Carbon intensity (Other fuel)” due to the change of energy mix, followed by “Factor of Carbon intensity (Electricity)” due to the change of energy mix and CO_2 emission factor.

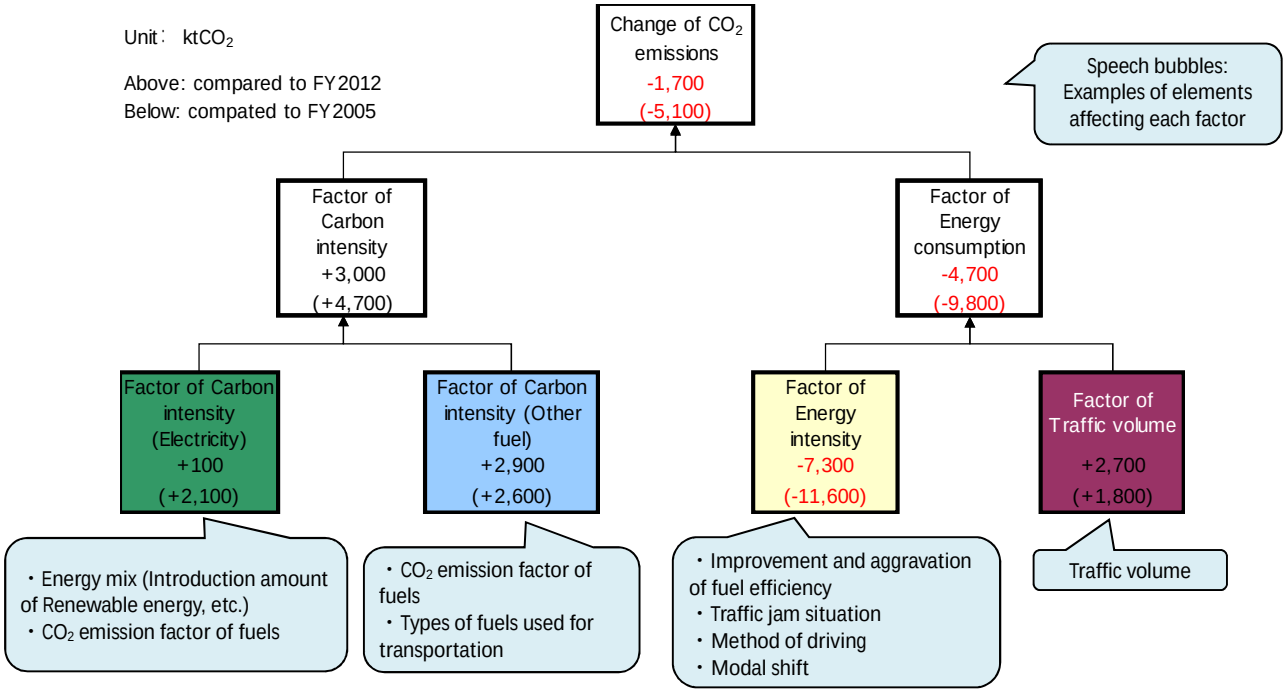


Figure 1-24 Factor of change of CO_2 emissions from Passenger sector (Transportation)

(2) Freight

Carbon dioxide emissions in the transportation sector (Freight) in FY2013 were 87 million tonnes. They decreased by 10.3% compared to FY2005 and increased by 0.1% compared to FY2012.

Compared with FY2005, the largest decrease factor is “Factor of Traffic volume” due to the decrease of the traffic volume, followed by “Factor of Energy intensity” due to the improvement of fuel efficiency and transport efficiency. On the other hands, the increase factors are “Factor of Carbon intensity (Other fuel)” and “Factor of Carbon intensity (Electricity)”.

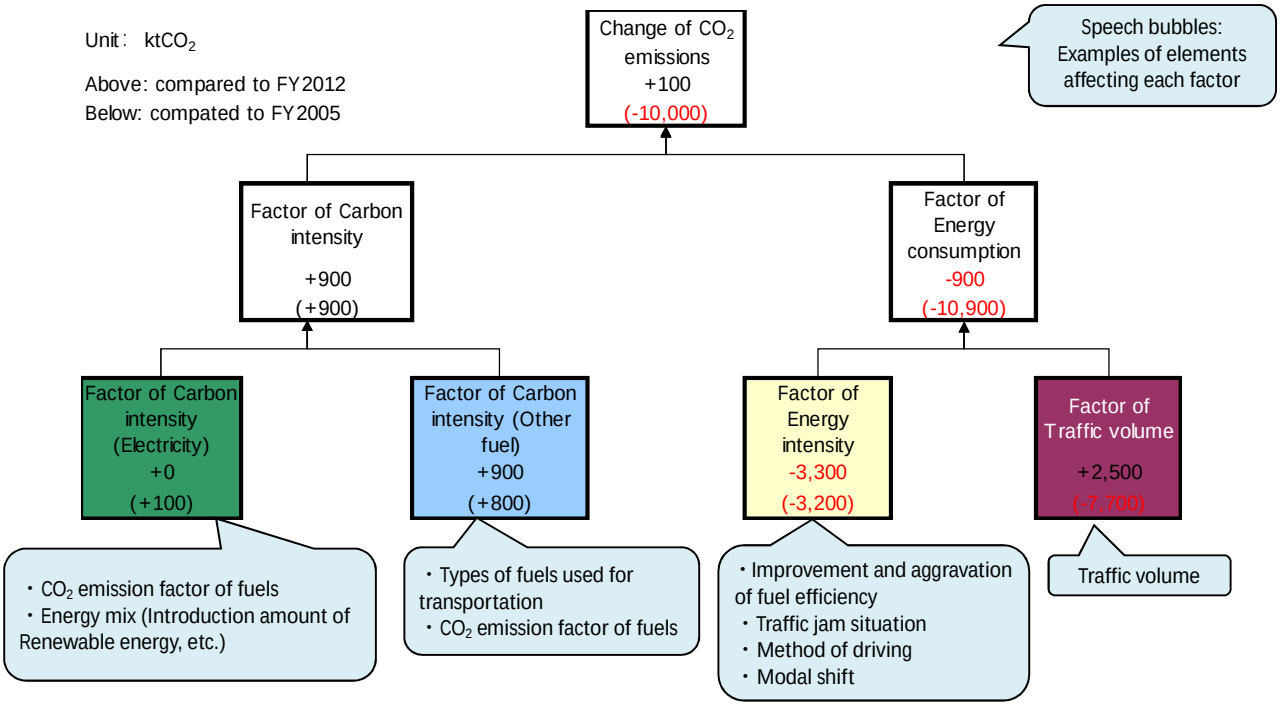


Figure 1-25 Factor of change of CO_2 emissions from Freight sector (Transportation)

1.1.5.5 Residential sector

Carbon dioxide emissions in Residential sector in FY2013 were 201 million tonnes. They increased by 11.9% compared to FY2005 and decreased by 1.3% compared to FY2012.

The largest increase factor from FY2005 is “Factor of Carbon intensity (Electricity)” due to the change of energy mix, followed by “Factor of number of households” due to the increase of the number of households. On the other hand, the largest decrease factor is “Factor of size of household” due to the decrease in size of household, followed by “Factor of Energy intensity (excluding Factor of Temperature)” due to the expansion of energy and power saving activities.

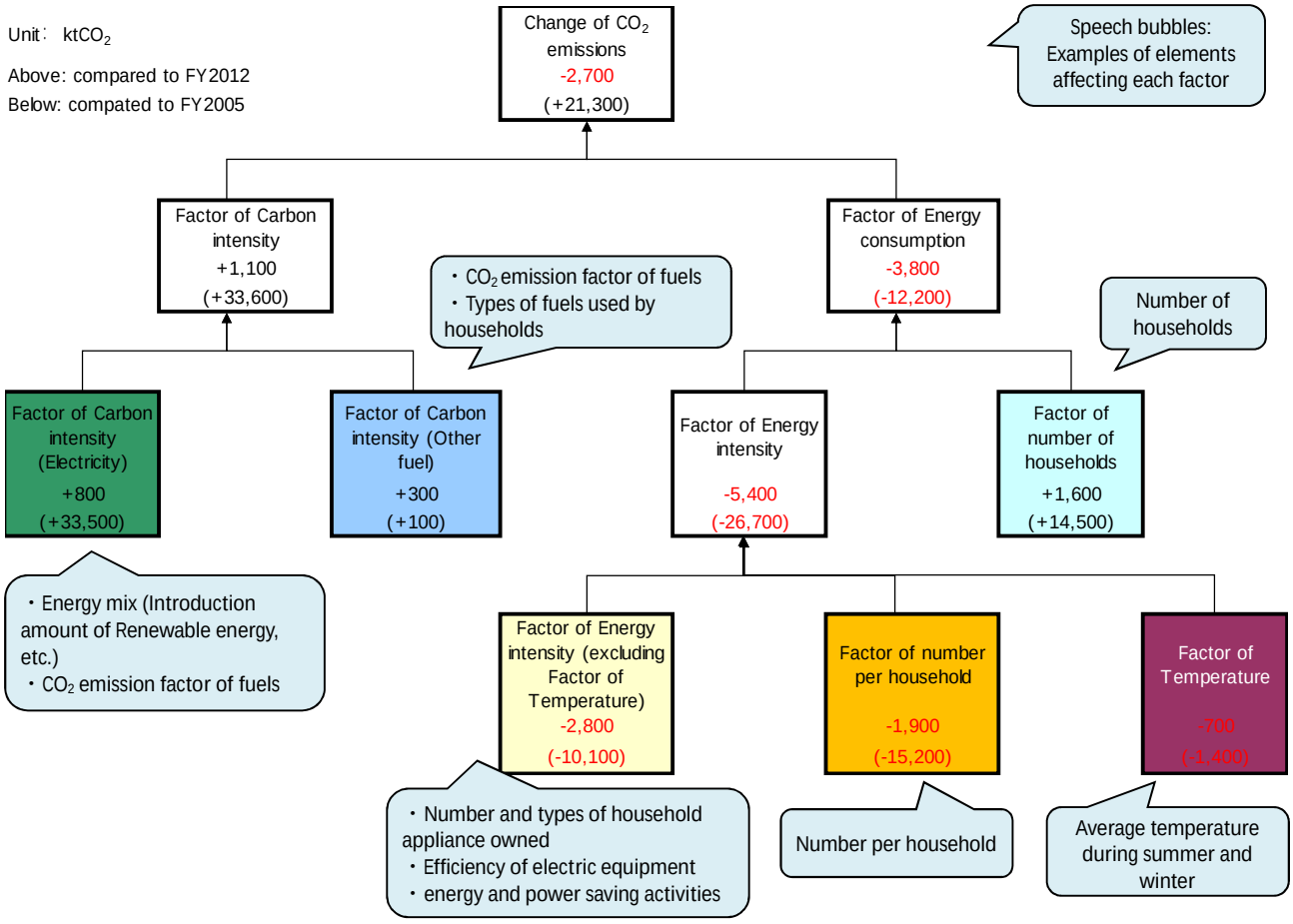


Figure 1-26 Factor of change of CO_2 emissions from Residential sector

1.1.5.6 Commercial and other sector

Carbon dioxide emissions in Commercial and other sector in FY2013 were 279 million tonnes. They increased by 16.7% compared to FY2005 and by 9.9% compared to FY2012.

Compared with FY2005, the largest increase factor is “Factor of Carbon intensity (Electricity)” due to the change of energy mix, followed by “Factor of Floor space” due to the increase of the floor space.

On the other hand, the decrease factors are “Factor of Energy intensity (excluding Factor of Temperature)” due to the decrease of energy consumption per floor space resulting from the energy-savings in equipment and devices, and the expansion of energy and power saving activities.

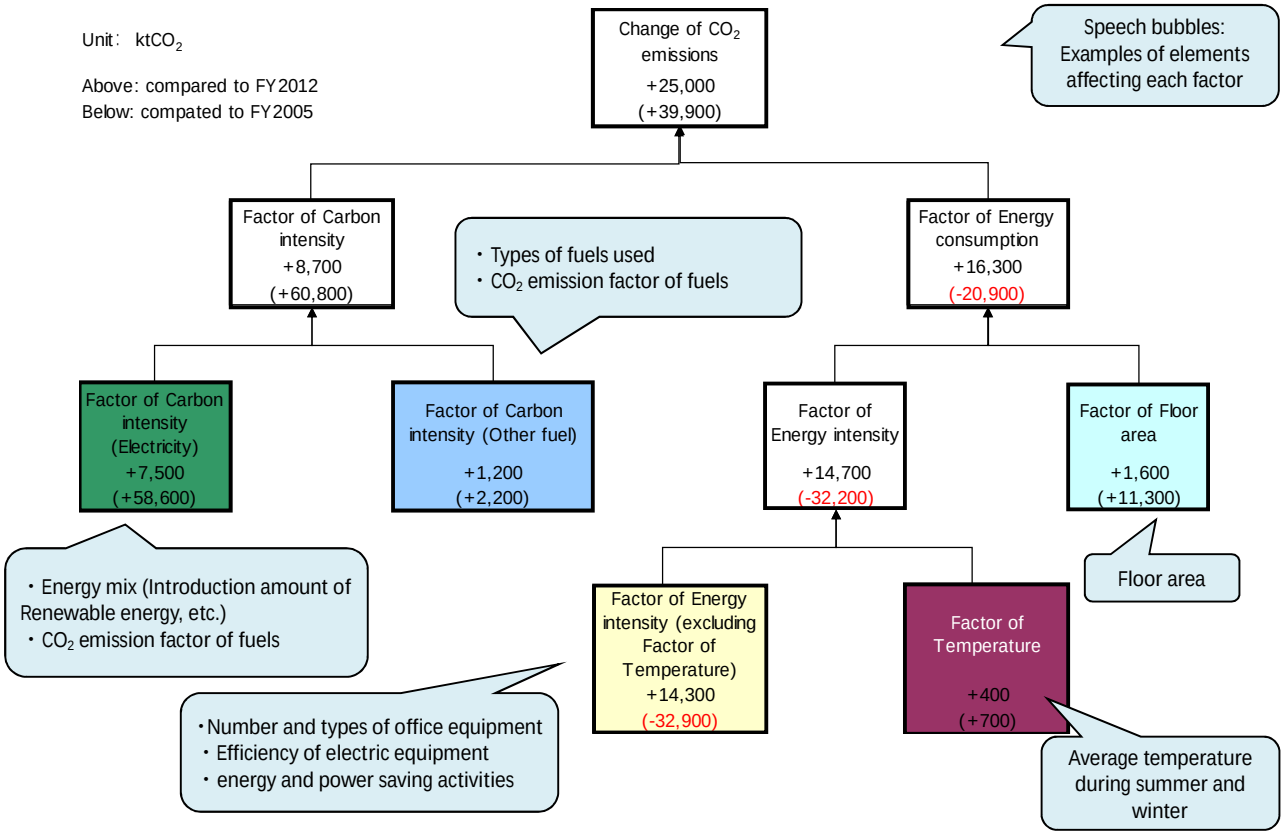


Figure 1-27 Factor of change of CO_2 emissions from Commercial and other sector

1.1.5.7 Summary

Summary of factor analysis of energy-related CO_2 emissions by sector from FY2005 to FY2013 is shown in Table 1-16.

Table 1-16 Summary of factor analysis of energy-related CO_2 emissions by sector from FY2005 to FY2013

(Unit : $MtCO_2$)

Sector		Factor of Activity		Factor of intensity				Factor of temperature	Total change
		Indices of Activity	Change		Carbon intensity (excl. electricity)	Carbon intensity (electricity)	Energy intensity		
Residential		Number of households	+15	+8	+0.1	+34	-25	-14	+21
Commercial & Other		Floor area	+11	+28	+2	+59	-33	+70	+40
Industry		Indices of Industrial Production	-37	+10	-3	+31	-18	-	-27
Transport	Passenger	Traffic volume	+2	-7	+3	+2	-12	-	-5
	Freight	Traffic volume	-8	-2	+1	+0.1	-3	-	-10
Energy Transformation		Production of secondary energy	-10	+7	+7	-			-3
Total Energy-related CO_2 emissions		—	-27	+44	+9	+125	-91	-1	+16

Increase of number of households

Progress of energy saving

Increase of Floor area

Increase of carbon intensity due to the increase of fossil power generation

Decrease of production

Improvement of fuel efficiency

Improvement of transport efficiency

Note: The description in balloons are major factors that seems to influence the change of emissions. The total and the sum of factors may not match due to rounding.

1.1.6 Trends in Indirect GHGs and SOx emissions"

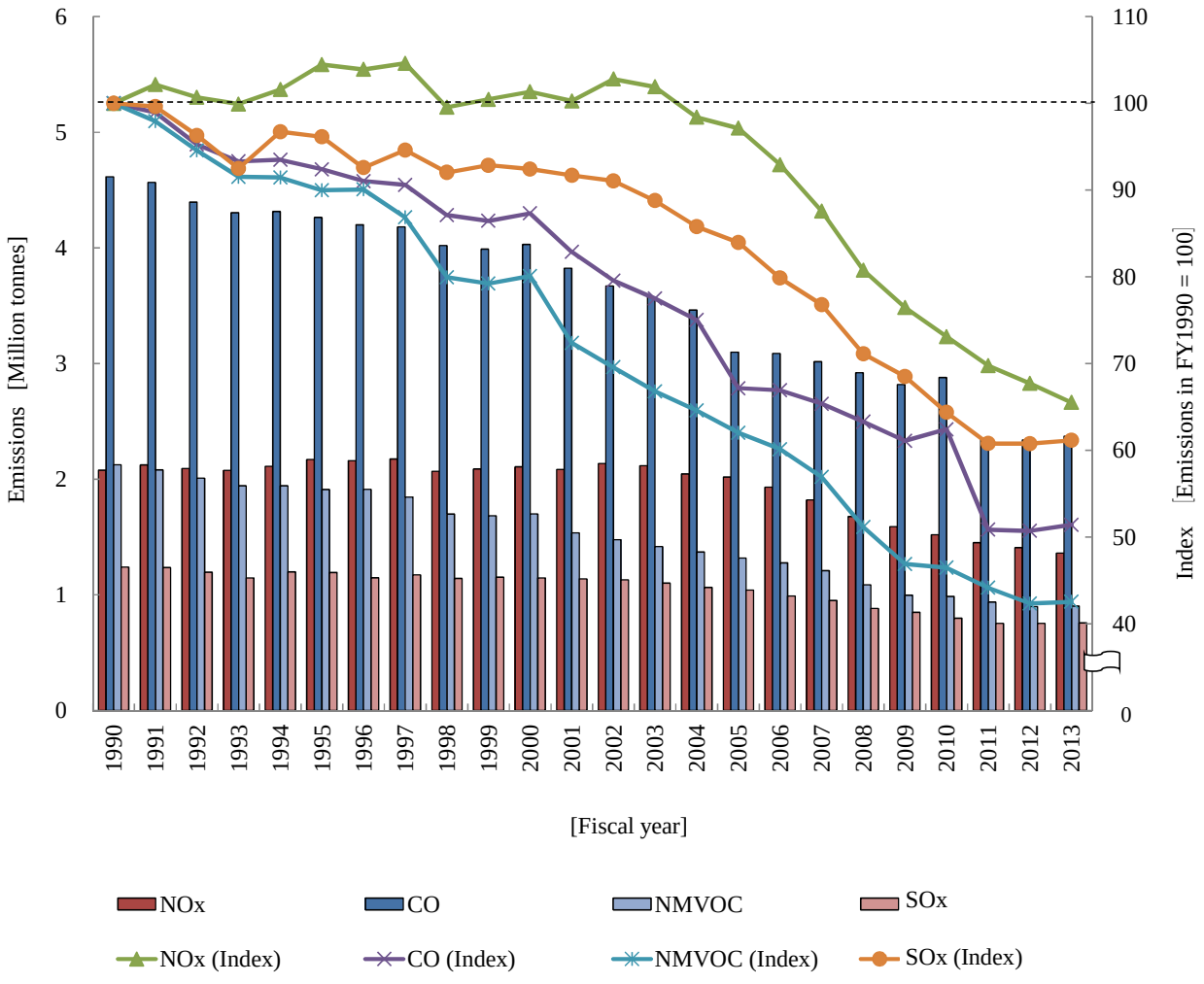
The UNFCCC reporting guidelines on annual greenhouse gas inventories (Decision 24/CP.19) require that emissions of seven types of GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3) shall be included in the GHG inventory, and emissions of indirect GHGs (NO_X, CO and NMVOC) as well as SOx should be included. Their emission trends are indicated below.

Nitrogen oxide (NO_X) emissions in FY2013 were 1.36 million tonnes. They decreased by 34.5% since FY1990 and by 32.6% compared to FY2005.

Carbon monoxide (CO) emissions in FY2013 were 2.37 million tonnes. They decreased by 48.6% since FY1990 and increased by 23.5% compared to FY2005.

Non-methane volatile organic compounds (NMVOC) emissions in FY2013 were 0.9 million tonnes. They decrease by 57.5% since FY1990 and increase by 31.4% compared to FY2005.

Sulfur dioxide (SO_2) emissions in FY2013 were 0.76 million tonnes. They decreased by 38.9% since FY1990 and by 27.2% compared to FY2005.



(Line charts show the trends of induces)

Figure 1-28 Trends in emissions of indirect GHGs and SOx

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 activities under Article 3.3 and 3.4 of the Kyoto Protocol in FY2013 were 47.4 million tonnes (in CO_2 eq.). The breakdown of emissions and removals to each activity in the first commitment period of the Kyoto Protocol is shown in Table 1-17.

Table 1-17 Accounting summary for activities under articles 3.3 and 3.4 of the Kyoto Protocol

GREENHOUSE GAS SOURCE AND SINK ACTIVITIES	Base Year	NET EMISSIONS/ REMOVALS 2013
	(kt CO_2 eq)	
A. Article 3.3 activities		
A.1. Afforestation/reforestation		-492
Excluded emissions from natural disturbances		NA
Excluded subsequent removals from land subject to natural disturbances		NA
A.2. Deforestation		1663
B. Article 3.4 activities		
B.1. Forest management		
Net emissions/removals		-50703
Excluded emissions from natural disturbances		NA
Excluded subsequent removals from land subject to natural disturbances		NA
Any debits from newly established forest (CEF-ne)		NA
Forest management reference level (FMRL)		0
Technical corrections to FMRL		2008
Forest management cap		
B.2. Cropland management (if elected)	10344	3568
B.3. Grazing land management (if elected)	848	-292
B.4. Revegetation (if elected)	-78	-1186
B.5. Wetland drainage and rewetting (if elected)	NA	NA

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

Table 1-18 Emission trends: summary（CTF Table 1）

GREENHOUSE GAS EMISSIONS	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	kt CO_2 eq											
CO_2 emissions without net CO_2 from LULUCF	1,154,402.75	1,154,402.75	1,163,030.69	1,172,821.31	1,166,399.29	1,227,224.21	1,240,762.63	1,253,779.64	1,251,343.50	1,216,700.38	1,251,663.00	1,272,504.83
CO_2 emissions with net CO_2 from LULUCF	1,095,511.96	1,095,511.96	1,096,004.04	1,103,240.95	1,092,796.55	1,154,320.90	1,166,296.54	1,174,708.81	1,168,898.11	1,133,148.03	1,167,596.80	1,185,757.74
CH_4 emissions without CH_4 from LULUCF	48,586.36	48,586.36	46,862.13	48,095.90	42,817.96	47,907.00	45,825.27	44,524.49	43,703.26	41,392.62	41,460.43	41,505.28
CH_4 emissions with CH_4 from LULUCF	48,659.34	48,659.34	46,931.93	48,162.52	42,907.30	47,988.24	45,895.16	44,617.38	43,802.61	41,463.51	41,524.44	41,571.98
N_2O emissions without N_2O from LULUCF	31,903.42	31,903.42	31,586.62	31,719.78	31,606.90	32,916.51	33,226.89	34,354.03	35,147.58	33,581.93	27,496.64	30,062.27
N_2O emissions with N_2O from LULUCF	32,239.90	32,239.90	31,918.15	32,047.82	31,933.26	33,239.79	33,541.19	34,660.74	35,446.50	33,873.98	27,783.78	30,343.75
HFCs	15,932.31	15,932.31	17,349.61	17,767.22	18,128.88	21,051.39	25,212.33	24,596.83	24,435.37	23,740.46	24,365.53	22,846.61
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
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
NF_3	32.89	32.89	32.89	32.89	43.85	76.74	202.81	194.27	172.78	172.65	282.59	186.01
Total (without LULUCF)	1,270,247.10	1,270,247.10	1,280,574.90	1,293,690.21	1,285,641.65	1,357,639.27	1,379,287.39	1,392,729.63	1,389,297.32	1,345,380.62	1,367,562.86	1,386,009.47
Total (with LULUCF)	1,211,765.77	1,211,765.77	1,213,949.60	1,224,504.51	1,212,454.61	1,285,140.48	1,305,205.49	1,314,058.40	1,307,250.19	1,262,191.20	1,283,847.82	1,299,610.57
Total (without LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	kt CO_2 eq											
1. Energy	1,089,870.51	1,089,870.51	1,097,164.82	1,105,633.80	1,100,269.62	1,157,171.36	1,170,580.81	1,182,530.61	1,182,223.13	1,153,101.85	1,188,228.51	1,208,302.92
2. Industrial processes and product use	109,251.91	109,251.91	113,624.35	115,520.87	117,689.43	125,007.41	135,031.55	137,124.47	134,062.37	121,457.94	108,626.56	106,591.43
3. Agriculture	42,925.22	42,925.22	41,649.73	43,274.36	38,836.09	44,126.30	42,211.10	41,340.21	40,904.31	39,107.61	39,481.63	40,103.68
4. Land Use, Land-Use Change and Forestryb	-58,481.33	-58,481.33	-66,625.31	-69,185.70	-73,187.03	-72,498.79	-74,081.90	-78,671.23	-82,047.12	-83,189.42	-83,715.04	-86,398.90
5. Waste	28,199.46	28,199.46	28,136.00	29,261.18	28,846.50	31,334.20	31,463.93	31,734.34	32,107.51	31,713.22	31,226.17	31,011.44
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)	1,211,765.77	1,211,765.77	1,213,949.60	1,224,504.51	1,212,454.61	1,285,140.48	1,305,205.49	1,314,058.40	1,307,250.19	1,262,191.20	1,283,847.82	1,299,610.57

GREENHOUSE GAS EMISSIONS	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change from base to latest reported year
	kt CO_2 eq													(%)
CO_2 emissions without net CO_2 from LULUCF	1,255,768.27	1,292,777.96	1,297,856.69	1,296,831.94	1,304,375.96	1,282,188.92	1,318,231.90	1,233,950.58	1,161,132.87	1,211,534.60	1,260,759.67	1,295,500.48	1,310,691.42	13.54
CO_2 emissions with net CO_2 from LULUCF	1,168,868.24	1,204,241.10	1,199,865.22	1,201,412.55	1,214,416.17	1,197,723.28	1,235,668.34	1,162,288.55	1,094,286.21	1,141,892.69	1,191,262.25	1,222,479.37	1,245,764.48	13.72
CH_4 emissions without CH_4 from LULUCF	40,278.00	39,501.20	37,592.73	39,029.56	38,962.32	38,216.42	38,470.09	38,268.88	37,192.74	38,263.04	37,263.38	36,420.43	36,042.07	-25.82
CH_4 emissions with CH_4 from LULUCF	40,349.75	39,582.11	37,653.66	39,099.96	39,029.18	38,275.10	38,528.14	38,349.85	37,257.91	38,322.66	37,323.99	36,476.35	36,099.86	-25.81
N_2O emissions without N_2O from LULUCF	26,531.75	26,049.92	25,882.62	25,899.70	25,510.95	25,533.58	24,971.76	24,091.64	23,630.81	23,300.62	22,827.33	22,484.83	22,458.07	-29.61
N_2O emissions with N_2O from LULUCF	26,809.20	26,323.79	26,146.17	26,156.75	25,760.31	25,775.07	25,205.59	24,319.80	23,851.38	23,516.33	23,040.18	22,694.47	22,667.43	-29.69
HFCs	19,451.82	16,218.01	16,200.76	12,379.29	12,724.24	14,548.01	16,602.99	19,152.64	20,779.51	23,114.01	25,847.20	29,087.58	31,776.63	99.45
PFCs	9,878.47	9,199.44	8,854.21	9,216.64	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	-49.84
Unspecified mix of HFCs and PFCs														
SF_6	6,066.02	5,735.48	5,406.31	5,258.70	5,063.86	5,243.91	4,754.51	4,206.12	2,474.65	2,468.45	2,299.56	2,299.32	2,165.76	-83.15
NF_3	195.05	271.72	299.14	367.36	1,249.87	1,093.43	1,210.12	1,173.16	1,166.68	1,369.46	1,561.30	1,255.57	1,360.96	4,038.06
Total (without LULUCF)	1,358,169.38	1,389,753.73	1,392,092.45	1,388,983.19	1,396,510.56	1,375,823.04	1,412,158.22	1,326,586.42	1,250,424.13	1,304,299.73	1,354,313.88	1,390,484.55	1,407,774.97	10.83
Total (with LULUCF)	1,271,618.55	1,301,571.65	1,294,425.46	1,293,891.26	1,306,866.97	1,291,657.58	1,329,886.54	1,255,233.53	1,183,863.21	1,234,933.15	1,285,089.92	1,317,728.99	1,343,115.17	10.84
Total (without LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total (with LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change from base to latest reported year
	kt CO_2 eq													(%)
1. Energy	1,194,000.75	1,233,537.84	1,239,105.19	1,238,623.17	1,245,671.00	1,224,055.56	1,260,846.54	1,178,817.66	1,113,941.56	1,163,142.65	1,212,514.41	1,246,241.85	1,259,498.70	15.56
2. Industrial processes and product use	95,478.34	88,436.76	87,046.63	83,710.04	84,728.60	87,324.77	86,359.92	82,108.16	74,787.14	78,197.45	79,990.29	82,636.66	86,929.33	-20.43
3. Agriculture	39,505.88	39,645.81	38,152.35	39,760.61	40,015.02	39,639.70	40,811.61	40,275.22	39,463.76	40,697.06	40,260.22	39,734.95	39,530.76	-7.91
4. Land Use, Land-Use Change and Forestryb	-86,550.83	-88,182.08	-97,666.98	-95,091.93	-89,643.58	-84,165.46	-82,271.69	-71,352.89	-66,560.92	-69,366.58	-69,223.96	-72,755.55	-64,659.80	10.56
5. Waste	29,184.41	28,133.32	27,788.27	26,889.38	26,095.94	24,803.02	24,140.15	25,385.38	22,231.68	22,262.58	21,548.96	21,871.09	21,816.18	-22.64
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Total (including LULUCF)	1,271,618.55	1,301,571.65	1,294,425.46	1,293,891.26	1,306,866.97	1,291,657.58	1,329,886.54	1,255,233.53	1,183,863.21	1,234,933.15	1,285,089.92	1,317,728.99	1,343,115.17	10.84

Table 1-19 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
	kt											
1. Energy												
A. Fuel combustion (sectoral approach)	1,076,548.33	1,076,548.33	1,084,086.37	1,092,915.15	1,088,031.65	1,145,042.04	1,157,786.15	1,169,854.02	1,169,496.20	1,140,858.05	1,175,846.72	1,196,028.20
1. Energy industries	352,782.85	352,782.85	355,881.04	362,715.03	346,422.62	387,366.79	377,028.59	379,153.02	377,005.39	364,997.08	384,032.34	393,060.45
2. Manufacturing industries and construction	378,577.64	378,577.64	373,709.40	366,701.45	365,726.39	375,193.89	381,196.03	385,476.83	385,503.15	362,343.07	369,107.61	377,904.63
3. Transport	200,214.98	200,214.98	212,672.57	218,928.64	222,568.29	231,618.00	240,453.11	246,923.50	248,301.34	246,427.52	250,254.29	249,013.71
4. Other sectors	144,972.86	144,972.86	141,823.37	144,570.04	153,314.35	150,863.36	159,108.43	158,300.67	158,686.32	167,090.39	172,452.48	176,049.41
5. Other	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
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
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
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
2. Industrial processes	63,926.78	63,926.78	65,038.08	65,014.06	63,689.00	65,151.78	65,387.05	65,880.14	63,183.32	57,271.43	57,413.19	57,880.39
A. Mineral industry	49,220.88	49,220.88	50,538.96	50,957.31	50,243.71	51,255.21	51,134.50	51,476.04	48,825.65	43,848.16	43,563.47	43,897.34
B. Chemical industry	6,976.74	6,976.74	6,949.83	6,801.03	6,346.47	6,765.85	6,941.39	7,044.56	7,029.19	6,396.05	6,906.06	6,771.22
C. Metal industry	7,272.68	7,272.68	7,091.31	6,795.75	6,651.97	6,655.80	6,849.34	6,870.40	6,834.15	6,545.61	6,463.33	6,739.86
D. Non-energy products from fuels and solvent use	392.21	392.21	391.21	394.69	387.28	408.11	390.27	409.45	408.24	395.13	391.00	385.48
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
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
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
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
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
I. Other carbon-containing fertilizers	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
4. Land Use, Land-Use Change and Forestry	-58,890.79	-58,890.79	-67,026.65	-69,580.36	-73,602.74	-72,903.31	-74,466.09	-79,070.83	-82,445.39	-83,552.36	-84,066.20	-86,747.08
A. Forest land	-79,073.12	-79,073.12	-86,228.01	-86,576.72	-86,922.70	-87,267.10	-87,611.89	-91,283.57	-91,123.69	-90,962.75	-90,802.50	-90,641.94
B. Cropland	12,237.34	12,237.34	10,889.62	7,492.39	5,588.04	6,389.62	5,610.91	3,970.86	3,283.78	3,286.26	2,228.95	208.59
C. Grassland	1,129.06	1,129.06	856.90	136.51	-195.11	110.69	698.33	345.18	58.58	33.31	-389.92	44.29
D. Wetlands	90.24	90.24	80.55	253.20	140.59	116.37	357.69	635.14	120.52	483.21	455.23	425.38
E. Settlements	4,234.99	4,234.99	5,100.63	5,723.54	3,639.43	2,450.18	2,291.89	1,466.80	1,024.79	964.01	512.51	91.52
F. Other land	1,543.97	1,543.97	1,727.87	1,383.16	1,696.87	1,527.94	1,293.31	1,210.34	1,574.04	1,195.34	1,301.32	955.13
G. Harvested wood products	946.72	946.72	545.79	2,007.56	2,450.13	3,768.99	2,893.66	4,584.42	2,616.58	1,448.27	2,628.22	2,169.95
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5. Waste	13,127.19	13,127.19	13,143.50	14,190.78	13,943.46	16,456.79	16,708.85	17,125.19	17,712.12	17,695.35	17,493.48	17,642.14
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
B. Biological treatment of solid waste												
C. Incineration and open burning of waste	12,424.36	12,424.36	12,457.05	13,491.88	13,262.72	15,754.88	16,041.03	16,484.72	17,056.89	17,086.23	16,840.90	16,986.23
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
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:												
International bunkers	30,829.18	30,829.18	32,531.98	32,937.28	34,935.20	36,093.69	38,179.77	30,958.25	35,432.29	37,361.08	36,022.49	36,731.88
Aviation	13,189.32	13,189.32	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
Navigation	17,639.86	17,639.86	18,612.86	18,720.51	21,079.01	21,027.20	21,256.78	12,516.34	16,297.92	17,359.53	16,446.03	17,189.28
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass	34,806.16	34,806.16	35,541.54	35,203.12	34,511.82	34,982.56	36,350.02	36,769.89	37,825.43	36,535.94	37,686.59	39,515.98
CO2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Long-term storage of C in waste disposal sites	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Indirect N2O												
Indirect CO2 (3)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total CO2 equivalent emissions without land use, land-use change and forestry	1,154,402.75	1,154,402.75	1,163,030.69	1,172,821.31	1,166,399.29	1,227,224.21	1,240,762.63	1,253,779.64	1,251,343.50	1,216,700.38	1,251,663.00	1,272,504.83
Total CO2 equivalent emissions with land use, land-use change and forestry	1,095,511.96	1,095,511.96	1,096,004.04	1,103,240.95	1,092,796.55	1,154,320.90	1,166,296.54	1,174,708.81	1,168,898.11	1,133,148.03	1,167,596.80	1,185,757.74
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change from base to latest reported year
	kt													(%)
1. Energy														
A. Fuel combustion (sectoral approach)	1,181,985.92	1,222,338.10	1,228,244.91	1,227,964.00	1,234,927.78	1,213,435.03	1,250,204.50	1,168,545.12	1,104,197.42	1,152,909.57	1,202,747.62	1,236,532.98	1,249,822.05	16.10
1. Energy industries	383,003.45	414,184.08	430,909.93	427,939.46	447,958.47	436,467.36	498,749.30	473,839.72	436,770.86	461,180.96	518,820.96	561,648.47	566,643.99	60.62
2. Manufacturing industries and construction	372,388.74	383,546.04	382,591.71	384,665.06	373,026.83	377,189.94	363,273.55	330,170.23	301,475.77	336,976.46	333,428.35	332,669.49	338,129.90	-10.68
3. Transport	253,036.44	248,697.82	244,439.68	238,588.32	232,726.97	228,263.03	226,722.19	218,193.17	214,763.95	215,467.45	212,651.37	217,611.70	215,803.65	7.79
4. Other sectors	173,557.30	175,910.16	170,303.59	176,771.16	181,215.50	171,514.70	161,459.46	146,342.00	151,186.84	139,284.69	137,846.94	124,603.32	129,244.52	-10.85
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
B. Fugitive emissions from fuels	548.17	524.57	505.76	477.66	507.77	553.11	615.64	565.32	500.92	474.55	477.48	490.27	479.56	150.33
1. Solid fuels	1.35	0.75	0.67	0.64	0.61	0.59	0.56	0.54	0.53	0.52	0.51	0.50	0.49	-90.79
2. Oil and natural gas and other emissions from energy production	546.82	523.81	505.09	477.02	507.16	552.52	615.09	564.78	500.39	474.03	476.97	489.77	479.07	157.22
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	
2. Industrial processes	56,477.04	53,737.03	52,968.44	52,834.19	53,920.03	54,047.12	53,260.60	49,135.80	43,490.86	44,672.07	44,541.71	44,784.50	46,551.39	-27.18
A. Mineral industry	42,953.24	40,467.10	40,130.95	39,804.58	41,213.62	41,179.79	40,182.19	37,413.33	32,770.04	32,754.05	33,103.30	33,698.91	35,111.89	-28.66
B. Chemical industry	6,310.97	6,217.57	6,015.29	6,097.01	5,757.37	5,838.47	5,931.03	5,073.50	4,837.17	5,389.64	5,067.05	4,617.79	4,757.48	-31.81
C. Metal industry	6,762.89	6,598.21	6,366.89	6,483.63	6,498.03	6,573.56	6,704.75	6,248.45	5,479.45	6,113.67	5,979.89	6,102.40	6,300.60	-13.37
D. Non-energy products from fuels and solvent use	371.72	374.29	369.98	362.67	360.96	367.78	356.47	328.97	332.92	338.85	315.67	288.99	299.09	-23.74
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	
H. Other	78.22	79.87	85.33	86.29	90.05	87.52	86.16	71.55	71.29	75.85	75.81	76.41	82.33	28.10
3. Agriculture	367.68	408.14	430.19	402.22	410.56	383.48	500.08	439.98	390.10	402.94	408.54	531.74	531.74	-12.67
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	247.35	269.92	246.40	236.30	231.29	230.36	325.00	305.74	270.15	242.88	246.78	369.97	369.97	-32.76
H. Urea application	120.34	138.22	183.79	165.92	179.27	153.12	175.08	134.24	119.95	160.06	161.77	161.77	161.77	175.84
I. Other carbon-containing fertilizers	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	
4. Land Use, Land-Use Change and Forestry	-86,900.03	-88,536.86	-97,991.47	-95,419.39	-89,959.79	-84,465.64	-82,563.56	-71,662.03	-66,846.66	-69,641.91	-69,497.41	-73,021.11	-64,926.94	10.25
A. Forest land	-90,482.49	-90,321.89	-99,042.54	-98,527.80	-92,664.34	-86,820.31	-85,555.91	-80,350.76	-75,507.11	-76,043.80	-77,808.29	-77,393.29	-68,162.38	-13.80
B. Cropland	111.97	398.89	-251.64	2,670.16	2,306.88	1,498.68	4,869.08	10,280.48	7,917.24	5,376.11	5,690.14	4,744.51	3,651.84	-70.16
C. Grassland	-254.93	-523.70	-1,196.36	-936.48	-1,030.68	-473.20	-988.41	-1,335.87	-266.39	-155.71	163.09	-178.94	-233.30	-120.66
D. Wetlands	386.21	94.78	62.69	56.34	56.62	41.45	33.26	34.36	69.20	51.18	45.13	31.67	45.03	-50.10
E. Settlements	-180.48	-1,098.58	-1,216.10	-1,222.25	-487.50	-259.92	-1,260.31	-680.78	-489.55	18.93	-1,025.41	-680.86	-899.70	-121.24
F. Other land	1,018.20	944.70	768.74	782.45	157.40	191.17	112.27	164.06	138.66	204.50	120.68	147.73	101.08	-93.45
G. Harvested wood products	2,501.48	1,968.93	2,883.73	1,758.19	1,701.83	1,356.48	226.46	226.47	1,291.29	906.86	3,317.25	308.06	570.47	-39.74
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
5. Waste	16,389.46	15,770.11	15,707.40	15,153.87	14,609.82	13,770.18	13,651.08	15,264.36	12,553.57	13,075.48	12,584.32	13,160.99	13,306.68	1.37
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	
B. Biological treatment of solid waste														
C. Incineration and open burning of waste	15,758.93	15,193.07	15,190.87	14,647.17	14,103.00	13,247.82	13,089.88	14,733.95	12,039.88	12,548.56	12,060.19	12,645.93	12,760.07	2.70
D. Waste water treatment and discharge														
E. Other	630.53	577.05	516.53	506.70	506.81	522.36	561.20	530.41	513.69	526.91	524.13	515.07	546.61	-22.23
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Memo items:														
International bunkers	33,571.42	36,728.93	37,506.71	39,113.12	41,564.88	38,991.92	37,259.15	34,849.64	30,686.03	31,179.83	31,636.35	32,349.06	33,186.32	7.65
Aviation	18,721.34	21,149.32	20,387.64	21,190.20	21,336.33	19,964.61	18,358.58	17,517.99	15,372.73	16,295.33	18,249.69	19,140.10	19,508.32	47.91
Navigation	14,850.08	15,579.61	17,119.07	17,922.92	20,228.55	19,027.31	18,900.57	17,331.65	15,313.30	14,884.50	13,386.66	13,208.96	13,678.00	-22.46
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
CO2 emissions from biomass	38,105.84	40,010.00	41,925.52	42,060.47	45,738.12	46,287.63	46,980.95	45,350.20	42,335.18	57,578.48	57,206.63	58,058.94	59,517.40	71.00
CO2 captured	NO	NO	NO	0.04	0.12	0.36	0.37	NO	NO	NO	NO	NO	NO	
Long-term storage of C in waste disposal sites	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	
Indirect N2O														
Indirect CO2 (3)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total CO2 equivalent emissions without land use, land-use change and forestry	1,255,768.27	1,292,777.96	1,297,856.69	1,296,831.94	1,304,375.96	1,282,188.92	1,318,231.90	1,233,950.58	1,161,132.87	1,211,534.60	1,260,759.67	1,295,500.48	1,310,691.42	13.54
Total CO2 equivalent emissions with land use, land-use change and forestry	1,168,868.24	1,204,241.10	1,199,865.22	1,201,412.55	1,214,416.17	1,197,723.28	1,235,668.34	1,162,288.55	1,094,286.21	1,141,892.69	1,191,262.25	1,222,479.37	1,245,764.48	13.72
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Table1-20 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
	kt											
1. Energy												
A. Fuel combustion (sectoral approach)	57.02	57.02	56.44	56.04	56.90	57.14	58.92	58.37	55.62	53.46	53.98	54.12
1. Energy industries	17.38	17.38	17.05	15.89	15.72	16.19	16.27	15.88	13.64	12.75	12.28	10.42
2. Manufacturing industries and construction	17.63	17.63	17.18	16.95	17.01	17.22	17.47	18.32	17.44	15.57	15.36	17.06
3. Transport	12.29	12.29	12.59	12.74	12.59	12.73	13.03	13.32	13.44	13.24	13.23	13.18
4. Other sectors	9.73	9.73	9.62	10.47	11.58	11.00	12.14	10.86	11.10	11.89	13.10	13.46
5. Other	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	80.31	78.14	73.43
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
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
C. CO_2 transport and storage												
2. Industrial processes	2.40	2.40	2.31	2.19	2.07	2.22	2.31	2.22	2.20	2.10	2.08	2.17
A. Mineral industry												
B. Chemical industry	1.47	1.47	1.43	1.34	1.28	1.39	1.46	1.35	1.33	1.34	1.31	1.37
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
D. Non-energy products from fuels and solvent use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
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
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	1,193.48	1,193.48	1,151.04	1,221.31	1,042.75	1,269.94	1,207.59	1,180.16	1,166.70	1,098.89	1,116.38	1,135.28
A. Enteric fermentation	362.57	362.57	369.83	372.49	368.65	363.01	359.73	356.48	355.34	353.54	351.28	347.29
B. Manure management	134.15	134.15	134.64	133.69	130.53	126.87	125.85	124.10	122.34	120.14	117.83	115.18
C. Rice cultivation	691.76	691.76	641.96	710.36	539.24	775.53	717.66	695.34	684.89	621.27	643.39	669.03
D. Agricultural soils	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
F. Field burning of agricultural residues	4.99	4.99	4.61	4.76	4.33	4.53	4.35	4.24	4.12	3.95	3.87	3.77
G. Liming												
H. Urea application												
I. Other carbon-containing fertilizers												
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	2.92	2.92	2.79	2.66	3.57	3.25	2.80	3.72	3.97	2.84	2.56	2.67
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
B. Cropland	2.43	2.43	2.40	2.37	2.34	2.32	2.29	2.27	2.26	2.24	2.22	2.21
C. Grassland	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
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
E. Settlements	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
G. Harvested wood products												
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5. Waste	491.64	491.64	485.93	484.11	476.38	469.50	458.30	447.69	435.77	420.94	407.84	395.22
A. Solid waste disposal	368.82	368.82	366.05	365.07	359.26	354.54	344.85	335.74	325.29	312.61	300.68	289.55
B. Biological treatment of solid waste	7.79	7.79	7.65	7.67	7.69	7.63	7.65	7.67	7.72	7.68	7.71	7.76
C. Incineration and open burning of waste	0.64	0.64	0.62	0.64	0.64	0.69	0.71	0.73	0.70	0.69	0.67	0.63
D. Waste water treatment and discharge	114.39	114.39	111.61	110.73	108.79	106.64	105.10	103.56	102.06	99.95	98.78	97.27
E. Other	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
Total CH_4 emissions without CH_4 from LULUCF	1,943.45	1,943.45	1,874.49	1,923.84	1,712.72	1,916.28	1,833.01	1,780.98	1,748.13	1,655.70	1,658.42	1,660.21
Total CH_4 emissions with CH_4 from LULUCF	1,946.37	1,946.37	1,877.28	1,926.50	1,716.29	1,919.53	1,835.81	1,784.70	1,752.10	1,658.54	1,660.98	1,662.88
Memo items:												
International bunkers	1.77	1.77	1.87	1.88	2.11	2.11	2.15	1.32	1.69	1.80	1.71	1.78
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
Navigation	1.68	1.68	1.77	1.78	2.01	2.00	2.03	1.19	1.55	1.65	1.57	1.64
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	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	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change from base to latest reported year
	kt													(%)
1. Energy														
A. Fuel combustion (sectoral approach)	51.48	52.22	52.30	56.86	59.47	61.42	61.59	61.77	58.37	81.87	67.39	67.49	66.71	17.00
1. Energy industries	8.24	7.99	7.69	8.69	8.72	8.81	9.98	12.72	12.56	12.74	13.21	13.92	11.73	-32.52
2. Manufacturing industries and construction	16.68	17.97	19.43	20.48	20.89	22.76	23.07	22.03	21.83	24.02	19.18	19.80	19.73	11.90
3. Transport	12.92	12.51	11.92	11.15	10.47	9.83	9.26	8.46	7.91	7.50	7.16	7.05	6.78	-44.80
4. Other sectors	13.64	13.75	13.26	16.53	19.40	20.02	19.28	18.57	16.07	37.62	27.83	26.71	28.48	192.73
5. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
B. Fugitive emissions from fuels	64.01	42.32	40.70	39.06	39.06	39.30	39.00	37.87	36.66	35.40	34.69	34.02	32.68	-83.57
1. Solid fuels	53.19	30.73	28.85	26.87	26.18	25.75	24.37	23.59	23.09	22.57	22.09	21.81	21.32	-88.80
2. Oil and natural gas and other emissions from energy production	10.82	11.58	11.86	12.20	12.88	13.54	14.63	14.28	13.57	12.83	12.60	12.22	11.35	33.40
C. CO_2 transport and storage														
2. Industrial processes	2.07	2.11	2.01	2.15	2.15	2.18	2.04	1.99	2.05	2.15	2.14	1.85	1.86	-22.57
A. Mineral industry														
B. Chemical industry	1.32	1.32	1.22	1.34	1.35	1.37	1.21	1.27	1.43	1.45	1.43	1.13	1.13	-23.69
C. Metal industry	0.75	0.79	0.79	0.81	0.80	0.82	0.82	0.72	0.62	0.71	0.72	0.72	0.73	-20.77
D. Non-energy products from fuels and solvent use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
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	
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
3. Agriculture	1,119.64	1,121.38	1,059.25	1,127.49	1,135.19	1,117.15	1,142.18	1,148.45	1,124.64	1,160.68	1,145.69	1,122.83	1,118.34	-6.30
A. Enteric fermentation	348.41	345.18	340.55	332.77	331.46	332.20	332.81	328.17	323.78	313.16	311.75	304.28	296.02	-18.35
B. Manure management	114.95	114.65	112.89	110.22	109.34	107.06	105.39	103.88	102.79	100.74	100.89	98.90	96.45	-28.10
C. Rice cultivation	652.53	657.92	602.35	681.17	691.01	674.60	700.78	713.32	695.08	743.86	730.18	716.84	723.09	4.53
D. Agricultural soils	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	
F. Field burning of agricultural residues	3.75	3.64	3.47	3.33	3.38	3.28	3.19	3.08	2.99	2.91	2.88	2.80	2.77	-44.56
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	
4. Land use, land-use change and forestry	2.87	3.24	2.44	2.82	2.67	2.35	2.32	3.24	2.61	2.38	2.42	2.24	2.31	-20.81
A. Forest land	0.59	0.97	0.19	0.57	0.43	0.12	0.10	1.02	0.41	0.20	0.25	0.08	0.16	-60.20
B. Cropland	2.19	2.17	2.16	2.15	2.15	2.14	2.13	2.12	2.11	2.10	2.08	2.07	2.06	-15.12
C. Grassland	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	1.69
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	
E. Settlements	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	
G. Harvested wood products														
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
5. Waste	373.91	362.01	349.45	335.62	322.62	308.61	294.00	280.67	265.99	250.43	240.62	230.63	222.10	-54.82
A. Solid waste disposal	277.44	265.30	252.95	240.39	228.14	215.33	203.17	189.14	176.85	164.56	154.66	146.30	138.55	-62.43
B. Biological treatment of solid waste	7.82	9.90	11.64	12.00	13.58	13.98	13.50	15.18	15.07	13.18	14.48	14.35	14.39	84.85
C. Incineration and open burning of waste	0.60	0.93	0.80	0.73	0.68	0.63	0.58	0.56	0.50	0.46	0.46	0.48	0.48	-25.49
D. Waste water treatment and discharge	88.06	85.88	84.05	82.49	80.22	78.67	76.75	75.79	73.58	72.23	71.02	69.51	68.68	-39.96
E. Other	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	
Total CH_4 emissions without CH_4 from LULUCF	1,611.12	1,580.05	1,503.71	1,561.18	1,558.49	1,528.66	1,538.80	1,530.76	1,487.71	1,530.52	1,490.54	1,456.82	1,441.68	-25.82
Total CH_4 emissions with CH_4 from LULUCF	1,613.99	1,583.28	1,506.15	1,564.00	1,561.17	1,531.00	1,541.13	1,533.99	1,490.32	1,532.91	1,492.96	1,459.05	1,443.99	-25.81
Memo items:														
International bunkers	1.55	1.63	1.78	1.86	2.08	1.95	1.93	1.78	1.57	1.53	1.40	1.39	1.37	-22.92
Aviation	0.13	0.15	0.14	0.15	0.15	0.14	0.13	0.12	0.11	0.12	0.13	0.14	0.13	43.80
Navigation	1.42	1.48	1.63	1.71	1.93	1.81	1.80	1.65	1.46	1.42	1.28	1.26	1.23	-26.63
Multilateral operations	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														

Table1-21 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
	kt											
1. Energy												
A. Fuel combustion (sectoral approach)	22.59	22.59	23.43	23.84	24.29	25.28	27.36	27.96	28.72	28.19	28.66	28.77
1. Energy industries	4.02	4.02	4.14	4.13	4.26	4.53	5.83	6.00	6.24	6.31	6.64	6.90
2. Manufacturing industries and construction	4.60	4.60	4.84	4.97	5.30	5.75	6.06	6.29	6.63	6.32	6.47	6.66
3. Transport	13.26	13.26	13.76	14.00	13.88	14.12	14.52	14.78	14.93	14.58	14.51	14.16
4. Other sectors	0.71	0.71	0.70	0.74	0.85	0.87	0.95	0.89	0.92	0.98	1.04	1.06
5. Other	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
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
2. Oil and natural gas and other emissions from energy production	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
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
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
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
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	41.88	41.88	41.36	41.10	41.09	40.39	39.14	38.55	38.14	37.78	37.59	37.85
A. Enteric fermentation												
B. Manure management	14.26	14.26	14.36	14.31	14.08	13.78	13.55	13.39	13.31	13.16	13.06	13.21
C. Rice cultivation												
D. Agricultural soils	27.49	27.49	26.88	26.66	26.89	26.49	25.47	25.05	24.72	24.51	24.43	24.54
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0.13	0.13	0.12	0.12	0.11	0.12	0.11	0.11	0.11	0.10	0.10	0.10
G. Liming												
H. Urea application												
I. Other carbon containing fertlizers												
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	1.13	1.13	1.11	1.10	1.10	1.08	1.05	1.03	1.00	0.98	0.96	0.94
A. Forest land	0.44	0.44	0.44	0.44	0.45	0.44	0.44	0.45	0.45	0.44	0.44	0.44
B. Cropland	0.43	0.43	0.41	0.40	0.39	0.39	0.37	0.34	0.32	0.31	0.29	0.28
C. Grassland	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
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
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
F. Other land	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
G. Harvested wood products												
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5. Waste	9.33	9.33	9.54	9.96	10.05	10.54	11.07	11.47	11.75	11.73	11.87	11.71
A. Solid waste disposal												
B. Biological treatment of solid waste	0.47	0.47	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.47
C. Incineration and open burning of waste	4.82	4.82	4.95	5.40	5.40	5.93	6.39	6.80	7.04	7.06	7.29	7.23
D. Waste water treatment and discharge	4.05	4.05	4.13	4.10	4.18	4.15	4.21	4.21	4.25	4.21	4.11	4.01
E. Other	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
Total direct N_2O emissions without N_2O from LULUCF	107.06	107.06	106.00	106.44	106.06	110.46	111.50	115.28	117.94	112.69	92.27	100.88
Total direct N_2O emissions with N_2O from LULUCF	108.19	108.19	107.11	107.54	107.16	111.54	112.55	116.31	118.95	113.67	93.23	101.82
Memo items:												
International bunkers	0.85	0.85	0.90	0.91	0.97	1.00	1.06	0.86	0.99	1.04	1.00	1.02
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
Navigation	0.48	0.48	0.51	0.51	0.57	0.57	0.58	0.34	0.44	0.47	0.45	0.47
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	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
Indirect CO_2												

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change from base to latest reported year
	kt													(%)
1. Energy														
A. Fuel combustion (sectoral approach)	28.79	27.89	26.94	26.12	26.08	25.33	25.21	24.21	23.05	22.91	22.61	22.42	22.52	-0.29
1. Energy industries	7.53	7.38	7.45	7.45	8.19	8.14	8.35	8.19	7.91	7.97	8.59	8.64	8.83	119.81
2. Manufacturing industries and construction	6.64	6.75	6.67	6.75	6.71	6.66	6.81	6.55	6.15	6.25	6.06	6.14	6.22	35.16
3. Transport	13.58	12.70	11.81	10.83	10.03	9.43	8.99	8.49	7.96	7.45	7.08	6.84	6.62	-50.03
4. Other sectors	1.04	1.06	1.01	1.08	1.14	1.10	1.05	0.98	1.03	1.25	0.88	0.80	0.85	19.04
5. Other	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	-16.32
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	
2. Oil and natural gas and other emissions from energy production	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	-16.32
C. CO_2 transport and storage														
2. Industrial processes	11.27	10.81	10.97	12.08	10.38	11.20	8.60	8.88	9.32	7.62	6.48	5.80	5.87	-82.36
A. Mineral industry														
B. Chemical industry	10.02	9.55	9.69	10.86	9.15	9.88	7.48	7.89	8.45	6.70	5.57	4.76	4.66	-85.56
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
D. Non-energy products from fuels and solvent use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
E. Electronic industry														
F. Product uses as ODS substitutes														
G. Other product manufacture and use	1.25	1.26	1.27	1.22	1.23	1.33	1.13	1.00	0.87	0.92	0.91	1.03	1.20	23.44
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
3. Agriculture	37.41	37.59	37.72	37.49	37.67	38.01	39.45	37.33	36.77	37.84	37.62	37.36	37.05	-11.53
A. Enteric fermentation														
B. Manure management	13.39	13.67	13.93	14.05	14.36	14.84	15.18	15.52	15.80	15.60	15.62	15.43	15.25	6.93
C. Rice cultivation														
D. Agricultural soils	23.92	23.83	23.70	23.35	23.22	23.09	24.19	21.73	20.89	22.16	21.92	21.86	21.73	-20.95
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
F. Field burning of agricultural residues	0.10	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.07	0.07	0.07	-44.56
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	
4. Land use, land-use change and forestry	0.93	0.92	0.88	0.86	0.84	0.81	0.78	0.77	0.74	0.72	0.71	0.70	0.70	-37.78
A. Forest land	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.45	0.44	0.44	0.44	0.44	0.44	0.69
B. Cropland	0.27	0.26	0.23	0.21	0.19	0.17	0.15	0.13	0.12	0.10	0.10	0.09	0.09	-79.49
C. Grassland	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	-5.98
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	
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	
F. Other land	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	-57.14
G. Harvested wood products														
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
5. Waste	11.57	11.12	11.22	11.23	11.48	11.13	10.53	10.42	10.16	9.82	9.90	9.88	9.92	6.31
A. Solid waste disposal														
B. Biological treatment of solid waste	0.47	0.59	0.70	0.72	0.81	0.84	0.81	0.91	0.90	0.79	0.87	0.86	0.86	84.85
C. Incineration and open burning of waste	7.00	6.41	6.40	6.37	6.59	6.19	5.68	5.47	5.27	5.09	5.12	5.24	5.26	9.22
D. Waste water treatment and discharge	4.10	4.11	4.12	4.13	4.08	4.11	4.04	4.04	3.99	3.94	3.91	3.78	3.80	-6.20
E. Other	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	
Total direct N_2O emissions without N_2O from LULUCF	89.03	87.42	86.85	86.91	85.61	85.68	83.80	80.84	79.30	78.19	76.60	75.45	75.36	-29.61
Total direct N_2O emissions with N_2O from LULUCF	89.96	88.33	87.74	87.77	86.44	86.49	84.58	81.61	80.04	78.91	77.32	76.16	76.07	-29.69
Memo items:														
International bunkers	0.93	1.02	1.04	1.09	1.15	1.08	1.03	0.97	0.85	0.87	0.88	0.90	0.89	4.17
Aviation	0.53	0.60	0.58	0.60	0.60	0.57	0.52	0.50	0.44	0.46	0.52	0.54	0.54	43.80
Navigation	0.40	0.42	0.47	0.49	0.55	0.52	0.51	0.47	0.42	0.41	0.36	0.36	0.35	-26.63
Multilateral operations	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	
Indirect CO_2														

Table1-22 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
	kt											
	22,471.61	22,471.61	24,856.54	25,384.52	29,071.68	34,494.85	42,822.25	42,855.01	44,419.65	40,308.94	37,483.60	34,719.72
Emissions of HFCs - (kt CO_2 equivalent)	15,932.31	15,932.31	17,349.61	17,767.22	18,128.88	21,051.39	25,212.33	24,596.83	24,435.37	23,740.46	24,365.53	22,846.61
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
HFC-32	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	0.00	0.01	0.02
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-43-10mee	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO
HFC-125	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	0.00	0.01	0.02
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-134a	0.00	0.00	IE, NO	0.08	0.63	1.30	2.01	2.79	3.49	3.87	4.05	4.31
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-143a	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-152												
HFC-152a	0.00	0.00	NO	0.00	0.01	0.01	0.01	0.01	0.00	NO	NO	0.02
HFC-161												
HFC-227ea	NO	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00	0.00	0.00
HFC-236cb												
HFC-236ea												
HFC-236fa	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-245fa	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO
HFC-365mfc	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO	IE, NO
Unspecified mix of HFCs - (kt CO_2 equivalent)	2.24	2.24	IE, NO	67.54	440.93	768.60	876.60	877.75	854.74	763.92	705.37	899.09
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
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
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
C_3F_8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_4F_{10}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C_4F_8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_5F_{12}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_6F_{14}	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
C10F18	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C3F6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
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
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
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**
Emissions of NF_3 - (kt CO_2 equivalent)	32.89	32.89	32.89	32.89	43.85	76.74	202.81	194.27	172.78	172.65	282.59	186.01
NF_3	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change from base to latest reported year
	kt													(%)
	29,330.29	25,417.45	25,054.96	21,595.94	21,347.59	23,546.79	24,519.84	24,896.05	24,826.39	27,363.56	29,602.65	32,523.91	35,056.69	56.00
Emissions of HFCs - (kt CO_2 equivalent)	19,451.82	16,218.01	16,200.76	12,379.29	12,724.24	14,548.01	16,602.99	19,152.64	20,779.51	23,114.01	25,847.20	29,087.58	31,776.63	99.45
HFC-23	0.80	0.52	0.43	0.09	0.04	0.06	0.02	0.04	0.00	0.00	0.00	0.00	0.00	-99.85
HFC-32	0.05	0.08	0.14	0.21	0.30	0.39	0.49	0.61	0.72	0.84	1.01	1.20	1.47	
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
HFC-43-10mee	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	
HFC-125	0.05	0.08	0.14	0.21	0.30	0.39	0.49	0.61	0.72	0.84	1.01	1.20	1.42	
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
HFC-134a	4.38	4.61	4.75	4.31	3.59	2.90	2.84	2.84	2.82	2.77	2.63	2.61	2.46	262,794.83
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
HFC-143a	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
HFC-152														
HFC-152a	0.08	0.16	0.40	0.84	1.22	1.41	1.44	1.68	1.58	1.30	1.26	0.99	0.68	1,797,042.86
HFC-161														
HFC-227ea	0.01	0.01	0.02	0.04	0.05	0.04	0.04	0.05	0.04	0.03	0.03	0.03	0.03	
HFC-236cb														
HFC-236ea														
HFC-236fa	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
HFC-245fa	IE, NO	IE, NO	IE, NO	0.19	0.48	0.67	0.85	0.93	1.01	1.11	1.24	1.36	1.47	
HFC-365mfc	IE, NO	IE, NO	0.00	0.08	0.17	0.25	0.31	0.35	0.41	0.46	0.51	0.59	0.65	
Unspecified mix of HFCs - (kt CO_2 equivalent)	1,141.08	1,510.75	2,356.16	3,542.91	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	894,170.99
Emissions of PFCs - (kt CO_2 equivalent)	9,878.47	9,199.44	8,854.21	9,216.64	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	-49.84
CF_4	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	-95.29
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	-95.29
C_3F_8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
C_4F_{10}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
c-C_4F_8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
C_5F_{12}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
C_6F_{14}	NA, NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA, NO	0.00	
C10F18	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
c-C3F6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Unspecified mix of PFCs - (kt CO_2 equivalent)	9,855.58	9,177.57	8,831.96	9,194.74	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	-48.54
Unspecified mix of HFCs and PFCs - (kt CO_2 equivalent)														
Emissions of SF_6 - (kt CO_2 equivalent)	6,066.02	5,735.48	5,406.31	5,258.70	5,063.86	5,243.91	4,754.51	4,206.12	2,474.65	2,468.45	2,299.56	2,299.32	2,165.76	-83.15
SF_6	**0.27**	**0.25**	**0.24**	**0.23**	**0.22**	**0.23**	**0.21**	**0.18**	**0.11**	**0.11**	**0.10**	**0.10**	**0.09**	**-83.15**
Emissions of NF_3 - (kt CO_2 equivalent)	195.05	271.72	299.14	367.36	1,249.87	1,093.43	1,210.12	1,173.16	1,166.68	1,369.46	1,561.30	1,255.57	1,360.96	4,038.06
NF_3	0.01	0.02	0.02	0.02	0.07	0.06	0.07	0.07	0.07	0.08	0.09	0.07	0.08	4,038.06

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 the Act on Promotion of Global Warming Countermeasures (Act No.117 of 1998)[9], 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 supplementary information required under Decision 2/CMP.8 etc., which is annually submitted in accordance with the UNFCCC and the Kyoto Protocol.

The MOE takes overall responsibilities for the national inventory and therefore makes every effort on improving the quality of inventory. The MOE 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 based on more recent international provisions. 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 Common Reporting Formats (CRF) and National Inventory Report (NIR), are done by the Greenhouse Gas Inventory Office of Japan (GIO), which belongs to the Center for Global Environmental Research of the National Institute for Environmental Studies. The relevant ministries, agencies and organizations provide the GIO the appropriate data (e.g., activity data, emission factors, GHG emissions and removals) through compiling various statistics and also provide relevant information on supplementary information required under Decision 2/CMP.8 etc. 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 values. The inventories are then published by the MOE and are submitted to the UNFCCC Secretariat by the Ministry of Foreign Affairs.

Figure 1-29 shows the overall institutional arrangement for Japan's inventory preparation as identified above.

[9] Enacted in October, 1998. The latest amendment was made on May 30th, 2014.

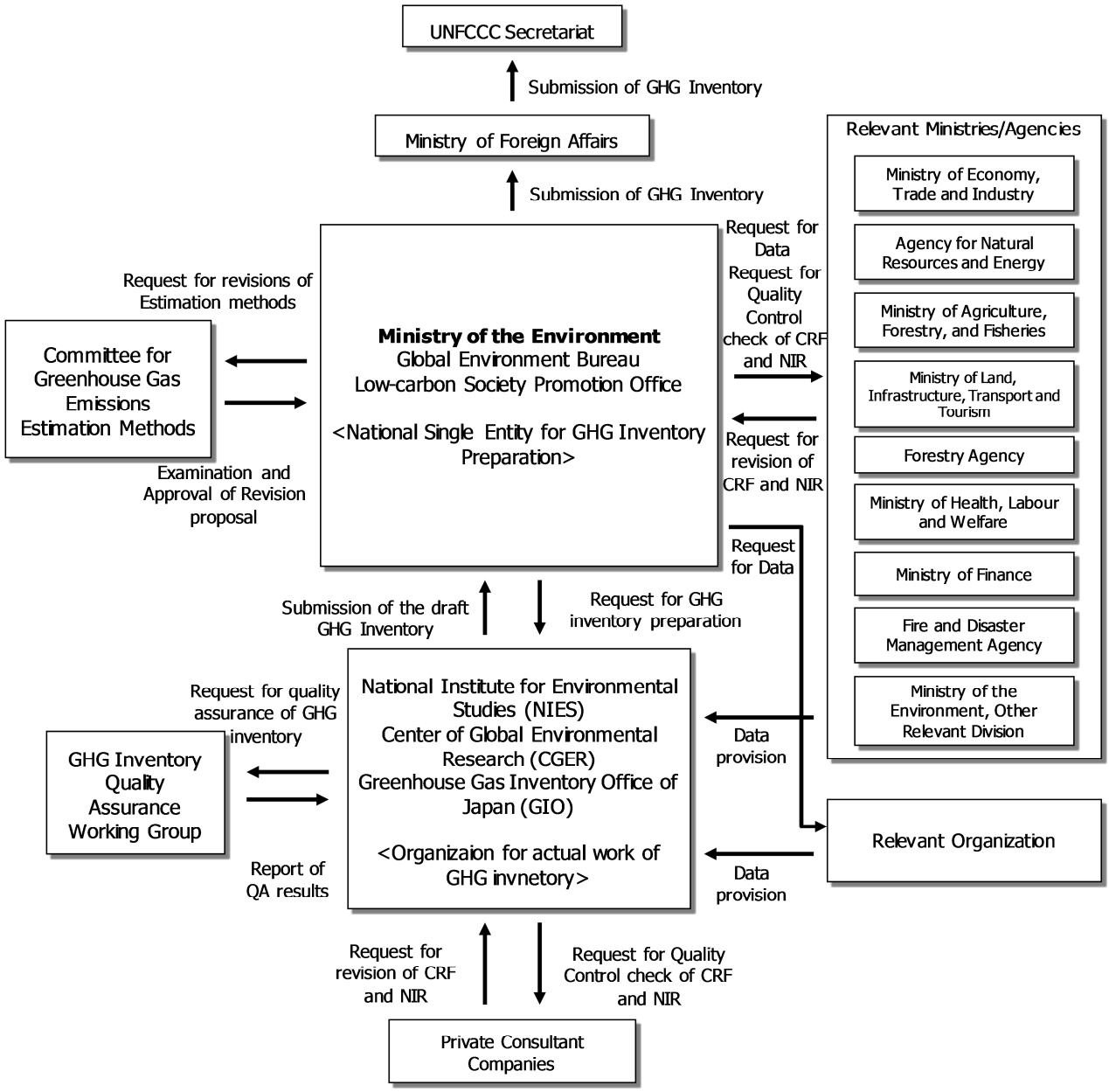


Figure 1-29 Japan's Institutional Arrangements for the National Inventory Preparation

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 QA/QC activities for the inventory.
- It prepares, confirms, and approves the QA/QC plan.
- It prepares, confirms, and approves 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.

- Confirmation of data provided for the preparation of the inventory.
- Confirmation of the inventory (CRF, NIR, spreadsheets, and other information) (Category-specific QC) prepared by the GIO.
- Responding, as appropriate, to questions from expert review teams about the statistics controlled by relevant ministries and agencies, or about certain data they have prepared, and preparing comments on draft reviews.
- Responding, as appropriate, to visits by expert review teams.

(4) Relevant Organizations

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

- Confirmation of data provided for the preparation of the inventory.
- Responding, as appropriate, to questions from expert review teams about the statistics controlled by relevant organizations, or about certain data they have prepared, and preparing comments on draft reviews.

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

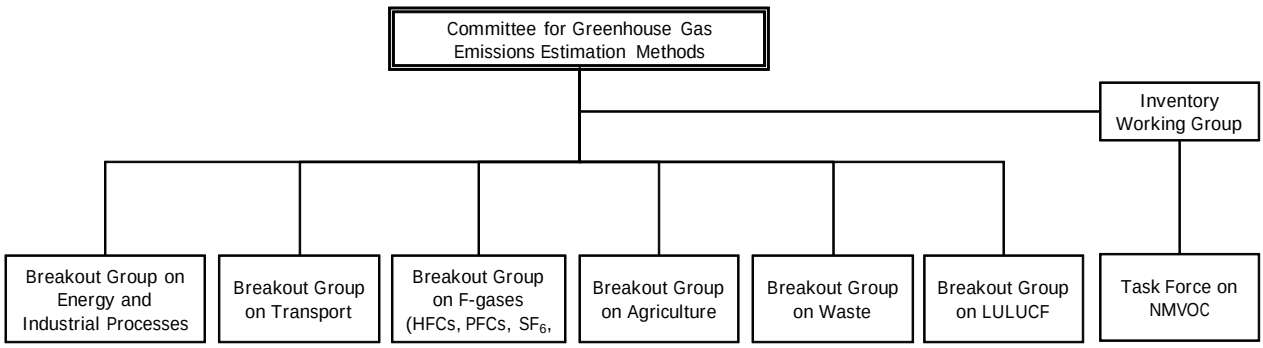


Figure 1-30 Structure of the Committee for the Greenhouse Gas Emissions Estimation Methods

(6) Private Consulting Companies

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

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

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

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

1.2.3 Brief Description of the Inventory Preparation Process

1.2.3.1 Annual Inventory Preparation Cycle

Table 1-23 shows the annual cycle of the inventory preparation. The inventory preparation cycle is set in conjunction with Japan's fiscal year calendar (starting April 1st and ending March 31 the next year) In Japan, in advance of the estimation of national inventory submitted to the UNFCCC (submission deadline: 15th April), preliminary figures are estimated and published as a document for an official announcement. (In preliminary figures, only GHG emissions excluding removals are estimated.)

Table 1-23 Annual Inventory Preparation Cycle

*Inventory preparation in fiscal year "n"

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

1.2.3.2 Inventory Preparation Process

(1) Discussion on inventory improvement (Step 1)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1.2.4 Information on the QA/QC Process

When compiling the inventory in Japan, inventory quality is controlled by performing quality control (QC) activities (such as checking the correctness of calculations and archive of documents) at each step in accordance with 2006 IPCC Guidelines. In Japan, the quality control activities relating to inventory compilation performed by personnel belonging to agencies involved in inventory compilation—that is, the Ministry of the Environment (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 (QAWG) are considered to be QA (quality assurance). They assess data quality from the perspectives of scientific knowledge and data availability with respect to current calculation methods. Table 1-24 sketches Japan's QA/QC activities.

Table 1-24 Summary of Japan's QA/QC activity

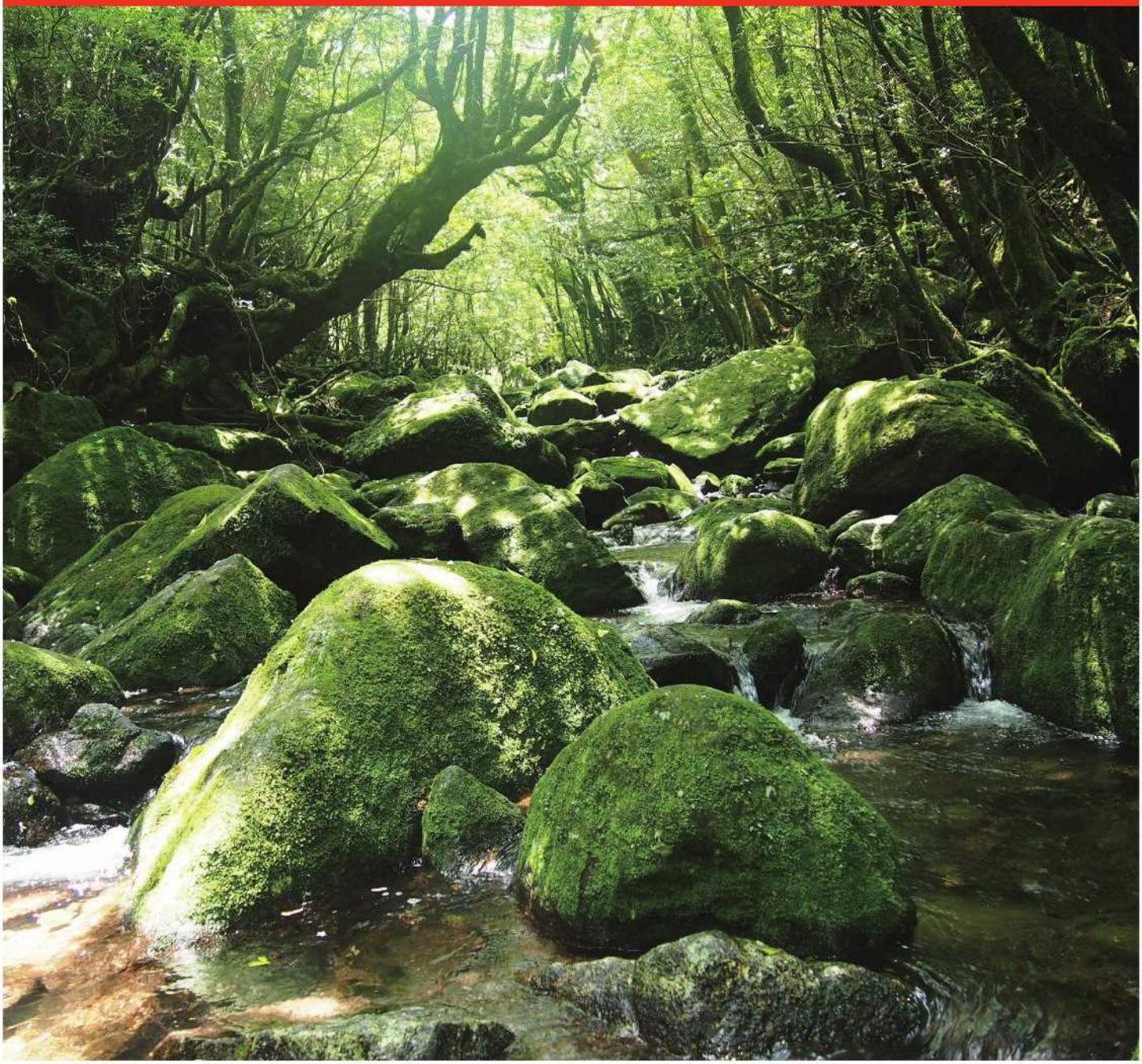
	Implementing entity	Main contents of activity
QC (Quality Control)	Ministry of the Environment (Low-carbon Society Promotion Office, Global Environment Bureau)	・Coordinating QA/QC activities for inventory preparation ・Establishing, revising, and approving QA/QC plan ・Developing, checking, and approving inventory improvement plan
	Greenhouse Gas Inventory Office of Japan, Center for Global Environmental Research, National Institute for Environmental Studies (GIO)	・Conducting general QC check (General QC) ・Archiving QA/QC activity records and relevant data and documents ・Developing inventory improvement plan ・Revising QA/QC plan
	Relevant Ministry and Agencies (including the Ministry of the Environment)	・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, emission factors, and activity data (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 (QA)

1.2.5 Changes in National inventory arrangements since NC6/BR1

There is no change in National inventory arrangements since Japan's 6th National Communication (NC6) and first Biennial Report (BR1) which Japan submitted in December 2013.

Chapter 2

Quantified Economy-Wide Emission Reduction Target



Japan's greenhouse gas emission reduction and removal target is a 3.8% emission reduction in 2020 compared to the 2005 level.

This is a target at this point, which has not yet taken into account the emission reduction effect resulting from nuclear power. A firm target, based on the energy policy situation and so on, will eventually be set.

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 necessary policies and measures. Of them, the targets of the amount of net removals by forest management and revegetation are to ensure approximately 38 million t-CO_2 or more (based on certain assumptions), 1.2 million t-CO_2, respectively. The amount of net removals by agricultural soils is estimated at approximately 7.7 million t-CO_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.

【Base year】(CTF Table 2(a))

Base year	FY2005
Emission reduction target	-3.8% of base year
Period for reaching target	FY2020

【Gases, sectors covered and GWP】(CTF Table 2(b), (c))

Gases covered	Base year for each gas	GWP values
CO_2	FY2005	IPCC Fourth Assessment Report (AR4)
CH_4	FY2005	IPCC Fourth Assessment Report (AR4)
N_2O	FY2005	IPCC Fourth Assessment Report (AR4)
HFCs	CY2005	IPCC Fourth Assessment Report (AR4)
PFCs	CY2005	IPCC Fourth Assessment Report (AR4)
SF_6	CY2005	IPCC Fourth Assessment Report (AR4)
NF_3	CY2005	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	Included	Japan will use net removals by LULUCF activities in accordance with the accounting rule under the second commitment period of the Kyoto Protocol. Of them, the targets of the amount of net removals by forest management and revegetation by net-net accounting approach (Base year: FY1990) will correspond with approximately 38 million t-CO_2 or more (based on certain assumptions), 1.2 million t-CO2, respectively. The amount of removals by agricultural soils is estimated at approximately 7.7 million t-CO_2 by net-net accounting approach (Base year: FY1990).
Contribution of LULUCF is calculated using	Activity-based approach	

【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	This is a target at this point, which has not yet taken into account the emission reduction effect resulting from nuclear power. A firm target, based on the energy policy situation and so on, will eventually be set.

Chapter 3

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

3.1 Mitigation actions and their effects

3.1.1 Information on institutional arrangements in Japan

3.1.1.1 Development of Japan's Promotion System

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

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

Japan will develop "Global Warming Countermeasure Plan" based on the Article 8.1 of "Act on Promotion of Global Warming Countermeasures" in order to promote global warming countermeasures in a comprehensive and planned manner in cooperation with Japanese government, local governments, business operators and general public.

3.1.1.2 Progress Management of Policies and Measures

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

In order to ensure the effectiveness of climate change policy, the Government council conducts an annual review on the progress of national policies and measures and voluntary initiatives conducted by business operators (Commitment to a Law Carbon Society). In addition, the Government estimates the greenhouse gas emission levels biannually (preliminary and definite values) to check the emission trends by sector and by gas.

3.1.2 Policies and Measures on Mitigation Actions and Their Effects

3.1.2.1 Policies and Measures for Greenhouse Gas Emissions Reductions and Removals

(1) Policies and Measures for Greenhouse Gas Emissions Reductions

a) Energy-related CO_2

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

Since urban/regional structures and transportation systems will continue to influence CO_2 emissions in the mid- and long-term time frames through increases/decreases in traffic and other factors, the Government will encourage low-carbon urban/regional development in the mid- and long-term time frame by low-carbonizing urban/regional structures and socio-economic system through the promotion of non-fossil-fuel energy use such as solar power, supports for actions on GHG emissions reduction led by citizens and business operators and promotion of rearrangement and improvement of regional environment (i.e. promotion of convenience of public transportation) based on the action plans for low carbon society in the local level which are in accordance with the Act on Promotion of Global Warming Countermeasures and such activities are expected to be associated with city plans, the Plan on Establishment of Agricultural Promotion Regions, and other countermeasures. At the same time, concerning the cities with high energy demands, activities should be conducted such as improvement of energy use through holistic and efficient use of energy, implementation of countermeasures against urban heat island, and formulation of Compact Cities by concentrating urban functions. Moreover, such

activities should be in accordance with local low-carbon city plans based on the Low Carbon City Act (Act No. 84 of 2012) and be consistent with action plans for low carbon society and master plans for city planning in the local level.

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

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

(a) Promotion and Enhancement of Voluntary Action Plans of Industry (voluntary initiatives by business operators in accordance with the industries' action plans towards a low carbon society)

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

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

The industrial community has been evaluated for making sufficiently high achievements to reduce emissions in the industry, commercial, transport and energy conversion sectors by voluntarily developing and implementing greenhouse gas emissions reduction plans (Voluntary Action Plans). As initiatives after FY2013, each industry group formulates and implements greenhouse gas emission reduction plans (the industries' action plans towards a low carbon society) with the pillars of '2020 targets for global warming countermeasures of domestic business activities,' with the assumption of maintenance and enhancement of the world's most advanced low-carbon technologies and energy efficiency, 'contribution to emissions reduction in the other sector through providing low-carbon products and services,' 'promoting international contributions (contributions to emissions reduction in the other countries),' and 'developing and introducing innovative technologies' in order to pursue voluntary initiatives by business operators. The formulation and progress statuses of those initiatives have been strictly assessed and verified by the Government. In addition, the business community is in the process of formulating the industries' action plans towards a low carbon society up to FY2030 as actions after FY2020. The Government encourages each industry to formulate their action plans towards a low carbon society.

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

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

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

B. Initiatives in the Commercial and Other Sector

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

The Government improves energy-saving performance of devices through application of the Top Runner Program that requires manufacturers and importers of products to meet criteria which is in line with standards of currently most-advanced devices and assumed technological advances in about 3 to 10 years. The Government is continuously considering the addition of new devices to the Program and considering a review of the criteria for devices that have reached its target year.

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

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

While giving full consideration to the necessity and levels of regulations and their balance, and other matters, the Government will make it mandatory in stages to comply with energy conservation standards for newly constructed housing and buildings by 2020. The Government will develop an environment for smooth implementation of steps toward this end while giving full consideration to improving the construction techniques of small- and medium-sized builders and carpenters and the positioning of traditional wooden houses. The Act for the Improvement of the Energy Saving Performance of Buildings (Act No. 53 of 2015) was promulgated in July 2015 to take measures such as obligation to conform to the energy consumption performance standards of large-scale non-residential construction., The Government will continue to further diffuse energy-saving measures and provide support in the development of new technologies and services as well as construction methods that contribute to better energy conservation in housing, building materials, devices and so on. In addition, the Government introduced the Top Runner Program for construction materials, and thermal insulation material, sash window, and sealed insulating glass are covered. Furthermore, the Government will also promote diffusion of low carbon building with a higher energy-efficiency performance. The Government will enhance and diffuse an objective and clarified system (CASBEE: Comprehensive Assessment System for Built Environment Efficiency) for verifying and labeling comprehensive environmental performances of housing and buildings, which includes energy conservative performances, Non-Energy Benefit (NEB) standards including in-room environment and the level of CO_2 emission at each stage of life cycle.

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

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

(c) Smart Consumption of Energy by Using Energy Management

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

Specifically, the Government will promote innovative energy conservation businesses that utilize new technology such as IoT and others through conducting operation tests of demand response systems and the Electricity System Reform. In addition, the Government will promote the introduction of smart meters as infrastructure and install them in all households and offices in the early 2020s. At the same time, the Government will promote the introduction of the energy management systems such as HEMS (Home Energy Management System) and BEMS (Building Energy Management System), develop an environment where the entire Japan consumes energy in a smart manner, and promote actions utilizing energy consumption data with the aim of optimizing energy consumption.

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

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

(d) Initiatives by Public Organizations

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

The Government will conclude "contracts considering reduction of greenhouse gases and other emissions" mainly in six areas (namely, supply of electricity, automobiles, vessels, ESCO, buildings, and industrial waste) based on the "Act on Promotion of Contracts of National Governments and Other Entities Involving Due Care for Reduction of Greenhouse Gas Emission (Act No. 56 of 2007)", as well as its basic policy.

In order to spur demands for products that contribute to greenhouse gas emissions reduction and other eco-friendly goods and services, the Government will take the initiative in procuring such goods and services based on the "Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Act No. 100 of 2000; hereinafter referred to as the "Act on Green Purchasing")". Prefectures and municipalities will take actions such as implementing countermeasures with regards to the natural and social conditions of region and reducing GHG emissions from their administrative operations.

C. Initiatives in the Residential Sector

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

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

(c) Diffusion of Combined Heat and Power

The Government will promote the diffusion of combined heat and power such as household fuel cells ("Ene-farm"), which allow energy to be used more efficiently by utilizing heat generated during electricity generation for purposes like heating water. Specifically, the Government promotes advanced research and development and support for implementing new devices with a view to achieve prices that allow for prompt self-reliant diffusion of technologies. The Government aims to introduce 5.3 million household fuel cells ("Ene-farm") into the market by 2030 (1.4 million by 2020).

(d) Other Supportive Measures

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

D. Initiatives in the Transport Sector

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

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

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

Taking into consideration that, in December 2014, fuel cell vehicles entered the market, the Government will systematically put in place the hydrogen stations and utilize hydrogen from renewable energy sources with a view to diffuse fuel cell vehicles. In addition, the Government will promote diffusion and development of fuel-cell buses and other fuel cell vehicles, and reform regulations based on the Regulatory Reform Action Plan. In order to promote such diffusion of next-generation automobiles, the Government will work to provide preferential tax treatment such as tax cuts for eco-friendly automobiles.

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

The Government will promote the environmentally-conscious form of driving by pursuing the diffusion of Eco-drive Management Systems (EMS) for vehicle transport operators. At the same time, the Government is implementing various traffic flow improvements to ensure that drivers will

experience comfortable driving without having to worry about traffic congestion. These improvements include enhancement of ring roads and other arterial road networks, which also ultimately help reduce CO_2 emissions, and promoting smart use of existing road networks.

Furthermore, the Government will engage in traffic flow management such as development of traffic safety facilities like traffic signals and reduction of traffic congestions on general roads by applying Intelligent Transport System (ITS).

(c) Promotion of Public Transport Utilization

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

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

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

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

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

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

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

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

E. Initiatives in the Energy Conversion Sector

(a) Power from Renewable Energy Sources

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

In addition to the viewpoint of improving energy security through the use of domestic energy resources, promoting renewable energy also represents an important growth strategy, since it stimulates creation of a new energy-related industry and expansion of job opportunities, which supports the national developing strategy. The Government will promote the thorough use of renewable energy sources including onshore and offshore wind power, solar power, small-scale hydro power, geothermal power and biomass and expand their introduction to the maximum extent, provided that due consideration is given to natural environment and to local communities.

Also, the government will continue to operate the feed in tariff scheme appropriately and revise it, balancing the maximization of expansion of implementation of renewable energy and suppressing the burden on the people, in addition to, developing the power system and expanding it, conducting research and development and trial of batteries, and streamlining the environmental impact assessment procedures, in a balanced manner of implementation, taking into consideration the characteristic of fuel type and circumstances.

For land based wind energy, the Government will streamline environmental impact assessments and strengthen the transmission system within districts and inter district power system, with a view to maximizing the use of appropriate land such as Hokkaido and the Tohoku district. The Government will also make efforts to expand implementation by further considering ways to facilitate coordination and ease regulation on treating cropland conversion for locations and make efforts to rationalize regulations and institutions as necessary. For offshore wind energy, especially for floating offshore wind energy, the Government will continue trial research currently conducting in off the shores of Fukushima and Nagasaki, and aim at commercialization as soon as possible by 2018, while carrying out technology development, safety, reliability, and economic assessments, establishment of methods to conduct environmental impact assessments, among others, aiming at the world's first full scale commercialization.

For solar energy, noting that it can fill the gap for peak demand of the afternoon using decentralized energy system and contribute to the realization of a consumer participatory energy management system, the Government aims to expand growth by lowering the power generation cost through innovative technology development and practical application.

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

For the promotion of small-scale hydro power generation, the Government will promote its implementation by supporting businesses that conduct research on the necessary flow rate for commercialization, design, and other related activities, in addition to carrying out trial test to make further improvements in efficiency and lowering cost.

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

Other than the abovementioned energy sources, the Government will focus its work on research and

development for lowering costs and improving efficiency and diversifying the use of ocean power generation.

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

(b) Renewable Heat Energy

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

(c) Persuasion of High Efficiency of Thermal Power Generation

As for thermal power generation, effective mitigation measures by power sectors are essential in a consistent manner with national reduction target. Hence, the reduction of environmental burdens should be attained as well by promoting the improvement of power efficiency and the replacement of the old electric power facilities with new ones through the voluntary initiatives of stakeholders of power generation and so forth.

In order to improve the efficiency of thermal power as envisaged in the energy mix, the Government aims to achieve combined-cycle level LNG thermal power generation and ultra-supercritical (USC) level coal-fired power generation, as well as reviewing the standards of judgment of the Act on the Rational Use of Energy intending to restrain the operation of inefficient thermal power plants, and to replace old thermal power plants with new ones.

In addition, through environmental impact assessments of construction of each thermal power plant, the Government examines, in the necessary and rational range, whether business operators are making efforts to reduce environmental burdens by using best available technology or not, as well as whether the consistency with Japan's target and plan of CO_2 emissions reduction is secured or not.

Moreover, 35 operators of electric utilities formulated and announced the "voluntary framework" in July 2015, and they are considering the formulation of concrete mechanism and rules for the achievement of the goal of voluntary framework by operators of electric utilities, in parallel with development of the national Global Warming plan based on the energy policies, toward the achievement of Japan's target of greenhouse gas reduction and its energy mix. The power sectors, each electric utility and the Government will implement the PDCA cycle of their mitigation measures.

At the same time, the Government will support technological development. The Government aims to achieve practical use of advanced ultra-supercritical (A-USC) thermal power generation in 2020s (generating efficiency: around 39% at present to improve to around 46%). The Government aims to establish technology of integrated coal gasification fuel cell combined cycle (IGFC) by 2025 and achieve practical use in 2030s (generating efficiency: around 39% at present to improve to around 55%) For LNG thermal power generation, the Government aims to achieve practical use of gas turbine of 1700 °C class by around 2020 (generating efficiency: around 52% at present to improve to around 57%).

Also concerning carbon dioxide capture and storage (CCS), the Government will carry out research and development for practical use of CCS technology around 2020, specifically large scale demonstration experiments, research and development for capture, safety assessment, and others, and conduct necessary geological surveys for selecting potential CO_2 storage sites. Moreover, the introduction of coal thermal power generation that gives consideration to further reduction of the

environmental impact will be promoted by a study to be conducted on introducing CCS-ready facilities as early as possible with due consideration given to the possible timing of the commercialization of CCS and other measures.

(d) Utilizing Nuclear Power Generations whose Safety is Approved

The safety of nuclear power plants is overseen by the Nuclear Regulation Authority, whose decisions are based on scientific and technical judgments. Upon approval by the Nuclear Regulation Authority that the regulatory standards are met, the government will respect its judgment and will proceed with the restart of the nuclear plant. In this case, the Government will make efforts to obtain understanding and cooperation of relevant parties including the municipality of each nuclear facility site. The Sendai Nuclear Power Plant's Unit 1 reactor was restarted on September 10. Also, their Unit 2 reactor was restarted on November 17. The Government will make efforts to decide on final disposal sites for high level radioactive waste, and promote technology development, personnel training, and establishment of environment for nuclear power to pursue the sophistication of nuclear power generation safety.

b) Non Energy-related CO_2

The Government will reduce CO_2 emissions in the cement production process by reducing the production volume of clinker through increased production proportion and expanded use of blended cement, which is made by mixing blast-furnace slag with clinker, an intermediate cement product. Specifically, in public works administrated by the government, the use of blended cement will be promoted in accordance with "Act on Green Purchasing". As one of the optional items of accreditation criteria on low carbon buildings, which is based on the Low Carbon City Act, the Government lists the use of slag cement or fly ash cement to prepare a favorable environment for promoting and utilizing blended cement.

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

c) Methane and Nitrous Oxide

1) Methane (CH_4)

The Government will promote the reduction of direct landfill of organic waste such as garbage, which will in turn reduce methane emissions associated with waste landfill. The Government will also promote the 3Rs initiatives for achieving the targets set out in the Basic Recycling Plan formulated in accordance with the Basic Recycling Law and the waste reduction targets stipulated in the Waste Management Law in line with the targets in the Basic Recycling Law. Specifically, the Government will promote waste reduction and recycling through the following measures: reviews of disposal methods and thorough

waste sorting and collection by municipal governments, reducing illegal dumping of industrial wastes through stricter waste disposal systems and the development of model disposal operators; and promoting actions based on the Guidelines for Controlling Greenhouse Gas Emissions. At the same time, the Government will reduce the amount of direct landfill of organic waste by promoting the improvement of the systems for waste disposal facilities of municipalities, including through banning the direct disposal to landfill of organic wastes in principle, in accordance with the waste disposal facility development plan based on the Waste Management Law.

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

2) Nitrous Oxide (N_2O)

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

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

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

d) Fluorinated Gases: HFCs, PFCs, SF_6 and NF_3

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

It is important to ensure the appropriate management and disposal of the four fluorinated gases; HFCs, PFCs, SF_6 and NF_3 (NF_3 has been newly added since 2015 GHG inventory submission in accordance with the revised UNFCCC reporting guidelines on annual inventories for Annex I Parties (Decision 24/CP.19)),

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

(2) Greenhouse Gas Sink Policies and Measures

a) Measures for Managing Forest Carbon Sink

Through implementation of measures designed to achieve the objectives regarding the multiple roles of forests as well as the supply and usage of forest products outlined in the “Basic Plan for Forest and Forestry endorsed by the Cabinet in July 2011 in accordance with the Forest and Forestry Basic Act (Law No. 161, 1964)”, the Government aims to attain the forest sink target approximately 38 million t-CO_2 or more in accordance with the accounting rule under the second commitment period of the Kyoto Protocol (based on certain assumptions).

In order to attain this target, a variety of policies and measures are implemented, based on the "Act on Special Measures concerning Advancement of Implementation of Forest Thinning, etc."(2013), including a promotion of thinning to achieve the goal of thinning an annual average of 520 thousand hectares of forests between FY2013 and FY2020 and a promotion of the establishment of seed orchards and scion gardens which are necessary to replace existing breeds of major forestry species with seeds and seedlings that grow well for the contribution to the carbon sink in the future. In addition, policies and measures concerning the proper management and conservation of protection forests, use of timber and woody biomass and so on are being implemented. The Government is carrying out these by gaining understanding by and cooperation from local governments, various stakeholders and the general public.

The implementation of these measures for managing forest carbon sink can contribute to not only conservation of forests and promotion of sustainable forest management but also conservation of biodiversity and sustainable use of forest resources.

In addition, it is necessary to consider a new scheme such like establishing a new tax as financial resources for forest management and conservation activities by municipalities, as well as enhancing utilization of “Tax for Climate Change Mitigation” revenue for promoting wood products and woody biomass to reduce energy-related CO_2 emission, from a viewpoint to secure stable resources for forest carbon sink management. The Government will also promote the public-private joint initiatives in a steady and comprehensive manner, including community afforestation programs and forest environment campaigns designed to gain the extensive understanding and support of the public.

b) Measures for Sinks in Agricultural Soils

It is proven that the carbon storage in cropland and grassland soils in Japan can be increased by continuous usage of organic matter such as compost and green manure. The Government will contribute to the carbon stock increase of an approximately 7.7 million t-CO_2 in cropland and grassland soils (7.1 – 8.3 million t-CO_2) (based on projected values of each year between 2013 and 2020) by promoting domestic agriculture production and maintaining crop acreage based on Food, Agriculture and Rural

Basic Plan (Cabinet decision, March 2015) as well as promoting soils by applying organic matter such as compost and green manure.

c) Promotion of Urban Greening

For the urban greening, actions will be continuously promoted such as park maintenance, greening in roads and bays, and creation of the new greening spaces at buildings. Improvement in report and verification system for the urban greening will also be strategically carried out. The target of net removals in revegetation is to ensure approximately 1.2 million t-CO_2.

(3) Joint Crediting Mechanism (JCM)

Japan establishes and implements the 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.

Since Japan and Mongolia signed bilateral documents in January 2013 for the first time to start this mechanism, the number of partner countries has increased to 16 as of the end of December 2015. This means that the target to double the number of partner countries in 3 years from November 2013 has been achieved a year in advance. So far, the Joint Committee was held 26 times in total, eight JCM projects are registered in four countries (Indonesia, Palau, Mongolia and Vietnam) and 19 JCM methodologies are approved. The government continues to support the further formulation of JCM projects and to increase the number of partner countries.

3.1.2.2 Cross-sectional Strategies

a) GHG Emissions Accounting, Reporting and Disclosure Program

Based on the "Act on Promotion of Global Warming Countermeasures", the Program obliges greenhouse gas emitters that exceed a given threshold of emission to report their emission quantities to the Government on an annual basis which are collected and disclosed it to the public. Proactive emission reduction by the emitters is facilitated through adequate review of greenhouse gases subjected to reporting based on Intergovernmental Panel on Climate Change (IPCC) guidelines, as well as through accurate report, prompt collection and disclosure of emission information.

b) Making the Tax System Greener

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

c) Domestic Emission Trading Scheme

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

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d) Preliminary Studies, Forecast and Evaluation of GHG Projects

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

e) Promotion of Environmental Considerations in Business Activities

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

f) Greening Finance

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

In addition, the Government will promote loans based on environmental responsibility ratings and ESG (Environmental, Social and Governance) investment.

g) Promotion of J-Credit Scheme which certifies Emission Reductions and Removals as credits in Japan

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

h) Development of Public Campaigns

The Government will work to enhance public and business operators’ awareness and understanding of the global warming issues, by providing clear and useful information about adverse impacts of global warming on the public and society backed by the latest scientific information, through dialog and

various forms of media. In this way, the Government will aim to foster a spirit of understanding and cooperation towards the global warming countermeasures while encouraging people to change their lifestyles towards the ones appropriate for a low-carbon society, and establishing the benefits of such changes.

For the sake of this purpose, the new national campaign “COOL CHOICE” will encouraging all possible “cool choices” to contribute to Global Warming Prevention such as energy-saving / low-carbon products / services / actions, etc.

i) Technology Development for Global Warming Countermeasures

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

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

Table 3-1 Progress in 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 CO_2 eq)
									2020
Emissions Reduction of Energy-related CO_2									Note 1
Development of Low-Carbon Urban/Regional Structures and Socioeconomic Systems									
Promotion of Global Warming Countermeasures Based on the Action Plan of Each Local Government	Cross-Cutting	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Support development of low-carbon communities which is coordinated with local city plans and led by local governments	Law/Standard Budget/Subsidy Awareness Raising	Implemented	Local governments will formulate and implement the local action plans based on the Act on Promotion of Global Warming Countermeasures (come in effect since 1998) which are expected to be coordinated with local city plans. The Government will provide guidelines for developing plans as well as support implementing actions based on their plans.	2008	MOE	-
Promotion of Developing Low-Carbon Community	Cross-Cutting	CO_2	Encourage low-carbonization of communities through concentrating city functions and low-carbonization of transport systems	Law/Standard Taxation Budget/Subsidy	Implemented	The Government will facilitate the formulation of low carbon city plans led by the local government based on "Low Carbon City Act (come in effect since December 2010)" as well as facilitate actions to integrate various urban functions, to promote the use of public transportation, to enhance efficiency of energy use, to preserve urban green areas, and to promote urban greening, based on the plans.	2012	MLIT, METI, MOE	-
Holistic and Efficient Use of Energy	Energy	CO_2	Support the installation of, and promote the diffusion and extended usage of, innovative and cutting-edge system which utilizes area-wide energy use at block and district.	Budget/Subsidy Awareness Raising	Implemented	The Government will provide support to develop facilities which contribute to area-wide energy use with utilization possibility, innovativeness and leadership in multiple districts on the project areas.	2008	MLIT, METI	-
Industry Sector									
Promotion and Reinforcement of Voluntary Action Plans of Industry	Energy Industry/ Industrial Processes	CO_2	Reduce CO_2 emissions from the industry, commercial, transport, and energy conversion sector by promoting voluntary and active activities of business operators to actively implement environmentally-friendly business actions on a voluntary basis with respect to the environment conservation.	Voluntary Agreement	Implemented	In industry sector, each industry group formulates and implements GHG emissions reduction plan (the Commitment to a Low Carbon Society) including 2020 emissions reduction target with an assumption of maximum use of world most-advanced low-carbon technologies (best available technologies, BAT). And the government will strictly assess and verify such initiatives.	Since 1997 (Depends on a group)	METI MOE Industry Group Related Ministries and Agencies (for Assessment and Verification)	NE
Promotion of Introduction of Highly Energy-efficient Equipment and Devices	Energy	CO_2	Reduce CO_2 emissions from energy consumption in the manufacturing sector and the like by promoting the diffusion of energy-saving equipment in the sector.	Budget/Subsidy Financing	Implemented	On the top of the introduction of various energy-efficient equipment and devices based on the Commitment to a Low Carbon Society, the Government will implement supporting programs to promote the diffusion of low-carbon industrial furnaces which lead to massive improvement of energy efficiency compared to conventional equipment and devices.	2008	METI	NE
	Energy	CO_2	Reduce CO_2 emissions from energy consumption by construction work by promoting the diffusion of low-fuel or low-carbon construction machinery.	Budget/Subsidy Financing Other	Implemented	The Government will certify, and support the introduction of, construction machinery which passes the given criteria of fuel efficiency and the machinery using leading technologies such as hybrid or electrically geared system.	2010	MLIT	NE
	Energy	CO_2	Reduce CO_2 emissions associated with energy consumption in agriculture and fishery sector by diffusing energy saving facilities/devices in greenhouse horticulture, appliances for agriculture, and fishing vessels.	Budget/Subsidy Awareness Raising Technology Development	Implemented	The Government will support the introduction of, and develop further technologies of, heat pump units to greenhouse horticulture, appliances for agriculture such as heating equipment using woody biomass, high-speed pudding machines, energy-efficient outboard motors for fishing vessels, and fish-luring lights using LED etc.	2007	MAFF	NE

Name of mitigation action	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 CO_2 eq)
									2020
Commercial and others Sector									
Improving the Energy Efficiency of Equipment and Devices based on the Top Runner Program	Energy	CO_2	Improve energy consumption when devices are used, through the continuous improvements in device quality by the Top Runner system. (Devices currently subject to the program: air conditioners, electronic refrigerators, electronic freezers, energy converters, multi-functional printers and electric water heaters)	Law/Standard Budget/Subsidy	Implemented	The Government will continue to reconsider about target devices for the Top Runner Programme that requires manufacturers and importers of products to meet criteria which is in line with standards for currently most-advanced devices and assumed technological advances in about 3 to 10 years. At the same time, consideration will be carried out in order to revise the standards on devices which reaches their target year.	1998	METI	NE
Improvement of the Energy Efficiency Performance and Low-Carbonization of Buildings	Energy	CO_2	Reduce CO_2 emissions from energy consumption in buildings by promoting their energy saving through "regulations," "assessment and display" and "providing incentives."	Law/Standard Budget/Subsidy Other	Implemented	Regarding newly constructed buildings, the Government will implement support to raise public awareness to encourage diffusion of the revised energy conservation standard. The Government will make it mandatory in stages to comply with energy conservation standards for newly constructed buildings by 2020. To promote further improvement of energy efficiency, the Government will promote diffusion of low carbon buildings with a higher energy-efficiency, and provide support for implementing pilot projects which can realize low CO_2 emissions. The Top-Runner Program will be introduced on construction materials and thermal insulation material, sash window, and sealed insulating glass are covered. And regarding existing buildings, the Government will persue retrofits to improve energy efficiency, improvement of the use of equipment and devices, provision of consultation on potential capacity of GHG emissions reduction, promoted use of data of energy consumption and so on in order to improve the energy efficiency of the entire building stocks. Also the Government will discuss multilateral measures which are expected to be in need in the future specifically for replacing equipment with high-performed one. The Government will encourage the enhancement and diffusion of objective and clarified system for verifying and labelling of comprehensive environmental performances.	2003 (When the reporting period of energy-saving performance started, based on the Energy Saving Law)	MLIT, METI, MOE	NE
Smart Consumption of Energy by Using Energy Management etc.	Energy	CO_2	Support the introduction of Energy Management Systems such as BEMS, HEMS and MEMS in order to promote wider diffusion of those systems.	Taxation Budget/Subsidy Other	Implemented	The Government will promote the introduction of smart-meter as infrastructure and install them in all households and offices in the early 2020s. At the same time, the Government will promote the introduction of Energy Management Systems (HEMS, BEMS, etc.) and the utilization of energy consumption data with the aim of optimizing energy consumption. Efficient energy management system will be introduced such as 'demand response', which adjusts energy demand in response to the energy supply condition. Also, the Government will support the introduction of technologies etc. for CO_2 emissions reduction when developing social system such as water supply, sewage system, waste management and ICT.	1998 (Energy Use Rationalization Business support Program) 2012 (Subsidy to promote innovative energy conservation technology implementation in housing and	METI, MOE, MIC, Related Ministries and Agencies	NE
Initiatives by Public Organizations	Energy	CO_2	Implement necessary actions to achieve targets based on the commitment plans of each ministry and agency in accordance with the national commitment plan. In order to spur demands for products that contribute to greenhouse gas emissions reduction and other eco-friendly goods and services, the Government and independent administrative agencies etc. will promote the conversion of demand and they will make environmentally-conscious contracts which will contribute to GHG emissions reduction.	Law/Standard	Implemented	The Government will reduce greenhouse gas emissions with regard to its own administration and undertakings at a level which is equivalent or superior to initiatives in the current national commitment plan, even during the period before the new national commitment plan is formulated in line with the new plan for global warming prevention. The Government and independent administrative agencies etc. will take the initiative in procuring such goods and services that contribute to GHG emissions reduction as well as will make environmentally-conscious contracts which will contribute to GHG emissions reduction, mainly in six areas (namely supply of electricity, automobiles, vessels, ESCO, buildings, and industrial waste).	2001	All Ministries and Agencies	NE

Name of mitigation action	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 CO_2 eq)
									2020
Residential Sector									
Improving the Energy Efficiency of Equipment and Devices based on the Top Runner Program [reprinted]	Energy	CO_2	Improve energy consumption when devices are used, through the continuous improvements in device quality by the Top Runner standard. (Devices currently subject to the program: industrial air conditioners, industrial electronic refrigerators, industrial electronic freezers, energy converters, multi-functional printers and electric water heaters)	Law/Standard Budget/Subsidy	Implemented	The Government will continue to reconsider about target devices for the Top Runner Programme that requires manufacturers and importers of products to meet criteria which is in line with standards for currently most-advanced devices and assumed technological advances in about 3 to 10 years. (LED light bulbs and other devices are already added on the list in 2013.) At the same time, consideration will be carried out in order to revise the standards on devices which reaches their target year.	1998	METI	NE
Improvement of the Energy Efficiency Performance and Low-Carbonization of Housing	Energy	CO_2	Reduce CO_2 emissions from energy consumption in houses by promoting energy saving in housing through "regulations," "assessment and display" and "providing incentives."	Law/Standard Taxation Budget/Subsidy Financing Technology Development Awareness Raising Other	Implemented	Regarding newly constructed houses, the Government will implement support to raise public awareness to encourage diffusion of the revised energy saving standard. The Government will make it mandatory in stages to comply with energy conservation standards for newly constructed houses by 2020. In order to develop an enabling environment for such measures, the Government will support the improvement of the energy-saving design and construction techniques of small- and medium-sized builders and carpenters who are the main player for house supply, as well as the arrangement of evaluation system of energy saving performance. To promote diffusion of low carbon houses with a higher energy-efficiency, and for implementing pilot projects which will lead to low CO_2 emissions. The Top-runner Program will be introduced on construction materials by the end of this fiscal year. And regarding existing houses, the Government will persue retrofits to improve energy efficiency, improvement of the use of equipment and devices, provision of consultation on potential capacity of GHG emissions reduction, promoted use of data of energy consumption and so on in order to improve the energy efficiency of the entire house stocks. Also the Government will discuss multilateral measures which are expected to be in need in the future specifically for replacing equipment with high-performed one. The Government will encourage the enhancement and diffusion of objective and clarified system for verifying and labelling of comprehensive environmental performances.	2003 (When the reporting period of energy-saving performance started, based on the Energy Saving Law)	MLIT, METI, MOE	NE
Promotion of Combined Heat and Power and Household Fuel Cells	Energy	CO_2	Reduce CO_2 emissions from energy consumption in houses by promoting the introduction of combined heat and power such as fuel cells for household use.	Budget/Subsidy Technology Development	Implemented	The Government will promote the diffusion of combined heat and power such as household fuel cells ("Ene-farm"), which allow energy to be used more efficiently by utilizing heat generated during electricity generation for purposes like heating water.	2009	METI	NE
Other Supportive Measures	Energy	CO_2	Promote innovative changes towards low-carbon lifestyle by providing information, "visualization" of CO_2 emissions as well as promoting low-carbon activities.	Budget	Implemented	The Government will work on the "visualization" of CO_2 emissions by various product type by displaying information on emissions and other items during the product's life cycle. Moreover, the Government will work to promote innovative changes towards low-carbon lifestyle through the introduction of Home Energy Management Systems (HEMS), which operates lighting, air conditioners and other devices to optimally adjust to interior conditions, promotion of the use of HEMS data, and promotion of "Home CO_2 advisor service".	2010	MOE, METI	NE

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 CO_2 eq)
									2020
Transport Sector									
Improvement in the Fuel Efficiency of Vehicles and Diffusion of Them (Measures for each vehicle as a unit)	Transport	CO_2	Reduce CO_2 emissions from energy consumption in the transport sector by supporting the introduction of highly energy-efficient next-generation automobiles (hybrid vehicles (HEV), plug-in hybrid vehicles (PHEV), fuel-cell vehicles (FCV), clean diesel vehicles (CDV) and promoting the extensive diffusion of those automobiles, while continuing to improve the performance of vehicles according to fuel efficiency standards.	Law/Standard Taxation Budget/Subsidy Technology Development	Implemented	For next-generation vehicles such as electric vehicles, the Government will promotes the development of recharging infrastructure, support the purchase of vehicles to create mass production effects and to promote price reduction, and also support research and development to extend a cruising range and reduce the production costs. Taking into consideration that, in December 2014, fuel cell vehicles entered the market, the Government will systematically put in place hydrogen stations and utilize hydrogen from renewable energy sources with a view to diffuse fuel cell vehicles.The Government will reform regulation and develop technologies. By doing the above, the Government will promote the diffusion of next generation vehicles and promote its implementation. And the Government will promote further improvement of performance of automobiles through fuel efficiency standards (as the "Top Runner Standard") and take preferential tax treatment measures targeted at gasoline-based vehicles in accordance with their fuel efficiency.	1979 (When the Fuel Efficiency Standards were determined based on the Energy Saving Law)	MLIT, METI	NE
Promotion of Traffic Flow Improvements and Promotion of the Environmentally-friendly Usages of Vehicles	Transport	CO_2	Reduce CO_2 emissions from energy consumption in the transport sector through promotion of Traffic Flow Improvements.	Budget/Subsidy Awareness Raising	Implemented	The Government is implementing various traffic flow improvements to ensure that drivers will experience comfortable driving without having to worry about traffic congestion. These improvements include enhancement of ring roads and other arterial road networks, which also ultimately help reduce CO_2 emissions, and promoting smart use of existing road networks.	2012 (Priority Plan for Social Infrastructure Development)	MLIT	NE
Promotion of the Use of Public Transports	Transport	CO_2	Reduce CO_2 emissions from energy consumption in the transport sector by improving the service and convenience of trains and buses as well as promoting eco-commuting.	Taxation Budget/Subsidy Awareness Raising	Implemented	The Government will reconstruct the public transport networks in communities and improve their convenience by installing BRT and LRT, developing new line railroad, installing transport connection information system and location system for buses etc.	1992	MLIT	NE
Promoting Low-Carbonization of Railway, Vessel and Aviation	Transport	CO_2	Reduce CO_2 emissions from energy consumption in the transport sector by promoting the development and introduction of energy-efficient railways, vessels and aircraft.	Taxation Budget/Subsidy Financing Technology Development	Implemented	The Eco-Rail Line project, which will implement the introduction of highly energy efficient vehicles and renewable energy to railway facilities etc. will be promoted. Manufacturing of vessels with energy-saving equipment and alternation to the manufacturing of vessels with energy-efficient equipment will be promoted. The Government will promote efficient operating method for aircrafts and low-carbonization of airport facilities including increased use of ground power unit (GPU) etc.	2005	MLIT	NE
More Efficient Logistics/Modal shifts etc.	Transport	CO_2	Reduce CO_2 emissions from energy consumption in the transport sector by improving the efficiency of truck transport and promoting modal shifts to trains and coastal shipping.	Taxation Budget/Subsidy Financing Awareness Raising	Implemented	The Government will improve the efficiency of truck transport by encouraging the use of larger trucks such as large CNG trucks and promoting cooperative transport and delivery by logistics operators etc. within regions. Introduction of large containers (over 31ft), which is efficient to promote phasing out from larger trucks use and promotion of eco-rail mark etc. will be promoted to achieve the modal shift to rail freight transport and introduction of trucks with separable trailers and promotion of eco-ship mark etc. will be promoted to achieve the modal shift to maritime vessel transport. The Government will aim at further reduction of environmental load by strengthening a partnership between owners of goods and operators of logistics.	2001	MLIT	NE

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 CO_2 eq)
									2020
Energy Transformation Sector									
Promotion of Power from Renewable Energy Sources	Energy	CO_2	Reduce CO_2 emissions from energy supply by promoting the thorough use of renewable energies such as onshore/offshore wind power, solar power, small-scale hydro power, geothermal power and biomass.	Law Budget/Subsidy Taxation Technology Development	Implemented	The Government will continue to operate the feed in tariff scheme appropriately and revise it, balancing the maximization of expansion of implementation of renewable energy and suppressing the burden on the people. For land based wind energy, the Government will streamline environmental impact assessments and strengthen the transmission system within districts and inter district power system, with a view to maximizing the use of appropriate land such as Hokkaido and the Tohoku district. The Government will also make efforts to expand implementation by further considering ways to facilitate coordination and ease regulation on treating cropland conversion for locations and make efforts to rationalize regulations and institutions as necessary. For the promotion of geothermal power generation, the Government will work on the regulatory and institutional reform including streamlining the procedure of environmental impact assessment and rationalization of the safety regulations to enhance the use of small-scale geothermal power generation using the existing wells at hot springs, and promote understanding of people in the local level. For biomass energy, the Government will focus on the promotion of industrialization and introduction of biomass energy by establishing the framework to promote actions aiming at developing the primary sector with using the renewable energy and achieving the use of local biomass energy in approximately 100 regions in 5 years. The Government will support arrangement of infrastructure and conduct technological demonstration etc. for the energy use of urban biomass use such as sewage sludge. For offshore wind energy, especially for floating offshore wind energy, the Government will continue trial research currently conducting in off the shores of Fukushima and Nagasaki, and aim at commercialization as soon as possible by 2018, while carrying out technology development, safety, reliability, and economic assessments, establishment of methods to conduct environmental impact assessments, among others, aiming at the world's first full scale commercialization. In addition to these activities, the Government will, among others, promote the demonstration and introduction of the independent and decentralized energy system with renewable energies as a core, in regions such as remote islands.	n/a	METI MOE Related Ministries and Agencies	NE
Persuasion of High Efficiency in Thermal Power Generation	Energy	CO_2	Establishment of effective framework of global warming countermeasures (voluntary framework) by the power industry, and make efforts to improve power generation efficiency further by advancing technology development.	Law/Standard Budget/Subsidy Technology Development	Implemented	As for thermal power generation, effective mitigation measures by power sectors are essential in a consistent manner with national reduction target. Hence, the reduction of environmental burdens should be attained as well by promoting the improvement of power efficiency and the replacement of the old electric power facilities with new ones through the voluntary initiatives of stakeholders of power generation and so forth. In order to improve the efficiency of thermal power as envisaged in the energy mix, the Government aims to achieve combined-cycle level LNG thermal power generation and ultra-supercritical (USC) level coal-fired power generation, as well as reviewing the standards of judgment of the Act on the Rational Use of Energy intending to restrain the operation of inefficient thermal power plants, and to replace old thermal power plants with new ones. In addition, through environmental impact assessments of construction of each thermal power plant, the Government examines, in the necessary and rational range, whether business operators are making efforts to reduce environmental burdens by using best available technology or not, as well as whether the consistency with Japan's target and plan of CO_2 emissions reduction is secured or not. Moreover, 35 operators of electric utilities formulated and announced the "voluntary framework" in July 2015, and they are considering the formulation of concrete mechanism and rules for the achievement of the goal of voluntary framework by operators of electric utilities, in parallel with development of the national Global Warming plan based on the energy policies, toward the achievement of Japan's target of greenhouse gas reduction and its energy mix. The power sectors, each electric utility and the Government will implement the PDCA cycle of their mitigation measures. At the same time, the Government will promote technology development of the advanced ultra-supercritical (A-USC) pressure steam power plants, the Integrated Coal Gasification Fuel Cell Combined Cycle (IGFC), and LNG gas turbines of 1700℃, which aims at commercialization of the technologies. Also concerning carbon dioxide capture and storage (CCS), the Government will carry out research and development for practical use of CCS technology around 2020, specifically large scale demonstration experiments, research and development for capture, safety assessment, and others, and conduct necessary geological surveys for selecting potential CO_2 storage sites. Moreover, the introduction of coal thermal power generation that gives consideration to further reduction of the environmental impact will be promoted by a study to be conducted on introducing CCS-ready facilities as early as possible with due consideration given to the possible timing of the commercialization of CCS and other measures.	n/a	METI, MOE	NE

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 CO_2 eq)	
									2020	
Emissions Reduction of Non energy-related CO_2										
Increased Use of Blended Cement	Industry/ Industrial Processes	CO_2	Reduce CO_2 emissions in the cement production process by reducing the production volume of clinker through increased production proportion and expanded use of blended cement, which is made by mixing blast-furnace slag with clinker, an intermediate cement product.	Law/Standard Awareness Raising	Implemented	Based on the Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Act on Green Purchasing), the Government will encourage the use of blended cement in public construction. Buildings using blended cement will be certificated as low-carbon buildings based on the "Low Carbon City Act".	Year 2001 (Based on Act on Green Purchasing, blended cement is designated as the eco-friendly goods.)	MOE, METI	730	
Promotion of Waste Reduction and Recycling	Waste Management/ Waste	CO_2	Reduce CO_2 emissions from waste incineration by promoting the waste reduction and recycling.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	The Government will promote 3Rs initatives for achieving the targets set out in the "Basic Plan for Establishing a Recycling-Based Society", formulated in accordance with the “Basic Act on Establishing a Sound Material-Cycle Society” (Basic Recycling Law) as well as the waste reduction targets set out in the “Waste Management and Public Cleansing Law” in line with the target set in Basic Recycling Law. Specifically, the Government will promote waste reduction and recycling by thorough waste sorting and collection as well as imposition of charges for waste collection by municipal governments, actions complying with individual Recycling Laws and actions based on the Guidelines for Controlling Greenhouse Gas Emissions. Also, the amount of incinerated wastes will be reduced by promoting the arrangement of waste disposal facilities which contribute to the realization of $_3$Rs in line with the waste disposal facilities development plan based on the "Waste Management and Public Cleansing Law".	2013	MOE	200	Note 2
Emissions Reduction of Methane										
Reducing direct landfill disposal of organic waste	Waste Management/ Waste	CH_4	Reduce methane emissions associated with waste landfill, by promoting the reduction of organic waste such as garbage going directly to landfill.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	The Government will promote 3Rs initiatives for achieving the targets set out in the "Basic Plan for Establishing a Recycling-Based Society", formulated in accordance with the “Basic Act on Establishing a Sound Material-Cycle Society” (Basic Recycling Law) as well as the waste reduction targets set out in the “Waste Management and Public Cleansing Law” in line with the target set in Basic Recycling Law. Specifically, the Government will promote waste reduction and recycling by thorough waste sorting and collection as well as imposition of charges for waste collection by municipal governments, reducing illegal dumping of industrial wastes through more strict waste disposal systems and the development of model disposal operators, and actions complying with individual Recycling Laws and actions based on the Guidelines for Controlling Greenhouse Gas Emissions. At the same time, the Government will reduce the amount of direct landfill of organic waste by promoting the improvement of the systems for waste disposal facilities of municipalities, including through banning the direct disposal to landfill of organic wastes in principle, in accordance with the waste disposal facilities development plan based on the "Waste Management and Public Cleansing Law".	2013	MOE	476	Note 2
Improvement of the Management of Organic Matter and Water	Agriculture	CH_4	Reduce methane emissions associated with rice cultivation by promoting the replacement from plowing in rice straw which has relatively higher methane emission intencity with application of compost which has lower emission intencity.	Law/Standard Budget/Subsidy	Implemented	The Government will support the initiatives to enable replacing the conventional approach of plowing in rice straw with application of compost such as installing compost generating facilities and converting agricultural activities into ones which are effective for global warming mitigation. Through the reduction of methane emissions, the Government will contribute to sustainable agricultural production harmonized with the environment.	2007	MAFF	333～922	Note 4 Note 5-3 Note5-4

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 CO_2 eq)	
									2020	
Emissions Reduction of Nitrous Oxide										
Upgrading combustion technology at sewage sludge incineration facilities	Waste Management/ Waste	N_2O	Reduce nitrous oxide from the incineration of sewage sludge by improving the incineration technology of facilities for sewage sludge and converting it into solid fuel.	Taxation Budget/Subsidy Technology Development	Implemented	The Government will support the development of turbo incinerators and will support construction and update of high-temperature incinerators. The Government will also conduct practical research of technologies of solid fuel power generator which uses waste heat, and will provide tax exemption on investing in obtaining facilities for storing solid fuel derived from sewage mire.	2001 (the level of sophistication of combusting sewage sludge at sewage treatment facilitie was standardized)	MLIT	NE	
Upgrading combustion technology at general waste incineration facilities	Waste Management/ Waste	N_2O	Reduce nitrous oxide from waste incineration by promoting more advanced incineration technology for facilities for general waste and the $_3$Rs for waste products.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	The Government will promote the upgrade of combustion technology at general waste incineration facilities such as implementing consecutive operation of consecutive incinerator. The Government will reduce the amount of waste incineration by promoting the 3Rs initiatives for achieving the targets set out in the "Basic Plan for Establishing a Recycling-Based Society", formulated in accordance with the “Basic Act on Establishing a Sound Material-Cycle Society” (Basic Recycling Law) as well as the waste reduction targets set out in the “Waste Management and Public Cleansing Law” in line with the target set in Basic Recycling Law, and by promoting the arrangement of waste disposal facilities which contribute to the realization of 3Rs in line with the waste disposal facilities development plan based on the "Waste Management and Public Cleansing Law".	2013	MOE	NE	
Appropriation and Reduction of the Amount of Fertilizer Used	Agriculture	N_2O	Reduce nitrous oxide emissions associated with the application of fertilizers through the use of lower fertilizer application rates, split-application regimes and slow-release fertilizers.	Law/Standard Budget/Subsidy	Implemented	For nitrous oxide associated with the application of fertilizers, the Government will provide support for fertilization plan revision to reduce amount of fertilizer as well as agricultural activities which are effective for the global warming mitigation. Through the reduction of nitrous oxide, the Government will contribute to sustainable agriculture production harmonized with the environment.	2007	MAFF	72	Note 4
Emissions Reduction of Fluorinated Gases										
Holistic policies to reduce the emissions of fluorinated gases	Industry/Industrial Processes	HFCs, PFC, SF_6, NF_3	Reduce emmisions of HFCs, PFCs, SF_6 and NF_3, by implementing holistic policies such as the Act on Rational Use and Proper Management of Fluorocarbons.	Law/Standard Taxation Budget/Subsidy Technology Development Awareness Raising Education Voluntary Agreement	Implemented	According to the Act on Rational Use and Proper Management of Fluorocarbons (June 2013), the Government will work on the following: practically phasing down fluorocarbons by gas suppliers, eliminating fluorocarbons from products and lowering GWP of products by manufacturers of equipment and products, preventing leakage of fluorocarbons from refrigeration and air conditioning equipment for business use during normal operation period by end-users, and enhancing and strengthening regulations on recycling and destruction programs. In addition, the Government will promote the technological development of fluorocarbon-free equipment and support for the introduction of such equipment as well as the promotion of the Voluntary Action Plan in industry.	2001 (Fluorocarbons Recovery and Destruction Law was adopted)	MOE, METI	18,500	

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 CO_2 eq)	
									2020	
Greenhouse Gas Sink Policies										
Forest Sink Strategies	LULUCF	CO_2	Maintain and strengthen the CO_2 absorption functions of forests through appropriate management of forests such as thinning.	Law/Standard Budget/Subsidy Technology Development Awareness Raising	Implemented	In accordance with the "Basic Plan for Forest and Forestry" and the "Act on Special Measures concerning Advancement of Implementation of Forest Thinning, etc." (2013), the Government aims to attain the forest sink target approximately 38 million t-CO2 or more (based on specific assumptions). In order to attain this target, the Government is working on the following through a variety of policy approaches: appropriate forest development such as thinning and afforestation, the proper management and preservation of protected and other forests, promoting the use of timber and woody biomass, promoting forest development programs where people participate in, accelerated implementation of initiatives to establish sustainable forest management practices, and promoting measures to diffuse seeds and seedlings that grow well.	2007	MAFF	38,000	Note 3
Measures for Sinks in Agricultural Soils	LULUCF	CO_2	Promote carbon storage in cropland and grassland soils though the promotion of domestic agriculture production as well as the making of soils by applying organic matter such as compost and green manure.	Law/Standard Budget/Subsidy Technology Development Awareness Raising	Implemented	It is proven that the carbon storage in cropland and grassland soils in Japan can be increased by continuous usage of organic matter such as compost and green manure. The Government will contribute to the carbon storage in cropland and grassland soils by promoting domestic agriculture production as well as the making of soils by applying organic matter such as compost and green manure.	2008	MAFF	7,084～8,280	Note 4 Note 5-1~4
Promotion of Urban Greening	LULUCF	CO_2	Promote urban greening to preserve and strengthen their carbon sink capacity.	Law/Standard Budget/Subsidy Technology Development Awareness Raising	Implemented	Actions will be promoted such as park maintenance, greening in roads and bays, and creation of the new greening spaces at buildings. Improvement in report and verification system for the urban greening will also be strategically carried out.	2006	MLIT	1,186	
Joint Crediting Mechanism (JCM)										
Establishement and implementation of the Joint Crediting Mechanism (JCM)	Cross-Cutting	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	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.	Budget/Subsidy	Implemented	Since Japan and Mongolia signed bilateral documents in January 2013 for the first time to start this mechanism, the number of partner countries has increased to 16 as of the end of December 2015. This means that the target to double the number of partner countries in 3 years from November 2013 has been achieved a year in advance. So far, the Joint Committee was held 26 times in total, eight JCM projects are registered in four countries (Indonesia, Palau, Mongolia and Vietnam) and 19 JCM methodologies are approved. The government continues to support the further formulation of JCM projects and to increase the number of partner countries.	2013	MOFA, METI, MOE, MAFF	NE	

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 CO_2 eq)
									2020
Cross-Sectoral Policies									
GHG Emissions Accounting, Reporting and Disclosure Program	Cross-Cutting	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Make it mandatory for those who exceed more than a certain amount of greenhouse gas emissions to calculate emission volume and report it to the Government. The reported data is collected and published by the Government.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	GHG Emissions Accounting, Reporting and Disclosure Program is based on the "Act on Promotion of Global Warming Countermeasures", which facilitate proactive emission reduction by the greenhouse gas emitters through the Government's adequate review of greenhouse gases subjected to reporting based on Intergovernmental Panel on Climate Change (IPCC) guidelines, as well as through accurate report, prompt collection and disclosure of emission information.	2006	MOE, METI	-
Making the Tax System Greener	Cross-Cutting	CO_2	The Government will pursue greening of the entire tax system including energy and vehicle taxes.	Taxation	Implemented	The Government will utilize the tax revenue of "Tax for Climate Change Mitigation", designed to add an extra tax multiplier commensurate with CO_2 emission levels from the all fossil fuel combustion and will firmly implement the various policies to curb energy-related CO_2 emissions. Additionally, the Government will also promote taxation system on vehicle taxes according to the environmental impact and strengthen greener taxation.	n/a	MOE	-
Promotion of Environmentally-conscious business activities	Cross-Cutting	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Formulate and publish the guidelines for measures to be taken by business operators in controlling greenhouse gas emissions generating from their business activities.	Law/Standard Budget/Subsidy Awareness Raising	Implemented	The Government will promote voluntary and active actions by business operators to implement environmentally-conscious business activities through the formulation of 'Guidelines for Controlling Greenhouse Gas Emissions' based on the Law for Promotion of Global Warming Countermeasures. In addition, the Government will review the guidelines based on the trends of available cutting-edge technologies in the fields.	2008	MOE, METI, MAFF	-
Greening Finance	Cross-Cutting	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Provide financial supports to mobilize private funds into low-carbon projects such as providing equity investoment into low-carbon projects and leasing of low-carbon equipment to reduce the burden of up-front costs. In addition, the Government will promote loans based on environmental responsibility ratings and ESG investment.	Budget/Subsidy Awareness Raising	Implemented	The Government will establish a fund for promoting regional low-carbon investments that invests in low-carbon projects in order to stimulate private investment. To reduce the burdens of a large amount of initial investment costs for households and business operators, the Government will subsidize them when they lease low-carbon equipment. The Government will promote environmental finance by providing interst subsidies and support the principles for financial action towards a sustainable society, etc.	2007	MOE	-
Promoting J-Credit system	Cross-Cutting	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Certify domestic greenhouse gas emission reductions and removals.	Budget/Subsidy	Implemented	The Government will operate a system that certifies emission reductions and absorptions in Japan as J-credits, which can be used for various purposes such as achieving the goals of the Commitment to a Low-Carbon Society as well as carbon offsets.	2013	MOE, METI, MAFF	-
Developing Public Campaigns	Cross-Cutting	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Foster the understanding of global warming countermeasures and promote the transformation of lifestyle habits into one that are appropriate for a low carbon society as well as the penetration of its effects.	Budget/Subsidy Awareness Raising	Implemented	The Government will enhance public understanding of global warming issues by providing clear information on adverse impacts of global warming. In addition, under the key concept of "COOL CHOICE," a national campaign will be developed by encouraging all possible "cool choices" to contribute to Global Warming Prevention such as energy-saving / low-carbon products / services / actions, etc.	2005	MOE	-

Footnotes

Note 1: Targets will be reviewed based on the energy policy situation and so on, and emissions reduction effect of energy-related CO_2 through each policy will also be scrutinized.

Note 2: Estimated figures of mitigation impacts of 'Reducing waste output and promoting reuse and recycling' in 'Emissions Reduction of Non energy-related CO_2' and 'Reducing direct landfill disposal of organic waste' in 'Emissions Reduction of Methane' are under scurutiny. Mitigation impacts of other policies for emissions control of non Energy-related CO_2, methane and nitrous oxide as well as greenhouse gas sink will also be scruitinised.

Note 3: Mitigation impact of 'Forest Sink Strategies' is estimated to be more than 38,000 ktCO_2.

Note 4: Estimated value based on the projections made when Japan's INDC was submitted in July, 2015.

Note5-1: Only removals by mineral soils

Note5-2: Calculated by net-net approach (Base year = 1990)

Note5-3: Based on projected values of each year from 2013 to 2020.

Note5-4: Projections have a certain number of uncertainty due to external factors such as change of temperature since the projection is based on mathematical model.

3.2 Assessment of economic and social consequences of response measures

Japan takes actions, taking into account the importance of making efforts to minimize economic and social adverse impacts of response measures. On the other hand, it should be noted that we have difficulty in accurately assessing specific adverse impacts arising from the implementation of response measures to address climate change issues. For example, fluctuations in crude oil prices are caused by a balance between supply and demand as well as numerous other factors (e.g., trends in crude oil futures market or economic fluctuation), and it is uncertain whether there exists a causal link or, if so, to what extent, between specific adverse impacts of climate change policy and measures.

In addition, it is necessary to change viewpoints in taking response measures for real solutions to climate change issues, and sustainable development could be one of the keys to the change. For instance, introduction of renewable energy leads to improving energy access, preparing for natural disasters and creating employment through development of a new industry, as well as contributes to reducing GHG emissions. As discussed in Rio+20 and the COP, the transition to green economy and the attainment of low-carbon growth are the key elements in order to address climate change and achieve the sustainable development which strikes a balance between environment and economy. Efforts toward establishment of low-carbon society should be accelerated throughout the world. Japan proposed “East Asia Low Carbon Growth Partnership” with the aim of promoting low-carbon growth through regional cooperation among the participating countries of the East Asia Summit and has held the dialogue for the partnership every year since 2012. In addition, Japan has announced and has been implementing its proactive diplomatic strategy for countering global warming, “Actions for Cool Earth (ACE)”, which contributes to the world with its outstanding environmental and energy technologies.

3.3 Estimates of emission reductions and removals and the use of units from the market-based mechanisms and land use, land-use change and forestry activities

The information on the estimates of emission reductions and removals and the use of units from the market-based mechanisms and land use, land-use change and forestry activities between FY2010 and FY2013 related to the progress in achievement of quantified economy-wide emission reduction targets of Japan is the follows.

Total GHGs emissions in FY2013 (excluding LULUCF) were 1,408 million t-CO_2 eq. They were 3.5% below compared to the emissions in the base year (FY2005) if units from LULUCF activities (60.6 million t-CO_2) are taken into account. There is no unit from the market-based mechanisms at the present.

Table 3-2 Reporting of progress (CTF Table 4)

Year	Total emissions excluding LULUCF (kt CO_2 eq)	Contribution from LULUCF (kt CO_2 eq)	Quantity of units from market based mechanisms under the Convention (number of units)	Quantity of units from market based mechanisms under the Convention (kt CO_2 eq)	Quantity of units from other market based mechanisms (number of units)	Quantity of units from other market based mechanisms (kt CO_2 eq)
(2005)	1,396,510.56	NA	0.00	0.00	0.00	0.00
2010	1,304,299.73	NA	0.00	0.00	0.00	0.00
2011	1,354,313.88	NA	0.00	0.00	0.00	0.00
2012	1,390,484.55	NA	0.00	0.00	0.00	0.00
2013	1,407,774.97	60,563.82	0.00	0.00	0.00	0.00
2014	NE	NE	0.00	0.00	0.00	0.00

Table 3-3 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	2018	2019	2020	Total		
	(kt CO_2 eq)											
A. Article 3.3 activities												
A.1. Afforestation/reforestation		-492.05								-492.05		-492.05
Excluded emissions from natural disturbances		NA								NA		NA
Excluded subsequent removals from land subject to natural disturbances		NA								NA		NA
A.2. Deforestation		1,663.43								1,663.43		1,663.43
B. Article 3.4 activities												
B.1. Forest management										-52,711.02		-52,711.02
Net emissions/removals		-50,703.30								-50,703.30		
Excluded emissions from natural disturbances		NA								NA		
Excluded subsequent removals from land subject to natural disturbances		NA								NA		
Any debits from newly established forest (CEF-ne)		NA								NA		
Forest management reference level (FMRL)		0.00								0.00		
Technical corrections to FMRL		2,007.72								2,007.72		
Forest management cap											-362,404.00	
B.2. Cropland management (if elected)	10,344.15	3,568.41								3,568.41	10,344.15	-6,775.75
B.3. Grazing land management (if elected)	848.01	-292.05								-292.05	848.01	-1,140.06
B.4. Revegetation (if elected)	-77.74	-1,186.11								-1,186.11	-77.74	-1,108.37
B.5. Wetland drainage and rewetting (if elected)	NA	NA								NA		NA

Documentation Box:

Because of bugs in the CRF reporter, there is a possibility that the figures in the above table will be different from the corresponding CRF table which will be submitted in the near future.

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

Units of market based mechanisms			Year	
			2013	2014
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 Convention	(number of units)		
		(kt CO_2 eq)		
	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

Projection

4.1 Introduction

The future level of 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 FY2020 and FY2030 are estimated as follows.

4.2 Projected scenarios

Based on the outlook on macro frame shown in 4.2, the projections for FY2020 and FY2030 are estimated under a 'with measures' scenario taking into account future emission reduction by each policy and measure described in 3.1.2.

4.3 Key parameters and assumptions

The outlook on macro frame below based on estimated economic growth rate, population and other parameters is considered for projections.

Table 4-1 Key assumptions on the macro frame (key parameters and assumptions) (CTF Table 5)

Key underlying assumptions		Historical							Projected		
Assumption	Unit	1990	1995	2000	2005	2010	2011	2015	2020	2025	2030
real GDP	trillion(2005)yen			476.72	507.16	512.42	514.16		610.6	NE	711
population	thousands	123,611		126,926	127,766	128,058	127,799		124,100	NE	116,618
household	thousands	40,670		46,782	49,063	51,842	52,055		53,053	NE	51,231
crude steel production	10^6t	112		107	113	111	106		NE	NE	120
cement production	10^6t	87		79	74	56	58		NE	NE	56
ethylene production	10^6t	6.00		7.20	7.55	7.00	6.47		NE	NE	5.70
paper and paperboard production	10^6t	29		30	31	27	27		NE	NE	27
Commercial floor area	10^6m^2				1,759	1,831	1,828		NE	NE	1,971

*Projections compiled from "Economic and Fiscal Projections for Medium to Long Term Analysis", "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)" and other sources.

4.4 Overall projections of GHG emissions

The estimated total GHG emissions in FY2020 under a 'with measures' scenario are approximately 1,399 million t-CO_2 equivalent, which are an increase by 0.2% from the base year FY2005 (1,397million ton). However, they aim to be by 3.8% below the base year by implementing additional mitigation measures and using removals from LULUCF sector[10].

The estimated total GHG emissions in FY2030 under a 'with measures' scenario is approximately 1,079 million t-CO_2 equivalent. It is a decrease by 23.4% and 22.7% from FY2013 and FY2005, respectively.

[10] The projections of removals in FY2020 are expected to be removals from forests (approximately 38 million t-CO_2), agricultural soils (approximately 7.7 million t-CO_2) and revegetation (approximately 1.2 million t-CO_2).

Taking into the account the projections of removals (removals from forests (approximately 27.8 million t-CO_2), agricultural soils (approximately 7.9 million t-CO_2) and revegetation (approximately 1.2 million t-CO_2)) in FY2030, they decrease by 26.0% and 25.4% from FY2013 and FY2005, respectively, as shown in Japan's INDC.

Table 4-2 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	2013	2020	2030
Sector									
Energy	1,009,693.34	885,396.80	925,474.99	954,740.03	1,009,693.34	945,267.60	1,041,552.79	1,053,578.32	784,200.00
Transport	235,977.66	204,473.71	245,105.82	253,562.89	235,977.66	217,875.05	217,945.91	194,840.61	165,500.00
Industry/industrial processes	84,728.60	109,251.91	135,031.55	106,591.43	84,728.60	78,197.45	86,929.33	93,001.43	74,800.00
Agriculture	40,015.02	42,925.22	42,211.10	40,103.68	40,015.02	40,697.06	39,530.76	38,723.08	37,500.00
Forestry/LULUCF	-89,643.58	-58,481.33	-74,081.90	-86,398.90	-89,643.58	-69,366.58	-64,659.80	-36,404.03	-25,900.00
Waste management/waste	26,095.94	28,199.46	31,463.93	31,011.44	26,095.94	22,262.58	21,816.18	19,321.96	17,300.00
Gas									
CO_2 emissions including net CO_2 from LULUCF	1,214,416.17	1,095,511.96	1,166,296.54	1,185,757.74	1,214,416.17	1,141,892.69	1,245,764.48	1,261,710.51	971,600.00
CO_2 emissions excluding net CO_2 from LULUCF	1,304,375.96	1,154,402.75	1,240,762.63	1,272,504.83	1,304,375.96	1,211,534.60	1,310,691.42	1,298,375.21	997,800.00
CH_4 emissions including CH_4 from LULUCF	39,029.18	48,659.34	45,895.16	41,571.98	39,029.18	38,322.66	36,099.86	33,988.76	31,700.00
CH_4 emissions excluding CH_4 from LULUCF	38,962.32	48,586.36	45,825.27	41,505.28	38,962.32	38,263.04	36,042.07	33,932.91	31,600.00
N_2O emissions including N_2O from LULUCF	25,760.31	32,239.90	33,541.19	30,343.75	25,760.31	23,516.33	22,667.43	21,762.11	21,300.00
N_2O emissions excluding N_2O from LULUCF	25,510.95	31,903.42	33,226.89	30,062.27	25,510.95	23,300.62	22,458.07	21,557.28	21,100.00
HFCs	12,724.24	15,932.31	25,212.33	22,846.61	12,724.24	23,114.01	31,776.63	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	3,280.06	4,000.00	4,200.00
SF_6	5,063.86	12,850.07	16,447.52	7,031.36	5,063.86	2,468.45	2,165.76	2,400.00	2,700.00
NF_3	1,249.87	32.89	202.81	186.01	1,249.87	1,369.46	1,360.96	1,000.00	500.00
Total with LULUCF	1,306,866.97	1,211,765.77	1,305,205.49	1,299,610.57	1,306,866.97	1,234,933.15	1,343,115.17	1,363,061.37	1,054,000.00
Total without LULUCF	1,396,510.56	1,270,247.10	1,379,287.39	1,386,009.47	1,396,510.56	1,304,299.73	1,407,774.97	1,399,465.40	1,079,000.00

*Projected emissions of Transport sector for FY2020 and FY2030 include CO_2 emissions from electricity consumption from railways which is typically included in the energy sector.
*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.

4.5 Projections by gas

4.5.1 Energy-related CO_2

Energy-related CO_2 covers approximately 90% of Japan's GHG emissions. Based on statistics, it can be broken down into the following 5 sectors: Industry; Commercial and other; Residential; Transport; and Energy conversion. The effects of policies and measures can be observed in each sector as well. Table 4-3 shows emission projection for each sector.

The emissions for the base year (FY2005) were revised from BR1 because they were estimated in accordance with the revised UNFCCC Inventory Reporting Guidelines[11]. In accordance with this revision, the emission projections in FY2020 reflect the change ratio of the total energy-related CO_2 emissions in the base year.

[11] Decision 19/CP.24, Annex I "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"

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

	Actual emissions		Estimated emissions			
	FY2005	FY2013	FY2020		FY2030	
	(Mt-CO_2)	(Mt-CO_2)	(Mt-CO_2)	(Changes from FY2005)	(Mt-CO_2)	(Changes from FY2013)
Industry	457	429	490	+7.3%	401	-6.6%
Commercial and Other	239	279	267	+11.6%	168	-39.7%
Residential	180	201	178	-0.9%	122	-39.4%
Transport	240	225	193	-19.7%	163	-27.4%
Energy conversion	104	101	96	-7.1%	73	-27.5%
Total	**1,219**	**1,235**	**1,224**	**+0.4%**	**927**	**-25.0%**

4.5.2 Non-energy-related CO_2

The estimated emissions of non-energy-related CO_2 in FY2020 decrease by 13.0% compared to FY2005 (approximately 74.3 million t-CO_2).

The estimated emissions in FY2030 decrease by 6.7% compared to FY2013 (by 17.0% from FY2005) (approximately 70.8 million t-CO_2).

4.5.3 Methane

The estimated emissions of for methane in FY2020 decrease by 12.9% compared to FY2005 (approximately 33.9 million t-CO_2 eq.).

The estimated emissions in FY2030 decrease by 12.3% compared to FY2013 (by 18.8% from FY2005) (approximately 31.6 million t-CO_2 eq.).

4.5.4 Nitrous oxide

The estimated emissions of nitrous oxide in FY2020 decrease by 15.5%compared to FY2005 (approximately 21.6 million t-CO_2 eq.).

The estimated emissions in FY2030 decrease by 6.1% compared to FY2013 (by 17.4% from FY2005) (approximately 21.1 million t-CO_2 eq.).

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

	Actual emissions		Estimated emissions			
	FY2005	FY2013	FY2020		FY2030	
	(Mt-CO_2)	(Mt-CO_2)	(Mt-CO_2)	(Changes from FY2005)	(Mt-CO_2)	(Changes from FY2013)
Non-energy-related CO_2	85.4	75.9	74.3	-13.0%	70.8	-6.7%
Methane	39.0	36.0	33.9	-12.9%	31.6	-12.3%
Nitrous oxide	25.5	22.5	21.6	-15.5%	21.1	-6.1%

4.5.5 Fluorinated gases

Since refrigerants in refrigerators and air-conditioners have shifted from HCFCs, which are ozone depleting substances, to HFCs, it is expected that the emissions of fluorinated gases (HFCs, PFCs, SF_6 and NF_3) will increase. The estimated emissions in CY2020 increase by 64.6% (approximately 45.6 million t-CO_2 eq.) from CY2005. The estimated emissions in CY2030 decrease by 25.1% (approximately 28.9 million t-CO_2 eq.) from CY2013 (increase by 4.5% from CY2005).

Table 4-5 Estimated emissions of fluorinated gases and each gas

	Actual emissions		Estimated emissions			
	CY2005	CY2013	CY2020		CY2030	
	(Mt-CO_2)	(Mt-CO_2)	(Mt-CO_2)	(Changes from CY2005)	(Mt-CO_2)	(Changes from CY2013)
HFCs	12.7	31.8	38.3	+201.6%	21.6	-32.1%
PFCs	8.6	3.3	4.0	-53.5%	4.2	+27.2%
SF_6	5.1	2.2	2.4	-52.9%	2.7	+23.5%
NF_3	1.2	1.4	1.0	-16.7%	0.5	-64.8%
Total	**27.7**	**38.6**	**45.6**	**+64.6%**	**28.9**	**-25.1%**

4.6 Projections by sector

4.6.1 Energy

The estimated emissions of the energy sector in FY 2020 (approximately 1,248.4 million t-CO_2 eq.) are an increase of approximately 0.2% compared to FY 2005. In FY 2030 (approximately 949.7 million t-CO_2 eq.), it is a decrease of approximately 24.6% compared to FY2013 and a decrease by 23.8% compared to FY2005.

4.6.2 Industrial Processes and Product Use (IPPU)

The estimated emissions of the Industrial Processes and Product Use (IPPU) sector in FY 2020 (approximately 93.0 million t-CO_2 eq.) are an increase of approximately 9.8% compared to FY 2005. In FY 2030 (approximately 74.8 million t-CO_2 eq.), it is a decrease of approximately 14.0% level as compared to FY2013 and a decrease by 11.7% compared to FY2005.

4.6.3 Agriculture

The estimated emissions of the Agriculture sector in FY 2020 (approximately 38.7 million t-CO_2 eq.) are a decrease of approximately 3.2% compared to FY 2005. In FY2030 (approximately 37.5 million t-CO_2 eq.), it is a decrease of approximately 5.1% as compared to FY2013 and a decrease by 6.3% compared to FY2005.

4.6.4 LULUCF

The estimated removals of the LULUCF sector in FY 2020 are approximately 36.4 million t-CO_2. In FY2030, it is approximately 25.9 million t-CO_2[12].

4.6.5 Waste

The estimated emissions of the Waste sector in FY 2020 (approximately 19.3 million t-CO_2 eq.) are a decrease of approximately 26.0% compared to FY 2005. In FY2030 (approximately 17.3 million t-CO_2 eq.), it is a decrease of approximately 20.7% compared to FY2013 and decrease of approximately 33.7% compared to FY2005.

Table 4-6 Estimated emissions by sector (without LULUCF)

	Actual emissions		Estimated emissions			
	FY2005	FY2013	FY2020		FY2030	
	(Mt-CO_2)	(Mt-CO_2)	(Mt-CO_2)	(Changes from FY2005)	(Mt-CO_2)	(Changes from FY2013)
Energy	1,245.7	1,259.5	1,248.4	+0.2%	949.7	-24.6%
Industrial Processes and Product Use	84.7	86.9	93.0	+9.8%	74.8	-14.0%
Agriculture	40.0	39.5	38.7	-3.2%	37.5	-5.1%
Waste	26.1	21.8	19.3	-26.0%	17.3	-20.7%
Total	**1,396.5**	**1,407.8**	**1,399.5**	**+0.2%**	**1,079.0**	**-23.4%**

4.7 Assessment of total effect of policies and measures

The reductions achieved by emission reduction measures have been quantified for methane, nitrous oxide and fluorinated gases. Methane reduction amounted to 0.8 Mt-CO_2 eq., followed by nitrous oxide (0.8 Mt-CO_2 eq.), and fluorinated gases (18.5 Mt-CO_2 eq.) for a total of 20.1 Mt-CO_2 eq. For CO_2, emission reduction measures are implemented, but difficult quantify the level of reductions for all measures, therefore the total level of reductions is not shown.

Table 4-7 Level of reduced emissions by mitigation actions in 2020

	reduced emissions
	FY2020
	(Mt-CO_2)
Methane	0.8
Nitrous oxide	0.8
Fluorinated gases	18.5
Total	**20.1**

[12] These estimated removals are not directly used for archiving reduction target in FY2020 and 2030. The emission and removal sources in FY 2020 and 2030 don't completely correspond with those in FY2005 and 2013.

4.8 Methodology

4.8.1 Estimation method for energy-related CO_2 emissions

4.8.1.1 Fuel combustion (CO_2)

- Emissions for FY2020

The emissions for the base year (FY2005) were revised from BR1 because they were estimated in accordance with the revised UNFCCC Inventory Reporting Guidelines. In accordance with this revision, the emission projections in FY2020 reflect the change ratio of the total energy-related CO_2 emissions in the base year.

- Emissions for FY2030

In order to maintain consistency with the energy mix (Table 4-8), the emissions in FY2030 are calculated based on sound policies and measures and technologies taking into account technical constraints and cost related issues.

Table 4-8 Energy mix used for 2030 emission projection

	FY2030
●Final energy consumption	326 10^6kl
(Reduction of energy saving)	50 10^6kl
●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%

4.8.1.2 Fuel combustion (CH_4, N_2O)

Based on the GHG inventory, projections of CH_4 and N_2O emissions from fuel combustion cover 5 sectors: Industry; Commercial and other; Residential; Transport; and Energy conversion.

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

4.8.1.3 Fugitive emissions from fuels

Based on the GHG inventory, projections of fugitive emissions from fuels cover 2 sub sectors: solid fuel (CO_2, CH_4) and fugitive emissions from oil, natural gas and other energy (CO_2, CH_4, N_2O).

The projected future emissions are based on calculation multiplying projected activity data (for example,

Coal, crude oil and natural gas outputs, crude oil refining volume and natural gas sales) by projected emission factor for each emission source in accordance with estimation method of the GHG inventory.

4.8.1.4 CO_2 transport and storage

In Japan, CO_2 emissions and removals from this sector is not calculated now or in the future.

4.8.2 IPPU sector

4.8.2.1 CO_2, CH_4, and N_2O

Based on estimation in the GHG inventory, projected future emissions from IPPU sector cover 5 sub sectors: mineral industry (CO_2), chemical industry (CO_2, CH_4, N_2O), metal production (CO_2, CH_4) non-energy products from fuels and solvent use (CO_2) and other product manufacture and use (N_2O).

The projected future emissions are based on calculation multiplying projected activity data (for example, clinker production and ethylene production) by projected emission factor for each emission source in accordance with estimation method of the GHG inventory.

4.8.2.2 Fluorinated gases

Based on estimation in the GHG inventory, projected future emissions from fluorinated gases cover 5 sectors: chemical industry (HFCs, PFCs, SF_6, NF_3), metal production (HFCs, PFCs, SF_6), electronic industry (HFCs, PFCs, SF_6, NF_3), use of ozone depleting substance alternative (HFCs, PFCs) and other product manufacture and use (PFCs, SF_6).

The projected future emissions are based on calculation multiplying projected activity data (for example, the amount of refrigerant charged into new system by type of refrigerant) by projected emission factor for each emission source in accordance with estimation method of the GHG inventory.

4.8.3 Agriculture sector

Based on estimation in the GHG inventory, projected future emissions from agriculture sector cover 7 sub sectors: enteric fermentation(CH_4), manure management(CH_4, N_2O), rice cultivation(CH_4), agricultural soil(N_2O), field burning of agricultural waste(CH_4, N_2O), lime application (CO_2)and urea application (CO_2).

The projected future emissions are based on calculation multiplying projected activity data (for example, number of domestic animals and area of cropland) by projected emission factor for each emission source in accordance with estimation method of the GHG inventory.

4.8.4 LULUCF sector

Based on estimation in the GHG inventory, projected future emissions and removals from LULUCF sector cover carbon stock change and non-CO_2 emissions on forest land, cropland, grassland, wetlands, settlements, and other land.

The carbon removals by forests are estimated by the following process: the figures used for estimation are based on envisaged state of forests that comes from appropriate forest development and conservation based on the Basic Plan for Forest and Forestry; for the forests under KP-LULUCF, the net growth of forests

is calculated by subtracting the amount of harvesting from the net stock changes of forests; then the net growth of forests is converted into CO_2 equivalent by multiplying a coefficient.

Mineral soils of cropland and grassland are based on mathematical model (revised RothC, Rothamsted Carbon Model), future temperature and future cultivated area provided in the Basic Plan for Food, Agriculture and Rural Areas. The projected future emissions and removals of cropland and grassland except mineral soils 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 estimation method of the GHG inventory.

The removals of planting in urban green areas in settlements are calculated, estimating the area of urban green areas under 30 years (activity data), in accordance with estimation method of the GHG inventory.

The emissions and removals (about 200 kt CO_2) included in above sources are estimated by extrapolation, etc., without assumption of scenarios, because these emissions and removals are not large.

4.8.5 Waste sector

Based on estimation in the GHG inventory, projected future emissions from waste sector cover 4 sectors: solid waste disposal (CH_4), biological treatment of solid waste (CH_4, N_2O), incineration and open burning of waste (CO_2, CH_4, N_2O) and wastewater treatment and discharge (CH_4, N_2O).

The projected future emissions are based on calculation multiplying projected activity data (for example, the amount of municipal waste and industrial waste, and amount of domestic wastewater and Industrial wastewater) by projected emission factor for each emission source in accordance with estimation method of the GHG inventory.

4.9 Differences from the projections reported in the NC6/BR1

4.9.1 Changes in projection methodologies

The GHG emission projection for FY2030 was based on the FY2030 energy mix as included in the energy basic plan which was developed in 2014, and the emission projection for FY 2020 was re-estimated based on the revised UNFCCC inventory reporting guidelines.

As for removals of the LULUCF sector, in addition to the future prediction of removals reported in BR1, emissions and removals from agricultural soil sinks , urban greening, and other emissions/removals from categories not included in the Convention inventory were newly estimated.

4.9.2 Comparison of projections

Emissions in FY 2020 were estimated about 1,364 million tons (0.9% increase compared to FY 2005) in Japan's 6th National Communication Report (NC6) and Japan's First Biennial Report (BR1). In addition, the emissions of FY 2030 had not been estimated at the time.

Table 4-9 Comparison of emission projections included in NC6/BR1

(Mt-CO_2)	Actual emissions					Estimated emissions	
	FY1990	FY1995	FY2000	FY2005	FY2010	FY2020	FY2030
NC6/BR1	1,266.7	1,337.7	1,342.1	1,351.4	1,257.4	1,364.0	NE
BR2	1,270.2	1,379.3	1,386.0	1,396.5	1,304.3	1,399.5	1,079.0

Chapter 5

Provision of Financial, Technological and Capacity-Building Support to Developing Country Parties

5.1 Finance

Japan has implemented various support projects to assist developing countries, especially those making efforts to reduce GHG emissions as well as those which are vulnerable to the negative impacts of climate change. As reported in the first biennial report, Japan provided approximately USD 17.6 billion including public and private finance during the 3-year period between 2010 and 2012 to play its part of the commitment of developed countries agreed by the Copenhagen Accord to provide USD 30 billion to developing countries in three years from 2010 to 2012 as the short-term finance. Japan continues its efforts toward a goal of mobilizing jointly USD 100 billion per year including both public and private finance by 2020 as the long-term finance.

Japan developed the "Proactive Diplomatic Strategy for Countering Global Warming (ACE : Actions for Cool Earth)," in November 2013, and announced to provide for developing countries total 1.6 trillion yen (approx. USD 16 billion dollars) by mobilizing Official Development Assistance (ODA), Other Official Flows (OOF), and Private Finance (PF) for mitigation and adaptation during the 3-year period between 2013 and 2015 to strengthen "partnership" with various countries and stakeholders. This commitment was achieved in approximately one year and half.

In addition, at the United Nations Climate Summit in September 2014, Japan announced the "Adaptation Initiative to Support Adaptation Action". With an all-Japan system led by industry, government and academia, this initiative consistently supports adaptation in developing countries from planning to implementation, which especially focuses on support to address vulnerabilities specific to Small Island Developing States (SIDS) and disaster risk reduction. To this end, Japan announced that it would support human resource development for 5,000 people in the adaptation field in three years. As for disaster risk reduction, Japan held the Third UN World Conference on Disaster Reduction（in Sendai, March 2015）, promoting support for disaster risk reduction.

Under these efforts, financial support from Japan in two years from 2013 to 2014 reached approximately USD 20.0 billion (public finance amounted approximately USD 16.4 billion, private finance amounted approximately USD 3.6 billion). Furthermore, at the G20 summit in November 2014, Japan announced USD 1.5 billion contribution to the Green Climate Fund (GCF) to which a total of USD 10.2 billion has been pledged as of the end of 2014.

5.1.1 National Approach to Tracking and Reporting Provision of Support to non-Annex I 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 Japan International Cooperation Agency (JICA) are implementing agencies of the types (1)-(3). The type (4) is contributions to the environment related funds and development organizations such as Global Environment Facility (GEF), the World Bank, United Nations Development Programme (UNDP), which are implementing agencies of this type of assistance. Regarding type (5), 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. The Ministry of Foreign Affairs gathers abovementioned information from the relevant ministries and institutions and compiles the Japanese climate change finance information.

Japan made a list of tangible examples of projects which contribute to climate change mitigation and adaptation in developing countries using the OECD Rio marker as one of the references. And based on the above list, Japan measures and reports projects which contribute to climate change mitigation and adaptation. The scope of Japan's support in addressing climate change is non-Annex I countries of the UNFCCCC.

In this report, Japan's climate finance is newly committed or contributed during the reporting period, in 2013 and 2014, therefore, it is "new and additional".

5.1.2 Measures to Ensure the Resources to Address the Needs of non-Annex I Parties

546 projects have been implemented in as many as 99 countries as of December 2014. Through the Japanese Embassies and JICA's overseas offices stationed in a number of developing countries, the Japanese Government has been developing projects in close consultation with the government of developing countries and international organizations in response to the needs of recipient countries. Japan has been providing assistance through various channels, including grant aid, concessional loan and technical assistance, taking into account local economic situations and content of projects.

5.1.3 Assistance through Bilateral and Regional Frameworks and Multilateral Channels

5.1.3.1 Overview

The main components of our assistance which amount to USD 20.0 billion as of December 2014 are as follows. It should be noted that Japan's assistance for developing countries accords importance to establishing a mechanism that not only ensures the effective use of public financing, but also facilitates the mobilization of private financing. Large-scale projects on infrastructure, such as the introduction of facilities with high energy efficiency and for renewable energy, and the construction of electric power transmission facilities, will require massive investment, and thus leveraging the private financing would be crucially important (this is why Japanese private financing of over USD 3.6 billion had been mobilized for assistance to developing countries, as of December 2014).

a. Mitigation: USD 17.26 billion

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

- Geothermal power plant planning (Kenya, Indonesia, Ethiopia and Turkey : USD 497 million)
- Projects for introduction of clean energy by solar electricity generation system (Tonga, Indonesia :USD 16 million)
- Promotion of biomass energy (Moldova, USD 11 million)
- Electric transmission installment planning (Uganda, Ghana, Sierra Leone and Tanzania : USD 112 million)

b. Adaptation: USD 2.46 billion

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

- Improvement of capabilities to cope with natural disasters caused by climate change (14 countries including Myanmar, Lao PDR and Philippines : USD 113 million)
- Flood control measures (Afghanistan , Fiji : USD 1.64 million)

- Development of Irrigation facilities and capacity building for irrigated agriculture (8 countries including Timor-Leste, Rwanda and Azerbaijan : USD 60 million)
- Water supply planning (12 Countries including Burkina Faso, Mozambique : USD 102 million)

c. Mitigation and Adaptation: USD 304 million

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

- Climate Change Program Loan (USD 246 million)
- Policy dialogue with Asian countries (in Tokyo, August 2013) and SIDS (in Tokyo, July 2014)

d. REDD+: USD 9.72 million

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

- Implementation of Forest conservation and capacity building (Asia, South America and Africa : USD 4.87 million)

Table 5-1 Provision of public financial support: summary information in 2013 (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:	237,743.90	NE	NE	NE	NE	2,337.24	NE	NE	NE	NE
Multilateral climate change funds	14,191.99	NE	NE	NE	NE	139.52	NE	NE	NE	NE
Other multilateral climate change funds	2,040.94	NE	NE	NE	NE	20.06	NE	NE	NE	NE
Multilateral financial institutions, including regional development banks	194,941.27	NE	NE	NE	NE	1,916.45	NE	NE	NE	NE
Specialized United Nations bodies	28,610.64	NE	NE	NE	NE	281.27	NE	NE	NE	NE
Total contributions through bilateral, regional and other channels		638,859.00	163,982.00	18,299.00			6,280.54	1,612.08	179.90	
Total	237,743.90	638,859.00	163,982.00	18,299.00		2,337.24	6,280.54	1,612.08	179.90	

Footnotes

The unit of JPY is "million yen" and the unit of USD is "million dollars".

The exchange rate is 101.72 JPY/USD.

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

Documentation Box:

New and Additional Climate Finance

Japan defines new and additional climate finance as newly committed or disbursed finance which contributes to climate change measures in developing countries.

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

Table 5-2 Provision of public financial support: summary information in 2014 (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:	260,388.71	NE	NE	NE	NE	2,559.83	NE	NE	NE	NE
Multilateral climate change funds	17,488.14	NE	NE	NE	NE	171.91	NE	NE	NE	NE
Other multilateral climate change funds	2,394.49	NE	NE	NE	NE	23.53	NE	NE	NE	NE
Multilateral financial institutions, including regional development banks	211,139.97	NE	NE	NE	NE	2,075.69	NE	NE	NE	NE
Specialized United Nations bodies	31,760.60	NE	NE	NE	NE	312.23	NE	NE	NE	NE
Total contributions through bilateral, regional and other channels		747,269.00	75,786.00	12,236.00			7,346.33	745.03	120.29	
Total	260,388.71	747,269.00	75,786.00	12,236.00		2,559.83	7,346.33	745.03	120.29	

Footnotes

The unit of JPY is "million yen" and the unit of USD is "million dollars"

The exchange rate is 101.72 JPY/USD.

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

Documentation Box:

New and Additional Climate Finance

Japan defines new and additional climate finance as newly committed or disbursed finance which contributes to climate change measures in developing countries.

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

5.1.3.2 Multilateral Channels

a. Cooperation with International Organizations

・Cooperation with UNDP (Adaptation)

Through UNDP, Japan has been implementing a grant aid project including activities such as providing technical support for managing natural disaster risk and sharing know-how in adaptation to climate change to Caribbean SIDS.

・Cooperation with the Global Adaptation Network(GAN) and the Asia Pacific Adaptation Network (APAN) (Adaptation)

Supports GAN and APAN, proposed by UNEP, to enhance capacity of policy-makers and practitioners in the Asia-Pacific region and the world by sharing knowledge on climate change adaptation.

・ Contribution to GEF (Mitigation/Adaptation)

Japan made a contribution to the Global Environment Facility (GEF), which is a multilateral financial mechanism to support developing countries' efforts to preserve and improve global environment.

Table 5-3 Provision of public financial support: contribution through multilateral channels in 2013 (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	237,743.90	2,337.24	NE	NE					
Multilateral climate change funds	14,191.99	139.52	NE	NE					
1. Global Environment Facility	12,094.27	118.90	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund									
6. UNFCCC Trust Fund for Supplementary Activities	56.78	0.56	NE	NE	Provided	OOF	Grant	Cross-cutting	Cross-cutting
7. Other multilateral climate change funds	2,040.94	20.06	NE	NE					
(1) The Multilateral Fund for the Implementation of the Montreal	1,747.64	17.18	NE	NE	Provided	ODA	Grant	Mitigation	Energy
(2) Vienna Convention and the Montreal Protocol	50.06	0.49	NE	NE	Provided	ODA	Grant	Mitigation	Cross-cutting
(3) Asia-Pacific Network for Global Change Research(APN)	243.24	2.39	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Multilateral financial institutions, including regional development banks	194,941.27	1,916.45	NE	NE					
1. World Bank	8,281.90	81.42	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation	680.40	6.69	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
3. African Development Bank	372.60	3.66	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
4. Asian Development Bank	6,936.13	68.19	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
5. European Bank for Reconstruction and Development	49.07	0.48	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	796.07	7.83	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
7. Other	177,825.10	1,748.18	NE	NE					
(1) International Development Association	111,178.55	1,092.99	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(2) African Development Fund	12,813.75	125.97	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(3) Asian Development Fund	39,269.74	386.06	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
(4) Fund for Special Operations (IDB)	583.33	5.73	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
(5) African Development Bank	2,100.87	20.65	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(6) Asian Development Bank	10,216.92	100.44	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(7) Inter-American Development Bank	1,580.76	15.54	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(8) Inter-American Investment Corporation	81.18	0.80	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
Specialized United Nations bodies	28,610.64	281.27	NE	NE					
1. United Nations Development Programme	27,559.68	270.94	NE	NE					
Total	27,559.68	270.94	NE	NE	Provided	Other (ODA, OOF)	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	697.25	6.85	NE	NE					
Total	697.25	6.85	NE	NE	Provided	Other (ODA, OOF)	Grant	Cross-cutting	Cross-cutting
3. Other	353.71	3.48	NE	NE					
United Nations Framework Convention on Climate Change	337.87	3.32	NE	NE	Provided	OOF	Grant	Cross-cutting	Cross-cutting
Intergovernmental Panel on Climate Change	15.84	0.16	NE	NE	Provided	OOF	Grant	Cross-cutting	Cross-cutting
Other									

Footnotes

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

The exchange rate is 101.72 JPY/USD. Values converted from Japanese Yen to USD using the 101.72 yen/US dollar rate may not match the total USD amount reported due to rounding.

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

1.World Bank in the tale means International Bank for Reconstruction and Development (IBRD).

Table 5-4 Provision of public financial support: contribution through multilateral channels in 2014(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	260,388.71	2,559.83	NE	NE					
Multilateral climate change funds	17,488.14	171.91	NE	NE					
1. Global Environment Facility	15,000.00	147.46	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund									
6. UNFCCC Trust Fund for Supplementary Activities	93.65	0.92	NE	NE	Provided	Other (ODA, OOF)	Grant	Cross-cutting	Cross-cutting
7. Other multilateral climate change funds	2,394.49	23.53	NE	NE					
(1) The Multilateral Fund for the Implementation of the Montreal	2,067.33	20.32	NE	NE	Provided	ODA	Grant	Mitigation	Energy
(2) Vienna Convention and the Montreal Protocol	52.11	0.51	NE	NE	Provided	ODA	Grant	Mitigation	Cross-cutting
(3) Asia Pacific Adaptation Network(APAN) and Global Adaptation	33.95	0.33	NE	NE	Provided	ODA	Grant	Adaptation	Cross-cutting
(4) Asia-Pacific Network for Global Change Research(APN)	241.10	2.37	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
Multilateral financial institutions, including regional development banks	211,139.97	2,075.69	NE	NE					
1. World Bank	13,467.80	132.40	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
2. International Finance Corporation	688.80	6.77	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
3. African Development Bank	825.90	8.12	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
4. Asian Development Bank	7,337.03	72.13	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
5. European Bank for Reconstruction and Development	125.11	1.23	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
6. Inter-American Development Bank	724.72	7.12	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
7. Other	187,970.61	1,847.92	NE	NE					
(1) International Development Association	110,999.05	1,091.22	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(2) African Development Fund	18,574.38	182.60	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(3) Asian Development Fund	39,269.74	386.06	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
(4) Fund for Special Operations (IDB)	698.89	6.87	NE	NE	Provided	ODA	Grant	Cross-cutting	Cross-cutting
(5) African Development Bank	2,071.92	20.37	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(6) Asian Development Bank	3,067.80	30.16	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(7) Inter-American Development Bank	11,012.54	108.26	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
(8) Inter-American Investment Corporation	2,276.29	22.38	NE	NE	Provided	ODA	Equity	Cross-cutting	Cross-cutting
Specialized United Nations bodies	31,760.60	312.23	NE	NE					
1. United Nations Development Programme	30,280.79	297.69	NE	NE					
Total	30,280.79	297.69	NE	NE	Provided	Other (ODA, OOF)	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme	1,033.93	10.16	NE	NE					
Total	1,033.93	10.16	NE	NE	Provided	Other (ODA, OOF)	Grant	Cross-cutting	Cross-cutting
3. Other	445.88	4.38	NE	NE					
United Nations Framework Convention on Climate Change	427.16	4.20	NE	NE	Provided	OOF	Grant	Cross-cutting	Cross-cutting
Intergovernmental Panel on Climate Change	18.72	0.18	NE	NE	Provided	OOF	Grant	Cross-cutting	Cross-cutting
Other									

Footnotes

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

The exchange rate is 101.72 JPY/USD. Values converted from Japanese Yen to USD using the 101.72 yen/US dollar rate may not match the total USD amount reported due to rounding.

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

1.World Bank in the tale means International Bank for Reconstruction and Development(IBRD).

5.1.3.3 Bilateral and Regional Frameworks Channels

a. Grant Aid in Bilateral Cooperation

・Prevention of Disaster and Rehabilitation (Adaptation)

In 20 countries, Japan provided a variety of assistance as measures taken for adaptation to climate change including large scale typhoon or cyclone; supports for introduction of meteorological observing equipment and system for building emergency information transmission structure , including relevant technical assistance, promotion of economic and social development efforts by vulnerable countries which are working on the improvement of the disaster preventing ability, the rehabilitation from natural disasters and disaster prevention, through providing grant aids for the provision of necessary materials and equipment, etc.

In Mauritius, Myanmar and Pakistan, Japan has been cooperating in installation of meteorological observing equipment and others as a part of measures against climate change and disaster prevention. In addition, in Vietnam, Bangladesh and Sri Lanka, Japan held the seminars on development of disaster resilient communities for educational institutions, community residents and others. Japan provided emergency relief supplies including foods, Non-Food Items, learning support goods and others for flood victims in Cambodia and Pakistan and typhoon victims in Philippines.

・Water Supply (Adaptation)

Japan supports constructing and repairing the water supply facilities in the areas which have been suffering from drought caused by climate change. For example, in Kenya, Japan has been cooperating in constructing and repairing the water supply facilities and providing equipment for reconstructing wells in areas where water supply was extremely poor and underwater development was technically and geologically difficult. In addition, in Tanzania, Japan supports to construct water supply facilities with human-powered deep well pump and provide ground water exploration equipment. In Burkina Faso, Japan provides support to construct 300 deep-well water supply facilities and implement educational activities for their maintenance and management.

・Support for Agriculture (Adaptation)

In Quang Nam Province, Vietnam, Japan diffused new agricultural technologies such as rice farming resilient to environmental stress caused by extreme climate event to improve an insufficiency of food in the community because of frequent natural disasters like typhoons.

・Biomass fuel (Mitigation)

In Moldova, Japan introduced the system to manufacture fuel (pellet) with high fuel efficiency from biomass such as straw, wheat and chips of fruit tree branch and constructed boilers specialized for pellets in educational institutions and others.

・Forest Conservation (REDD+)

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

b. Loan Support in Bilateral Cooperation

・Introduction of Renewable Energy (Mitigation)

Japan promotes contributes to sustainable development through the introduction of renewable energy to mitigate climate change effects as well as enhancing power supply. Japan has been cooperating in the construction of a geothermal power plant in Laguna Colorada, Bolivia and geothermal power plants in Guanacaste Province, northwestern area of Costa Rica. In Bangladesh, Japan has been providing financial support for establishment of facilities of renewable energy such as solar power and as biomass in rural areas and others.

・Improvement of Energy Access through the Maintenance of Electricity Transmission Equipment (Mitigation)

Japan has been contributing to reducing GHG emissions by electrification of local areas and the improvement of transmission efficiency, while aiming for a transfer to clean energy. In Haryana, India, Japan has been supporting to achieve reduction of power distribution loss rate and achieve stable power supply by constructing and replacing distribution lines, installing new and additional substations, introducing power meter with automatic meter reading and installing meter box. In Sri Lanka, Japan has been supporting to achieve reduction of power transmission and distribution losses by developing underground power transmission and distribution network in the area of in and around Colombo.

・Climate Change Program Loan (Mitigation/Adaptation)

Japan's ODA loan aid is implemented by JICA and one of its characteristic programs is Climate Change Program Loan (CCPL). It helps to develop the multi-year national climate change policy of developing countries, which is called the "policy matrix", based on policy dialogues and supports to implementation of those policies. In this process, Japan flexibly coordinates various ODA instruments such as loan aid or technical assistance. Japan revises the policy matrix by doing monitoring and evaluation every year, and then considers the second and subsequent phase of program loan. Japan has been currently implementing projects using the Program Loan in Vietnam.

c. Technical Assistance in Bilateral Cooperation

・Prevention of Disaster and Rehabilitation (Adaptation)

In Brazil, Japan has been cooperating in developing a draft of city plan, construction of the system for disaster warning, disaster observation and forecasting and others based on risk assessments and risk mapping of natural disasters. In Sri Lanka and Fiji, Japan has been supporting in the enhancement of the capacity for weather forecasting and early warning service and others.

・Water Supply (Adaptation)

In Samoa, Japan contributed to stable supply of safe water by enhancing the capacity of Samoa Water Authority agents for constructing pipelines and repairing leakages.

・Support for NAMAs (Mitigation)

Japan carried out capacity building as well as sharing information of policies and experiences to promote low carbon in Japan to formulate and implement NAMA in Asia.

・Introduction of Energy Saving and Renewable Energy (Mitigation)

In Serbia, Japan has been supporting in the development of Energy Managers and development of a scheme for an energy audit system. In Seychelles, Japan has been formulating a master plan for the development of micro grid composed of renewable energy and diesel generator in order to improve energy supply structure in Remote Islands. In Argentina, Japan has been implementing seminars in a third country for contributing to the improvement of production efficiency by resource and energy savings through enhancing the knowledge and capacity of cleaner production technologies and application of tools in Latin American nations. In Bornuur soum, Mongolia, Japan improved the efficiency of heat only boiler (HOB) and reduced consumption of coal used as fuel for boiler, CO_2 emissions and air pollutant emissions by suspending old model HOB used separately in each facility and intensively introducing highly efficient HOB to provide several facilities with hot water for heating.

・Promotion of REDD+ Efforts (REDD+)

Japan carried out training program in Japan for Malawi to enhance capacity to formulate and implement local Participatory Forest Management Plan as a measure to contribute to encouraging REDD+ efforts. In Mozambique, Japan supports to enhance the knowledge and technical capacity for appropriate forest monitoring by establishing Forest resources Information Platform for encouraging REDD+ efforts.

Table 5-5 Provision of public financial support : contribution through bilateral, regional and other channels in 2013 (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	821,140.00	8,072.52						
1	Afghanistan	295.00	2.90	Provided	ODA	Grant	Adaptation	Prevention and restoration of disaster	
2	Argentina	126.00	1.24	Provided	ODA	Grant	Mitigation	Air pollution, Energy	
3	Asia, Oceania	112.00	1.10	Committed	OOF	Grant	Adaptation	Cross-cutting	
4	Asia	470.00	4.62	Provided, Committed	ODA, OOF	Grant	Mitigation	Cross-cutting	
5	Azerbaijan	777.00	7.64	Committed	ODA	Grant	Adaptation	Agriculture	
6	Bangladesh	63,441.00	623.68	Provided, Committed	ODA, OOF	Grant, Concessional Loan	Mitigation	Energy, Cross-cutting, Water and sanitation	
7	Bangladesh	28,968.00	284.78	Provided, Committed	ODA, OOF	Grant, Concessional Loan	Adaptation	Prevention and restoration of disaster, Agriculture	
8	Bhutan	1,373.00	13.50	Provided, Committed	ODA	Grant	Adaptation	Agriculture, Prevention and restoration of disaster	
9	Bolivia	38.00	0.37	Provided	ODA	Grant	Adaptation	Agriculture	
10	Botswana	271.00	2.66	Provided	ODA	Grant	Cross-cutting	Forestry	
11	Brazil	349.00	3.43	Provided	ODA	Grant	Adaptation	Prevention and restoration of disaster	
12	Burkina Faso	968.00	9.52	Committed	ODA	Grant	Adaptation	Water and sanitation	
13	Cabo Verde	15,292.00	150.33	Committed	ODA	Concessional Loan	Adaptation	Water and sanitation	
14	Cambodia	1,216.00	11.95	Committed	ODA, OOF	Grant	Mitigation	Energy, Cross-cutting	
15	Cambodia	21.00	0.21	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
16	China	1,997.00	19.63	Provided, Committed	ODA, OOF	Grant, Non-Concessional Loan	Mitigation	Air pollution, Cross-cutting	
17	Colombia	5,880.00	57.81	Committed	OOF	Non-Concessional Loan	Mitigation	Energy	
18	Costa Rica	56,086.00	551.38	Committed	ODA	Concessional Loan	Mitigation	Energy	
19	Costa Rica	244.00	2.40	Provided	ODA	Grant	Cross-cutting	Forestry	
20	Cote d'Ivoire	183.00	1.80	Committed	ODA	Grant	Mitigation	Forestry	
21	Cote d'Ivoire	17.00	0.17	Committed	ODA	Grant	Cross-cutting	Forestry	
22	Cuba	276.00	2.71	Provided	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*						
23	Developing countries and others	4,900.00	48.17	Committed	OOF	Non-Concessional Loan	Mitigation	Cross-cutting	
24	Developing countries	225.00	2.21	Committed	OOF	Grant	Cross-cutting	Other (Others)	
25	Djibouti, Rwanda	28.00	0.28	Committed	OOF	Grant	Mitigation	Energy	
26	Ecuador	389.00	3.82	Provided	ODA	Grant	Adaptation	Agriculture	
27	Ethiopia	223.00	2.19	Provided	ODA	Grant	Mitigation	Energy	
28	Ethiopia	1,205.00	11.85	Provided, Committed	ODA	Grant	Adaptation	Water and sanitation	
29	Ethiopia	244.00	2.40	Provided	ODA	Grant	Cross-cutting	Forestry	
30	Fiji	134.00	1.32	Provided	ODA	Grant	Mitigation	Energy	
31	Ghana	1,686.00	16.57	Committed	ODA	Grant	Mitigation	Energy	
32	Ghana	6.00	0.06	Committed	OOF	Grant	Adaptation	Water and sanitation	
33	Honduras	952.00	9.36	Committed	ODA	Grant	Mitigation	Energy	
34	Honduras	106.00	1.04	Provided	ODA	Grant	Cross-cutting	Forestry	
35	India	264,681.00	2,602.05	Committed	ODA, OOF	Grant, Concessional Loan, Non-Concessional Loan	Mitigation	Energy	
36	India	60.00	0.59	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
37	Indonesia, Myanmar	21.00	0.21	Provided	ODA	Grant	Mitigation	Energy	
38	Indonesia	4,984.00	49.00	Provided, Committed	ODA, OOF	Grant	Mitigation	Energy, Water and sanitation, Cross-cutting, Forestry	
39	Indonesia	529.00	5.20	Provided, Committed	ODA	Grant	Cross-cutting	Prevention and restoration of disaster, Water and sanitation, Forestry	
40	Iraq	5.00	0.05	Provided	ODA	Grant	Mitigation	Water and sanitation	
41	Kenya, Ethiopia	40.00	0.39	Committed	OOF	Grant	Mitigation	Energy	
42	Kenya	518.00	5.09	Provided, Committed	ODA, OOF	Grant	Mitigation	Energy, Other (Others)	
43	Kenya	2,687.00	26.42	Committed	ODA	Grant	Adaptation	Water and sanitation, Prevention and restoration of disaster	
44	Kyrgyzstan	100.00	0.98	Provided	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						
45	Kuwait	63,239.00	621.70	Committed	OOF	Non-Concessional Loan	Mitigation	Energy, Air pollution	
46	Lao People's Democratic Republic	1,889.00	18.57	Provided, Committed	ODA, OOF	Grant	Mitigation	Energy	
47	Lao People's Democratic Republic	115.00	1.13	Provided	ODA	Grant	Cross-cutting	Forestry	
48	Latin America, Africa	350.00	3.44	Provided	ODA	Grant	Mitigation	Cross-cutting	
49	Malawi	257.00	2.53	Provided	ODA	Grant	Cross-cutting	Forestry	
50	Malaysia	4,767.00	46.86	Committed	OOF	Grant, Non-Concessional Loan	Mitigation	Energy, Water and sanitation, Cross-cutting, Forestry	
51	Malaysia	105.00	1.03	Provided	ODA	Grant	Cross-cutting	Forestry	
52	Mauritius	2,229.00	21.91	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
53	Mexico	3,946.00	38.79	Committed	OOF	Grant, Non-Concessional Loan	Mitigation	Energy, Other (Others)	
54	Moldova	1,154.00	11.34	Committed	ODA	Grant	Mitigation	Energy	
55	Mongolia	1,394.00	13.70	Provided, Committed	ODA, OOF	Grant	Mitigation	Cross-cutting, Energy, Air pollution	
56	Mozambique	298.00	2.93	Provided	ODA	Grant	Mitigation	Water and sanitation	
57	Mozambique	574.00	5.64	Provided	ODA	Grant	Adaptation	Water and sanitation	
58	Mozambique	350.00	3.44	Provided	ODA	Grant	Cross-cutting	Forestry	
59	Myanmar	14,119.00	138.80	Provided, Committed	ODA, OOF	Grant, Concessional Loan	Mitigation	Energy	
60	Myanmar	4,667.00	45.88	Provided, Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster, Agriculture	
61	Nauru	100.00	0.98	Committed	ODA	Grant	Adaptation	Water and sanitation	
62	Nepal	74.00	0.73	Provided	ODA	Grant	Mitigation	Energy	
63	Nepal	21.00	0.21	Committed	ODA	Grant	Adaptation	Agriculture	
64	Nicaragua	1,496.00	14.71	Committed	ODA	Concessional Loan	Mitigation	Energy	
65	Nicaragua	7.00	0.07	Provided	ODA	Grant	Adaptation	Water and sanitation	
66	Pakistan	4.00	0.04	Provided	ODA	Grant	Adaptation	Prevention and restoration of disaster	
67	Palau, Samoa, Fiji, Tonga, Vanuatu, Kiribati, Tuvalu	30.00	0.29	Committed	OOF	Grant	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						
68	Palau	189.00	1.86	Provided	ODA	Grant	Adaptation	Cross-cutting	
69	Palestinian Authority	63.00	0.62	Committed	ODA	Grant	Adaptation	Agriculture	
70	Papua New Guinea	8,340.00	81.99	Committed	ODA	Concessional Loan	Mitigation	Energy	
71	Paraguay	131.00	1.29	Provided	ODA	Grant	Cross-cutting	Cross-cutting	
72	Philippines	44,292.00	435.43	Committed	ODA	Grant, Concessional Loan	Mitigation	Air pollution, Energy	
73	Philippines	50,329.00	494.78	Provided, Committed	ODA	Grant, Concessional Loan	Adaptation	Agriculture, Prevention and restoration of disaster	
74	Philippines	281.00	2.76	Provided	ODA	Grant	Cross-cutting	Other (Others)	
75	Rwanda	43.00	0.42	Provided	ODA	Grant	Adaptation	Agriculture	
76	Sierra Leone	1,552.00	15.26	Committed	ODA	Grant	Mitigation	Energy	
77	Singapore	5.00	0.05	Provided	ODA	Grant	Mitigation	Other (Others)	
78	Singapore	5.00	0.05	Provided	ODA	Grant	Cross-cutting	Other (Others)	
79	South Africa	2,940.00	28.90	Committed	OOF	Non-Concessional Loan	Mitigation	Energy	
80	South Africa	15.00	0.15	Provided, Committed	ODA, OOF	Grant	Adaptation	Agriculture, Prevention and restoration of disaster	
81	Sri Lanka	15,962.00	156.92	Provided, Committed	ODA	Grant, Concessional Loan	Mitigation	Energy	
82	Sri Lanka	1.00	0.01	Provided	ODA	Grant	Adaptation	Agriculture	
83	Swaziland	92.00	0.90	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
84	Tanzania	5,319.00	52.29	Committed	ODA, OOF	Grant, Concessional Loan	Adaptation	Water and sanitation, Agriculture	
85	Thailand, Indonesia, Malaysia	20.00	0.20	Committed	OOF	Grant	Mitigation	Energy	
86	Thailand, Cambodia, Lao People's Democratic Republic, Viet Nam, Indonesia	35.00	0.34	Committed	OOF	Grant	Mitigation	Energy	
87	Thailand	18,405.00	180.94	Provided, Committed	ODA, OOF	Grant, Non-Concessional Loan	Mitigation	Energy, Air pollution	
88	Thailand	320.00	3.15	Provided	ODA	Grant	Cross-cutting	Other (Others)	
89	Timor-Leste	2,861.00	28.13	Provided, Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster, 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						
90	Tonga	1,573.00	15.46	Committed	ODA	Grant	Mitigation	Energy	
91	Turkey	7,374.00	72.49	Provided, Committed	ODA, OOF	Grant, Non-Concessional Loan	Mitigation	Energy	
92	Tuvalu	100.00	0.98	Committed	ODA	Grant	Adaptation	Water and sanitation	
93	Uganda	1,204.00	11.84	Committed	ODA	Grant	Mitigation	Energy	
94	Uganda	43.00	0.42	Provided	ODA	Grant	Adaptation	Agriculture	
95	Uzbekistan	34,877.00	342.87	Committed	ODA	Concessional Loan	Mitigation	Energy	
96	Viet Nam, Malaysia, Indonesia	40.00	0.39	Committed	OOF	Grant	Mitigation	Energy	
97	Viet Nam, Myanmar	8.00	0.08	Committed	OOF	Grant	Adaptation	Water and sanitation	
98	Viet Nam, Thailand	9.00	0.09	Committed	OOF	Grant	Adaptation	Prevention and restoration of disaster	
99	Viet Nam	1,913.00	18.81	Provided, Committed	ODA, OOF	Grant	Mitigation	Energy, Air pollution, Cross-cutting, Water and sanitation, Forestry, Other (Others)	
100	Viet Nam	44,392.00	436.41	Provided, Committed	ODA	Grant, Concessional Loan	Adaptation	Prevention and restoration of disaster, Water and sanitation, Agriculture	
101	Viet Nam	15,099.00	148.44	Provided, Committed	ODA	Grant, Concessional Loan	Cross-cutting	Cross-cutting, Forestry, Other (Others)	

Custom Footnotes

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

The exchange rate is 101.72 JPY/USD. Values converted from Japanese Yen to USD using the 101.72 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 2014 (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	835,291.00	8,211.65						
1	Afghanistan	43.00	0.42	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
2	Albania	85.00	0.84	Provided	ODA	Grant	Mitigation	Water and sanitation	
3	Asia, Africa	64.00	0.63	Provided	ODA	Grant	Mitigation	Forestry	
4	Asia, Oceania	477.00	4.69	Committed	OOF	Grant	Mitigation	Energy	
5	Asia, Oceania	109.00	1.07	Committed	OOF	Grant	Adaptation	Cross-cutting	
6	Asia, South America	128.00	1.26	Committed	OOF	Grant	Mitigation	Forestry	
7	Asia	348.00	3.42	Provided	ODA	Grant	Mitigation	Cross-cutting	
8	Bangladesh	56,970.00	560.07	Provided, Committed	ODA	Grant, Concessional Loan	Mitigation	Prevention and restoration of disaster, Other (Others)	
9	Bangladesh	266.00	2.62	Provided, Committed	ODA, OOF	Grant	Adaptation	Prevention and restoration of disaster, Water and sanitation, Agriculture	
10	Belize	100.00	0.98	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
11	Bhutan	91.00	0.89	Provided	ODA	Grant	Adaptation	Prevention and restoration of disaster	
12	Bolivia	2,495.00	24.53	Committed	ODA	Concessional Loan	Mitigation	Energy	
13	Brazil	14,700.00	144.51	Committed	OOF	Non-Concessional Loan	Mitigation	Energy	
14	Burkina Faso, Paraguay	42.00	0.41	Provided	ODA	Grant	Mitigation	Energy, Forestry	
15	Cambodia	171.00	1.68	Provided, Committed	ODA, OOF	Grant, Concessional Loan	Mitigation	Cross-cutting, Energy, Water and sanitation	
16	Cambodia	5,737.00	56.40	Provided, Committed	ODA, OOF	Grant, Concessional Loan	Adaptation	Water and sanitation, Agriculture	
17	Cameroon	374.00	3.68	Committed	ODA	Grant	Adaptation	Water and sanitation	
18	Cameroon	26.00	0.26	Provided	ODA	Grant	Cross-cutting	Forestry	
19	Caribbean States	1,526.00	15.00	Committed	ODA	Grant	Cross-cutting	Other (Others)	
20	Chile	76.00	0.75	Committed	OOF	Grant	Mitigation	Energy	
21	China	25.00	0.25	Provided	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						
22	Commonwealth of Dominica	100.00	0.98	Committed	ODA	Grant	Adaptation	Other (Others)	
23	Costa Rica	49.00	0.48	Committed	OOF	Grant	Mitigation	Energy	
24	Developing countries	1,051.00	10.33	Provided	ODA	Grant	Mitigation	Energy	
25	Dominican Republic	500.00	4.92	Committed	ODA	Grant	Mitigation	Energy	
26	Ethiopia	70.00	0.69	Committed	OOF	Grant	Mitigation	Energy	
27	Ethiopia	70.00	0.69	Provided	ODA	Grant	Cross-cutting	Forestry	
28	Fiji	136.00	1.34	Provided	ODA	Grant	Adaptation	Prevention and restoration of disaster	
29	Grenada	484.00	4.76	Committed	ODA	Grant	Mitigation	Energy	
30	Grenada	200.00	1.97	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
31	Guinea	13.00	0.13	Provided	ODA	Grant	Adaptation	Water and sanitation	
32	Guyana	300.00	2.95	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
33	India	290,769.00	2,858.52	Provided, Committed	ODA, OOF	Grant, Concessional Loan, Non-Concessional Loan	Mitigation	Forestry, Energy, Air pollution	
34	India	15,620.00	153.56	Committed	ODA	Concessional Loan	Adaptation	Water and sanitation	
35	Indochina countries	85.00	0.84	Provided	ODA	Grant	Mitigation	Forestry	
36	Indonesia	90,406.00	888.77	Provided, Committed	ODA, OOF	Grant, Concessional Loan, Non-Concessional Loan	Mitigation	Water and sanitation, Air pollution, Energy, Cross-cutting	
37	Indonesia	4,954.00	48.70	Committed	ODA	Concessional Loan	Adaptation	Prevention and restoration of disaster, Agriculture	
38	Indonesia	92.00	0.90	Provided, Committed	ODA, OOF	Grant	Cross-cutting	Forestry, Cross-cutting	
39	Iran	26.00	0.26	Provided	ODA	Grant	Mitigation	Energy	
40	Iran	42.00	0.41	Provided	ODA	Grant	Adaptation	Water and sanitation	
41	Iran	284.00	2.79	Provided	ODA	Grant	Cross-cutting	Forestry	
42	Jordan	2,238.00	22.00	Committed	ODA	Grant	Mitigation	Energy	
43	Kenya, Ethiopia	30.00	0.29	Committed	OOF	Grant	Mitigation	Energy	
44	Kenya	89.00	0.87	Provided, Committed	ODA, OOF	Grant	Mitigation	Energy	
45	Kenya	46.00	0.45	Committed	ODA, OOF	Grant	Adaptation	Water and sanitation, 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						
46	Lao People's Democratic Republic, Cambodia	41.00	0.40	Provided	ODA	Grant	Adaptation	Prevention and restoration of disaster	
47	Lao People's Democratic Republic	67.00	0.66	Committed	OOF	Grant	Mitigation	Energy, Cross-cutting	
48	Lao People's Democratic Republic	1,388.00	13.65	Provided, Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster, Water and sanitation	
49	Lao People's Democratic Republic	16.00	0.16	Provided	ODA	Grant	Cross-cutting	Forestry	
50	Latin America, Africa	300.00	2.95	Provided	ODA	Grant	Mitigation	Cross-cutting	
51	Latin America	48.00	0.47	Committed	OOF	Grant	Mitigation	Energy	
52	Madagascar	206.00	2.03	Committed	ODA	Grant	Adaptation	Agriculture	
53	Malawi	101.00	0.99	Committed	ODA	Grant	Mitigation	Energy	
54	Malaysia	103.00	1.01	Committed	OOF	Grant	Mitigation	Energy	
55	Maldives	27.00	0.27	Committed	OOF	Grant	Mitigation	Energy	
56	Maldives	4.00	0.04	Committed	OOF	Grant	Adaptation	Water and sanitation	
57	Mauritius	45.00	0.44	Provided	ODA	Grant	Adaptation	Cross-cutting	
58	Mexico	5,012.00	49.27	Committed	OOF	Grant, Non-Concessional Loan	Mitigation	Energy	
59	Mongolia	182.00	1.79	Provided, Committed	ODA, OOF	Grant	Mitigation	Energy, Air pollution	
60	Morocco	90,656.00	891.23	Committed	OOF	Non-Concessional Loan	Mitigation	Air pollution	
61	Mozambique	17,288.00	169.96	Provided, Committed	ODA	Grant, Concessional Loan	Mitigation	Energy	
62	Myanmar	1,068.00	10.50	Committed	ODA, OOF	Grant	Mitigation	Energy	
63	Myanmar	15,022.00	147.68	Provided, Committed	ODA	Grant, Concessional Loan	Adaptation	Agriculture, Prevention and restoration of disaster	
64	Nepal	1,571.00	15.44	Committed	ODA	Grant	Mitigation	Energy	
65	Nicaragua	1,521.00	14.95	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
66	North America, Latin America	81.00	0.80	Provided	ODA	Grant	Adaptation	Prevention and restoration of disaster	
67	Pakistan	5,603.00	55.08	Provided, Committed	ODA	Grant, Concessional Loan	Mitigation	Water and sanitation, 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						
68	Pakistan	3,719.00	36.56	Provided, Committed	ODA	Grant	Adaptation	Energy, Prevention and restoration of disaster, Water and sanitation	
69	Palau, Samona, Fiji, Tonga, Vanuatu, Kiribati, Tuvalu and others	47.00	0.46	Committed	OOF	Grant	Cross-cutting	Energy	
70	Palau	31.00	0.30	Committed	OOF	Grant	Mitigation	Cross-cutting	
71	Papua New Guinea	175.00	1.72	Provided	ODA	Grant	Adaptation	Energy	
72	Papua New Guinea	173.00	1.70	Provided	ODA	Grant	Cross-cutting	Forestry	
73	Paraguay	1,827.00	17.96	Committed	ODA	Grant	Adaptation	Water and sanitation	
74	Peru	6,944.00	68.27	Committed	ODA	Concessional Loan	Mitigation	Energy	
75	Peru	2,480.00	24.38	Committed	ODA	Concessional Loan	Adaptation	Prevention and restoration of disaster	
76	Philippines	517.00	5.08	Provided, Committed	ODA	Grant	Mitigation	Energy, Water and sanitation	
77	Philippines	5,930.00	58.30	Provided, Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
78	Rwanda	1,549.00	15.23	Committed	ODA	Grant	Adaptation	Cross-cutting, Agriculture	
79	Saint Lucia	560.00	5.51	Committed	ODA	Grant	Mitigation	Energy	
80	Saint Lucia	100.00	0.98	Committed	ODA	Grant	Adaptation	Other (Others)	
81	Saint Vincent and the Grenadines	486.00	4.78	Committed	ODA	Grant	Mitigation	Energy	
82	Saint Vincent and the Grenadines	100.00	0.98	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
83	Saudi Arabia	32.00	0.31	Committed	OOF	Grant	Mitigation	Energy	
84	Saudi Arabia	25.00	0.25	Provided	ODA	Grant	Mitigation	Water and sanitation	
85	Senegal	108.00	1.06	Provided	ODA	Grant	Adaptation	Agriculture	
86	Senegal	2.00	0.02	Provided	ODA	Grant	Cross-cutting	Other (Others)	
87	Serbia	572.00	5.62	Provided, Committed	ODA	Grant	Mitigation	Energy	
88	Seychelles	9.00	0.09	Provided	ODA	Grant	Mitigation	Energy	
89	Sri Lanka	94.00	0.92	Provided, Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
90	Tajikistan	1,628.00	16.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
91	Tanzania	4,410.00	43.35	Committed	ODA	Grant	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						
92	Thailand	200.00	1.97	Committed	OOF	Grant	Mitigation	Energy	
93	Thailand	4.00	0.04	Committed	OOF	Grant	Adaptation	Prevention and restoration of disaster	
94	Tonga	200.00	1.97	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
95	Tunisia	38,075.00	374.31	Committed	ODA	Concessional Loan	Mitigation	Energy	
96	Tunisia	10,398.00	102.22	Committed	ODA	Concessional Loan	Adaptation	Prevention and restoration of disaster	
97	Turkey	1,637.00	16.09	Committed	OOF	Non-Concessional Loan	Mitigation	Energy	
98	Uganda	2,519.00	24.76	Committed	ODA	Grant	Mitigation	Energy	
99	Uganda	156.00	1.53	Provided	ODA	Grant	Adaptation	Agriculture	
100	Uzbekistan	86,839.00	853.71	Committed	ODA	Concessional Loan	Mitigation	Energy	
101	Viet Nam	21,009.00	206.54	Provided, Committed	ODA, OOF	Grant, Non-Concessional Loan	Mitigation	Cross-cutting, Air pollution, Energy	
102	Viet Nam	21.00	0.21	Committed	ODA	Grant	Adaptation	Prevention and restoration of disaster	
103	Viet Nam	10,000.00	98.31	Committed	ODA	Concessional Loan	Cross-cutting	Cross-cutting	
104	Zambia	858.00	8.43	Committed	ODA	Grant	Adaptation	Water and sanitation	

Custom Footnotes

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5.1.3.4 Private Financial Flows

In order to further promote climate change action, Japan has also been working on establishing a mechanism to leverage private investment by use of public finance. Co-financing by JBIC with private sector and trade insurance by NEXI are the examples of utilizing private finance. Private Finance also plays an important role to tackle climate change as its total amount is over USD 3.6 billion as of December 2014.

a. Other Official Flow, Including Co-funding with Private Sector

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

<Features>

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

<Examples>

JBIC has provided finance needed for the environment-related loans (improving energy efficiency project or renewable energy project) to financial institutions, such as Türkiye Kalkınma Bankası A.Ş. in Turkey, Banco Nacional de Comercio Exterior, S.N.C. in Mexico, Banco Nacional de Desenvolvimento Econômico e Social in Brazil and The Standard Bank of South Africa Limited in South Africa. Through this operation, the funding of JBIC enabled private finance institutions to co-finance, which led to the mobilization of more fund.

5.2 Technology Development and Transfer

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

5.2.1 Innovation

The government promotes diffusion of technological innovation and ensures the significant GHG emissions reduction in the future, and contributes to GHG emissions reduction in developing countries immediately and efficiently by promoting the development of locally tailored technologies which can accommodate the needs of developing countries.

- Expanding Domestic Investment

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

- Formulating Technology Roadmap

  “New Low Carbon Technology Plan” was revised to include a technology roadmap indicating targeted technology levels based on the latest scientific knowledge. Japan will steadily implement this plan and globally cooperate to develop and diffuse innovative technologies such as CCS (Carbon dioxide Capture and Storage), Innovative Structural Materials and Artificial photosynthesis, to cover approximately 80 percent of the reductions needed to halve global emissions by 2050.

- International Cooperation on Research and Development

  The government will accelerate global development of innovative technologies by promoting international cooperation with major countries with a focus on basic research. To tackle global warming issues through accelerated innovation, Japan will annually host “Innovation for Cool Earth Forum (ICEF)”, with the participation of leaders of industry, government, and academia.

- Formulating the "Energy and Environment Innovation Strategy"

  Japan will formulate and announce "Energy and Environment Innovation Strategy" by spring 2016. In order to reinforce the development of innovative technologies in energy and environment, prospective focused areas will be identified and research and development on them will be strengthened.

5.2.2 Emissions Reduction in Oversea Countries by Diffusing Technologies

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

5.2.2.1 Joint Crediting Mechanism (JCM)

Japan establishes and implements the 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.

Since Japan and Mongolia signed bilateral documents in January 2013 for the first time to start this mechanism, the number of partner countries has increased to 16 as of the end of December 2015. This means that the target to double the number of partner countries in 3 years from November 2013 has been achieved a year in advance. So far, the Joint Committee was held 26 times in total, eight JCM projects are registered in four countries (Indonesia, Palau, Mongolia and Vietnam) and 19 JCM methodologies are approved. The government continues to support the further formulation of JCM projects and to increase the number of partner countries.

5.2.2.2 Development of the Basic Framework to Diffuse Technologies

- Support for International Standardization and Institutional Arrangement

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

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

- Utilization of Satellites

  The government aims to launch a new GHG observing satellite which has the state-of-the-art technologies (successor to GOSAT) in FY 2017. The satellite will monitor nation-by-nation, megacity-by-megacity, and large scale sources GHG emission levels, verify the effectiveness of countermeasures and propose emission reduction measures mainly in Asia.

- 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).

5.2.2.3 Other Supports for Developing Countries

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

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

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

Information on Japan's project on the provision of assistance for the development and transfer of technology is as shown in Table 5-7.

Table 5-7 Provision of technology development and transfer support (CTF Table 8)

(In alphabetical order of "Recipient country and/or region" and grouped by "Targeted area")

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	Asia/Africa	Mitigation and Adaptation	Project for promoting sustainable forest management in developing countries	Forestry	Public	Private	Planned	Developing busienss models to incentivize forest conservation which will promote sustainable forest management and reducing emissions from deforestation and forest degradation.
2	Burkina Faso, Paraguay	Mitigation	Project to Survey Global Environmental Issues on International Agriculture and Rural Areas	Energy, Forestry	Public	Private	Planned	MAFF supports to establish agricultural and rural development methods for contributing to reduce greenhouse gas by introducing renewable energy and circulation type agriculture, and so on.
3	China	Mitigation	Japan-China Co-benefits Cooperation	Energy	Public	Public	Implemented	on-going
4	Global	Mitigation	Demonstration Project of technologies and systems for International Energy Efficiency	Energy	Private and Public	Private and Public	Implemented	Demonstrate Japanese technologies which promote Energy Efficiency, Renewable Energy and Smart Community in order to assure the effectiveness of advanced technologies in diverse conditions and infrastructures of each country.
5	Guyana	Mitigation	Strengthening the performance of the wood processing sector in Guyana, through building local capasity and the enhancing national systems that promote forest products trade and sustainable utilization of forest resources (Guyana)	Forestry	Public	Public	Planned	To increase the competitiveness of the wood processing sector in Guyana, the project trains stakeholders in the wood processing sector, prepare a draft for a national system for inspection and certification of solid wood for domestic and foreign markets, and conducts awareness campaigns for solid wood users.
6	Indonesia	Mitigation	Japan-Indonesia Co-benefits Cooperation	Agriculture	Public	Public	Implemented	on-going
7	Indonesia	Mitigation	Co-benefits Type Air conditioning Solar Thermal Energy	Energy	Public	Public	Implemented	on-going
8	Indonesia	Mitigation	Initiatiating The Conservation Of Cempaka Tree Species (Elmerrillia spp.) Though Plantaiton Development With Local Community Participation In North Sulawesi, Indonesia (Indonesia)	Forestry	Public	Public	Planned	While the demand for cempaka wood is increasing, the supply from natural forest is declining. Cempaka tree species grows naturally only in the North Sulawesi area. To prevent destructive logging of the natural forest, the PD promotes artificial reforestation with the involvement of local communities. This PD contributes to the conservation of cempaka tree species by establishing reforestation technology.
9	Laos, Cambodia	Adaptation	Project to Survey Global Environmental Issues on International Agriculture and Rural Areas	Prevention and restoration of disaster	Public	Private	Planned	MAFF supports to develop disaster prevention method adapting to climate change and to formulate rural prevention disaster plans in rural areas of developping country.

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
10	Malaysia	Mitigation	Capacitty building on reduced impact logging(RIL) in dry inland forest in the permanent forest of peninsular Malaysia	Forestry	Public	Public	Planned	Though "Reduced Imapct Logging (RIL) has attracted attention as an important component of sustainable forest management, it is not common or well understood at the sites. For this reason, the project is training forest workers for further understanding of knowledge and technology of RIL and its practice.
11	Mongolia	Mitigation	Study on Co-benefits type pollution control for Heat Only Boiler	Energy	Public	Public	Implemented	on-going
12	Myanmar	Adaptation	Community Life Environment Improvement Project utilizing communication System in the Ayeyarwady River delta in Southern Myanmar	Communication	Public	Private and Public	Implemented	Provides emergency communication systems to villeges frequently affected by natural disasters around the Ayeyarwady river delta in Southern Myanmar.
13	Myanmar	Adaptation	Community Life Environment Improvement Project utilizing communication System in the Ayeyarwady River delta in Southern Myanmar(Phase 2)	Communication	Public	Private and Public	Implemented	Provides emergency communication systems to villeges frequently affected by natural disasters around the Ayeyarwady river delta in Southern Myanmar.
14	Myanmar	Adaptation	The Project for Establishment of Disastrous Weather Monitoring System	Prevention and restoration of disaster	Public	Private	Implemented	Improves Myanmar's weather monitoring capacity by installation of the weather radar systems in Yangon, Kyaukpyu and Mandalay as well as automatic weather stations (AWS) at 30 locations throughout the country and others.
15	Myanmar	Adaptation	The Project for Establishment of Disastrous Weather Monitoring System(PhaseII)	Prevention and restoration of disaster	Public	Private	Implemented	Improves Myanmar's weather monitoring capacity to take measures against weather disasters such as heavy rain and cyclone and reduce damage of weather disasters by providing necessary funds to complete maintenance of automatic weather stations and others.
16	Panama	Mitigation	Tropical Forest Governance in the Region of Darien, Panama (Panama)	Forestry	Public	Private	Planned	The purpose of the project is to support the implementation of strategies for measures against illegal logging in Darien area. The project establishes a system for implementing measures against illegal logging, establish effective monitoring methods of wood, and propose a financial mechanism for SFM.
17	Peru	Mitigation	Guideline for the management of Tara(Caesalpinea spinosa) plantations with a view to the rehabilitation of waste lands in the sub-humid tropics of the coastal region of Peru	Forestry	Public	Private	Planned	The southern coastal region of Peru is semi-acrid and poor in water resources. A past project confirmed that a timber species "Tara" is effective for plantation in wastelands. For this reason, this project develops guidelines for SFM and agroforestry system in Tara plantation and a technological manual for reforestation.

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
18	Rwanda	Adaptation	The Project for Development of Irrigation Scheme in Ngoma District	Agriculture	Public	Private	Implemented	Contributes to the stabilization and improvement of agricultural productivity and aenables irrigated agriculture for subject areas, by constructing reservoir and irrigation facilities suitable for hill-side irrigation, procuring equipments, implementing technical assistance, and readjusting the land of existing paddy field.
19	Sri lanka, Myanmar	Adaptation	Project to Study on Maintenance/Conservation Measures of Irrigation/Drainage System in Costal and Estuary Areas	Agriculture	Public	Public	Implemented	MAFF supports to provide teqnical support relating to collecting materials on the field of water management, facilities and equipment in coastal areas of Asian countries and analizing/organizing damage and ploblems caused by abnormal weather brought by climate change.
20	Tajikistan	Adaptation	The Project for Rehabilitation of Drinking Water Supply Systems in Pyanj District, Khatlon Region	Water and sanitation	Public	Private	Implemented	Supports for repairing, building and expanding village water infrastructure and others in Pyanj District, Khatlon Region, where many local residents still do not have access to safe water.

5.3 Capacity-Building

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

Therefore, Japan actively conducts projects to enhance their capacity with taking advantage of our low-carbon technologies, know-how, and experiences of developing low-carbon society in Japan to leverage the progress of global climate change actions. For example, Workshop on Greenhouse Gas Inventories in Asia (WGIA) has been held 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. Also, the national adaptation plan was formulated in November 2015, in order to progress policies and measures for adaptation to climate change impacts systematically and comprehensively. Japan works on capacity-building of developing countries by sharing globally experiences and findings of Japan through international networks such as Asia Pacific Climate Change Adaptation Network (APAN) and Global Adaptation Network (GAN), also by supporting the formulation of adaptation plan and the implementation of measures with utilizing technologies of Japan.

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

Table 5-8 Provision of capacity-building support (CTF Table 9)

(In alphabetical order of "Recipient country and/or region" and grouped by "Targeted area")

No.	Recipient country and/or region	Targeted area	Programme or project title	Description of programme or project
1	Asia/Pacific	Mitigation	The 13th Workshop on Greenhouse Gas Inventories in Asia (WGIA13)	WGIA has been held 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.
2	Asia/Pacific	Mitigation	Low Carbon Asia Research Network	Supports the International Research Network for Low Carbon Societies in Asia to develop capacity of researchers and others for building low carbon societies.
3	Asia/Pacific	Adaptation	Workshop for countries of the Asia-Pacific region: Advancing National Adaptation Planning in Asia-Pacific Aligning national, local, and sectoral initiatives for maximum impacts	In order to promote the national adaptation planning process and the implementation of adaptation actions in the Asia-Pacific region, Ministry of the Environment, Japan develops ten case studies and organizes workshops in Pattaya, Thailand, inviting countries and experts from the region to share the experience and lessons for deeper understandings of each other.
4	Asia/Pacific	Adaptation	The Global Adaptation Network(GAN),the Asia-Pacific Adaptation Network(APAN)	Supports GAN and APAN, proposed by UNEP, to enhance capacity of policy-makers and practitioners in the Asia-Pacific region and the world by sharing knowledge on climate change adaptation.
5	Asia/Pacific	Multiple Areas	Asia-Pacific Seminar on Cimate Change	Every year since 1991, the Ministry of the Environment, Japan has been convening the Asia-Pacific Seminar on Climate Change which has served as an important vehicle for countries in the region to exchange views and information on their respective efforts to mitigate and adapt to climate change in a practical manner, thereby contributing to capacity and confidence building among them.
6	Asia/Pacific	Multiple Areas	Asia-Pacific joint research /observation work of the Global Environment	Supports the Asia-Pacific Network for Global Change Research (APN) which is an intergovernmental network in the Asia-Pacific region to foster global change research, increase developing country participation in that research, and strengthen interactions betw een the science community and policy-makers.
7	Asia/Pacific	Multiple Areas	Community Based Restoration and Sustainable Management of Vulnerable of the Rewa Delta, Viti Levu	Conversion of coastal and mangrove wetlands to agricultural lands and agricultural development are causing the reduction and degradation of forests. This project sets the model area for restoring mangrove ecosystems by implementing dissemination and awareness raising of community, project on mangrove ecosystem restoration, formulation of guideline for conservation and others. The project is implemented by the department of forestry, Ministry of Fisheries and Forests in cooperation with international NGO and universities. It contributes to climate change measures and biodiversity conservation.
8	Bangladesh	Mitigation	Project for Updating Dakar Urbanization Master Plan by the Horizen 2025	This project contributes to air pollution control and climate change mitigation by revising the Strategic Transport Plan (STP) in Dakar Metropolitan Area (DMA) to clarify policy objectives for improvement of traffic congestion and environmental deterioration.

No.	Recipient country and/or region	Targeted area	Programme or project title	Description of programme or project
9	Bangladesh	Adaptation	Community based Cyclone Disaster Preparedness project	This project develops local staff with specializing in disaster reduction to aim to realize resilient community in the southwest of Bangladesh where is vulnerable to Cyclones. The local staff is expected to contribute to the community by such as spreading the concept of disaster reduction in the community, providing capacity building to people engaging in disaster reductions, improving infrastructure especially for cyclones and continue its services.
10	Bangladesh	Adaptation	Community based Cyclone Disaster Preparedness project - Phase II	This project develops local staff with specializing in disaster reduction to aim to realize resilient community in the southwest of Bangladesh where is vulnerable to Cyclones. The local staff is expected to contribute to the community by such as spreading the concept of disaster reduction in the community, providing capacity building to people engaging in disaster reductions, improving infrastructure especially for cyclones and continue its services.
11	China	Multiple Areas	Japan-China Co-benefits Cooperation	The bilateral cooperation between Japan and China based on the agreement which was concluded in December 2007 and renewed in April 2011. Feasibility study for demonstration and joint research for co-benefits with controlling air pollutants and capacity building is conducted in order to contribute further strengthen environmental management in China.
12	Cuba	Adaptation	The Project for Capacity Enhancement of Groundwater and Seawater Intrusion Management	The project enhances the capacity of groundwater development and management including seawater intrusion management by the monitoring of water bearing layer in target areas, building a groundwater model, groundwater recharge and capacity enhancement of technological aspect of addressing saltwater invasion.
13	Global	Mitigation	Capacity builing project for facilitating Energy Efficiency and Renewable Energy	Establish environments and measures to facilitate the promotion of Energy Efficiency and the introduction of Renewable Energy worldwide through capacity building.
14	Guyana	Mitigation	Strengthening the performance of the wood processing sector in Guyana, through building local capasity and the enhancing national systems that promote forest products trade and sustainable utilization of forest resources (Guyana)	To increase the competitiveness of the wood processing sector in Guyana, the project trains stakeholders in the wood processing sector, prepare a draft for a national system for inspection and certification of solid wood for domestic and foreign markets, and conducts awareness campaigns for solid wood users.
15	Indonesia	Mitigation	Initiatiating The Conservation Of Cempaka Tree Species (Elmerrillia spp.) Though Plantaiton Development With Local Community Participation In North Sulawesi, Indonesia (Indonesia)	While the demand for cempaka wood is increasing, the supply from natural forest is declining. Cempaka tree species grows naturally only in the North Sulawesi area. To prevent destructive logging of the natural forest, the PD promotes artificial reforestation with the involvement of local communities. This PD contributes to the conservation of cempaka tree species by establishing reforestation technology.
16	Indonesia	Adaptation	Cooperation on Climate Change Impact Assessment for Local Adaptation Planning in the Republic of Indonesia	This project aims to cooperate on climate change impact assessment to formulate the local climate change adaptation plans under National Action Plan for Climate Change Adaptation (RAN-API) through capacity building for local authroties.
17	Indonesia	Adaptation	The Project for Assessing and Integrating Climate Change Impacts into the Water Resources Management Plans for Brantas and Musi River Basins	This project formulates strategis against climate change and adaptation and mitigation policies as well as preparing climate change prediction data in the targeted river basin and revaluating the safety level of flood control and water utilization based on its results.
18	Indonesia	Multiple Areas	Japan-Indonesia Co-benefits Cooperation	The bilateral cooperation between Japan and Indonesia based on the agreement which was concluded in December 2007 and renewed in September 2011. Study, demonstration and capacity building for reduction of GHG emissions and controlling pollution in agro-industry is conducted in order to contribute further strengthen environmental management in Indonesia.
19	Malaysia	Mitigation	Capacitty building on reduced impact logging(RIL) in dry inland forest in the permanent forest of peninsular Malaysia	Though "Reduced Imapct Logging (RIL) has attracted attention as an important component of sustainable forest management, it is not common or well understood at the sites. For this reason, the project is training forest workers for further understanding of knowledge and technology of RIL and its practice.
20	Mongolia	Adaptation	Supporting Impact Assessment and Adaptation planning on Climate Change in Monglia	This project aims to support practical formulation for national climate change adaptation planning by cooperation of scientific technical impact assessment in Mongolia.
21	Mongolia	Multiple Areas	Study on Co-benefits type pollution control for Heat Only Boiler	The study focuses on coal fired Heat Only Boilers to demonstrate co-benefits derived from improvement of the HOB devices and conducting capacity building in order to contribute further strengthen environmental management in Mongolia.
22	Panama	Mitigation	Tropical Forest Governance in the Region of Darien, Panama (Panama)	The purpose of the project is to support the implementation of strategies for measures against illegal logging in Darien area. The project establishes a system for implementing measures against illegal logging, establish effective monitoring methods of wood, and propose a financial mechanism for SFM.

No.	Recipient country and/or region	Targeted area	Programme or project title	Description of programme or project
23	Papua New Guinea	Multiple Areas	Development of Quality - of - Governance Standards for Reducing Emissions from Deforestation and Forest Degradation (REDD) in Papua New Guinea	Though the PNG Forestry Authority has undertaken a variety of initiatives to fully promote the concept of REDD+, there also needs to be more consultation in the design of the national REDD+ strategy. This project contributes to climate change measures and sustainable forest management by developing Quality of Governance standards for REDD through survey with stakeholders and others. The University of Southern Queensland, Australia has been implementing this project as a research project, cooperating with the PNG Forestry Authority. Since the PNG Forestry Authority is committed to the Project Steering Committee (PSC), the results of this project are expected to be used for PNG's forest policies and contribute to climate change measures.
24	Peru	Mitigation	Guideline for the management of Tara(Caesalpinea spinosa) plantations with a view to the rehabilitation of waste lands in the sub-humid tropics of the coastal region of Peru	The southern coastal region of Peru is semi-acrid and poor in water resources. A past project confirmed that a timber species "Tara" is effective for plantation in wastelands. For this reason, this project develops guidelines for SFM and agroforestry system in Tara plantation and a technological manual for reforestation.
25	Senegal	Multiple Areas	Project for Updating Dakar Urbanization Master Plan by the Horizoen 2025	Update Dakar Urbanization Master plan by the Horizon 2025 with the target year at 2035 based on the perspective of environmental sustainability.
26	Sri Lanka	Adaptation	Capacity Building for Community Based Risk Reduction Project	This project aims to build a consistent network between local community, NGOs, enterprises, and local governments allowing to address affectively future natural disasters in Sri Lanka, as well as educate people disaster prevention skills, by organizing meetings, workshops, and seminars.
27	Thailand	Multiple Areas	The Project for Bangkok Master Plan on Climate Change 2013 - 2023	This project improves the implementation structure including cooperation with related agencies as well as supporting the formulation of Master Plan on climate Change covering five sectors: energy, transportation, waste/waste water treatment, green urban planning and adaptation planning in the megacity, Bangkok.
28	Thailand	Multiple Areas	Project for Capacity Development on Mitigation/Adaptation for Climate Change in the Southeast Asia Region	Supports for Thailand Greenhouse Gas Management Organization (TGO) to establish the Climate Change International Technical and Training Center (CITC) and develop and implement training program matched with the needs of Thailand and ASEAN developing countries.
29	Vietnam, Mexico, Nepal	Multiple Areas	Improved information to promote forest management for protection of soil and water	Develop a set of comprehensive methods for assessing the state of forests primarily designated for soil and water conservation and/ or risk reduction.

Chapter 6

Other Reporting Matters

6.1 Process of Self-Assessment of Compliance with Emission Reductions in Comparison with Emission Reduction Commitments

As for the self-assessment process of compliance with the greenhouse gas emission reduction target, please refer to 3.1.1.2. Progress Management of Policies and Measures.

6.2 Other Information

Japan has been implementing efforts based on the Kyoto Protocol Target Achievement Plan stipulated in Act on Promotion of Global Warming Countermeasures (Formulated April, 2005 and completely revised March, 2008) to achieve 6% greenhouse gases emissions reduction commitment for the first commitment period of the Kyoto Protocol. Since the first commitment period of the Kyoto Protocol ended at the end of 2012, the Kyoto Protocol Target Achievement Plan came to the end at the end of FY2012 as well. After FY2013, Japan has submitted Biennial Report to report the progress of the target and obtained international reviews with registration of the reduction target (3.8% reduction compared to FY2005) by 2020 under the Cancun Agreement.

In addition, Japan's INDC towards post-2020 GHG emission reductions is at the level of a reduction of 26.0% by FY2030 compared to FY2013 (25.4% reduction compared to FY2005), ensuring consistency with its energy mix, 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.

Japan is to develop the Plan for Global Warming Countermeasures based on the Act on Promotion of Global Warming Countermeasures.

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Acronyms and Abbreviations

	Terms	Definition
A	AAU	Assigned Amount Units
	ACE	Actions for Cool Earth
	AD	Activity Data
	APAN	Asia Pacific Adaptation Network
	AR4	IPCC Fourth Assessment Report
	ARD	Afforestation, Reforestation and Deforestation
	A-USC	Advanced Ultra-supercritical
B	BAT	Best Available Technology
	BEMS	Building Energy Management System
	BR	Biennial Report
	BRT	Bus Rapid Transit
C	CASBEE	Comprehensive Assessment System for Built Environment Efficiency
	CCPL	Climate Change Program Loan
	CCS	Carbon Dioxide Capture and Storage
	CERs	Certified Emission Reductions
	CFC	Chlorofluorocarbons
	CH_4	Methane
	CM	Cropland Management
	CNG	Compressed Natural Gas
	CO	Carbon monoxide
	CO_2	Carbon dioxide
	CO_2 eq.	Gas Emission in CO_2 equivalent
	COP	Conference of Parties
	CRF	Common Reporting Format
	CTF	Common Tabular Format
	CY	Calendar Year
E	EF	Emission Factor
	EMS	Eco-drive Management Systems
	ERUs	Emission Reduction Units
	ESCO	Energy Service Company
	ESG	Environmental, Social, Governance
	EV	Electric Vehicle
F	FM	Forest Management
	FY	Fiscal Year
G	GAN	Global Adaptation Network
	GCF	Green Climate Fund
	GDP	Gross Domestic Product
	GEF	Global Environment Facility
	GHG	Greenhouse Gas
	GIO	Greenhouse Gas Inventory Office
	GM	Grazing Land Management
	GWP	Global Warming Potential
H	HCFC	Hydrochlorofluorocarbon
	HFCs	Hydrofluorocarbons
	HEMS	Home Energy Management System
	HOB	Heat Only Boiler
	HWP	Harvested Wood Products
I	ICEF	Innovation for cool earth Forum
	ICT	Information and Communication Technology
	IGFC	Integrated coal gasification fuel cell combined cycle
	IoT	Internet of Things
	IPCC	Intergovernmental Panel on Climate Change
	IPPU	Industrial Processes and Product Use

	Terms	Definition
	ITS	Intelligent Transport System
	ITTO	The International Tropical Timber Organization
J	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	LED	Light Emitting Diode
	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
	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
	NAMA	Nationally Appropriate Mitigation Action
	NC	National Communication
	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
O	ODA	Official Development Assistance
	ODS	Ozone Depleting Substance
	OOF	Other Official Flow
P	PDCA	Plan–Do–Check–Act
	PFCs	Perfluorocarbons
Q	QA/QC	Quality Assurance / Quality Control
	QAWG	Quality Assurance Working Group
	QC	Quality Control
R	R&D	Research and Development
	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	SECURE	Stand-by Emergency Credit for Urgent Recovery
	SF_6	Sulfur hexafluoride
	SIDS	Small Island Developing States
	SOx	Sulfur oxides
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
W	WG	Working Group
	WGIA	Workshop on Greenhouse Gas Inventories in Asia

Notation Key	Definition
NO	Not Occurring
NE	Not Estimated
NA	Not Applicable
IE	Included Elsewhere
C	Confidential