



2017 Taiwan
Greenhouse Gas Inventory
Report Summary

Executive Summary

ES.1 Background Information on National Greenhouse Gas Inventory

The guidelines in Article 4 and Article 12 of the United Nations Framework Convention on Climate Change (UNFCCC) and Article 5 of Kyoto Protocol state that each party shall submit information on its progress in response to climate change to the UNFCCC Convention of the Parties for review. In particular, the National Inventory Report (NIR) is an Annex prepared in Common Reporting Format (CRF), in which the UNFCCC1 requires each country to report on its national greenhouse gas inventory describing the procedures for greenhouse gas emission inventory preparation, information on emission trends, statistics by sectors, and a national report of re-calculation. Although Taiwan is not a UNFCCC party, it has long been committed to fulfill its responsibility as a member of the global village by taking initiatives to slow down global warming with arduous efforts. The establishment of a national greenhouse gas inventory report and the estimation of greenhouse gas emissions and removals is the fundamental obligation of a country to UNFCCC as well as one of the essential steps in reducing global warming.

Since 1998, Taiwan has taken initiatives to prepare the GHG inventory. The country passed 24/CP. 17 resolution according to the 17th Convention of the Parties to the United Nations Framework Convention on Climate Change held in Durban, South Africa and the 7th session of Meeting of Parties to the Kyoto Protocol (COP17/CMP7) in 2011, requesting developed countries to submit Annual National Inventory Report starting from 2015 in accordance with 2006 IPCC Guidelines for National Greenhouse Gas Inventories proposed by Intergovernmental Panel on Climate Change, IPCC in 2006 ("2006 IPCC Guidelines"). The Report also carried out the statistics and compilation in accordance with 2006 IPCC Guidelines to actively demonstrate the effort and resolution to abide by the convention. Today, the country has established a greenhouse gas inventory database from 1990 to 2015. The

database aims to summarize the overview on greenhouse gas inventory statistics to explain the GHG trends in Taiwan. It is also part of the continual effort to quantify future greenhouse gas emissions, to introduce Taiwan's greenhouse gas statistics overview, and thereby to receive comments from all fields for the continuous improvement on the quality of national greenhouse gas inventories.

ES.2 Summary of National Emission and Absorption Related Trends

Taiwan's total greenhouse gas (GHG) emissions increased from 137,854 Kilotons of carbon dioxide (excluding carbon dioxide removal) in 1990 up to 284,643 Kilotons of carbon dioxide equivalents (excluding carbon dioxide removal) in 2015, with emission increased by 106.48% at an average annual growth rate of 2.65%. The total emission in 2015 is decreased than the previous year by 0.56%. Net Greenhouse Gas Emission increased from 114,468 Kilotons of carbon dioxide equivalents in 1990 up to 263,138 Kilotons of carbon dioxide equivalents in 2015, with emissions increased by 129.88%, at an average annual growth rate of 2.98%. The total emissions in 2015 are decreased than the previous year by 0.61%, as shown in Figure ES2.1. Further comparison of statistics on various greenhouse gas emissions shows that carbon dioxide accounts for the majority of greenhouse gas emissions in Taiwan in 2015, followed by CH₄, N₂O and then fluorinated greenhouse gas. Between 1990 and 2015, carbon dioxide emissions grew by 118.42%, increasing at an average annual growth rate of 2.87%; CH₄ emission decreased by 49.92% with an average annual growth rate of -2.83%, as negative growth; N₂O emission increased by 55.62% with an annual growth rate of 1.44%, as shown in Table ES2.1.

The energy sector, industrial processes and product use sector, agriculture sector, and waste sector are the main emission sources of carbon dioxide in Taiwan, as shown in Table ES2.2. In 1990, Taiwan had carbon dioxide emission of 124,077 Kilotons of carbon dioxide equivalents. In 2015, the figure was 271,013 Kilotons of carbon dioxide equivalent, with an increase by 118.42% and an average annual growth rate of 2.87%. In 2015, CO₂ emissions accounted for 95.21% of total GHG emissions; among all sectors, the energy sector

1 UNFCCC, FCCC/CP/2002/8, 2002.



accounted for 93.69%, industrial processes and product use sector 6.26%, agriculture sector 0.01% and waste sector 0.04%. The CO₂ emission in 2015 compared with 2014 was decreased by 0.33%, mainly because of the decrease in emission by 0.18% in energy sector, by 2.27% in industrial processes and product use sector, by 5.76% in agriculture sector, and by 29.90% in waste sector.

The main CH₄ emission in Taiwan is from the agriculture sector, waste sector, and energy sector, as shown in Table ES2.3. In 1990, total CH₄ emission in Taiwan was 10,882 Kilotons of carbon dioxide equivalents. In 2015, total CH₄ emission was 5,449 Kilotons of carbon dioxide equivalents, down by 49.92% with an average growth rate of -2.83%, as negative growth. In 2015, the CH₄ emissions accounted for 1.91% of total GHG emissions; among all sectors, the waste sector is the largest source for CH₄ emission, responsible for 66.86%, followed by the agricultural sector 23.28%, energy sector 9.14%, and industrial processes and product use sector 0.72%. Compared to 2014, the 2015 CH₄ emission was down by 3.78%, with the waste sector down by 5.45% and agriculture sector down by 1.36% and the energy sector up by 2.45% and industrial processes and product use sector up by 4.87%.

The main N₂O emission in Taiwan is from the industrial processes and product use sector, agriculture sector, and energy sector with minor emissions from the waste sector, as shown in Table ES2.4. In 1990, total N₂O emission in Taiwan was 2,895 Kilotons of carbon dioxide equivalents. In 2015, total N₂O emission was 4,506 Kilotons of carbon dioxide equivalents, up by 55.62% with an average growth rate of 1.44%. In 2015, the N₂O emissions accounted for 1.58% of total GHG emissions; among all sectors, the industrial processes and product use sector is the largest source for N₂O in Taiwan in 2014, responsible for 33.45%, followed by agriculture sector 33.00%, energy sector 27.49%, and waste sector 8.06%. Compared to 2014, the 2015 N₂O emission was down by 3.78%, with the industrial processes and product use sector down by 0.44%, agriculture sector dropped by 2.13%, energy sector down by 0.10%, and waste sector down by 0.21%.

In Taiwan, the majority of fluorinated greenhouse gases come from economically critical industries, including the semiconductor, optoelectronics, power facilities, and magnesium alloy, which are emission-heavy industries. The fluorinated greenhouse gas emissions are shown in Table ES2.5. In particular, the emission from Taiwan's HFCs decreased from 755 kilotons of carbon dioxide equivalents in 1993 to 982 kilotons of carbon dioxide equivalents in

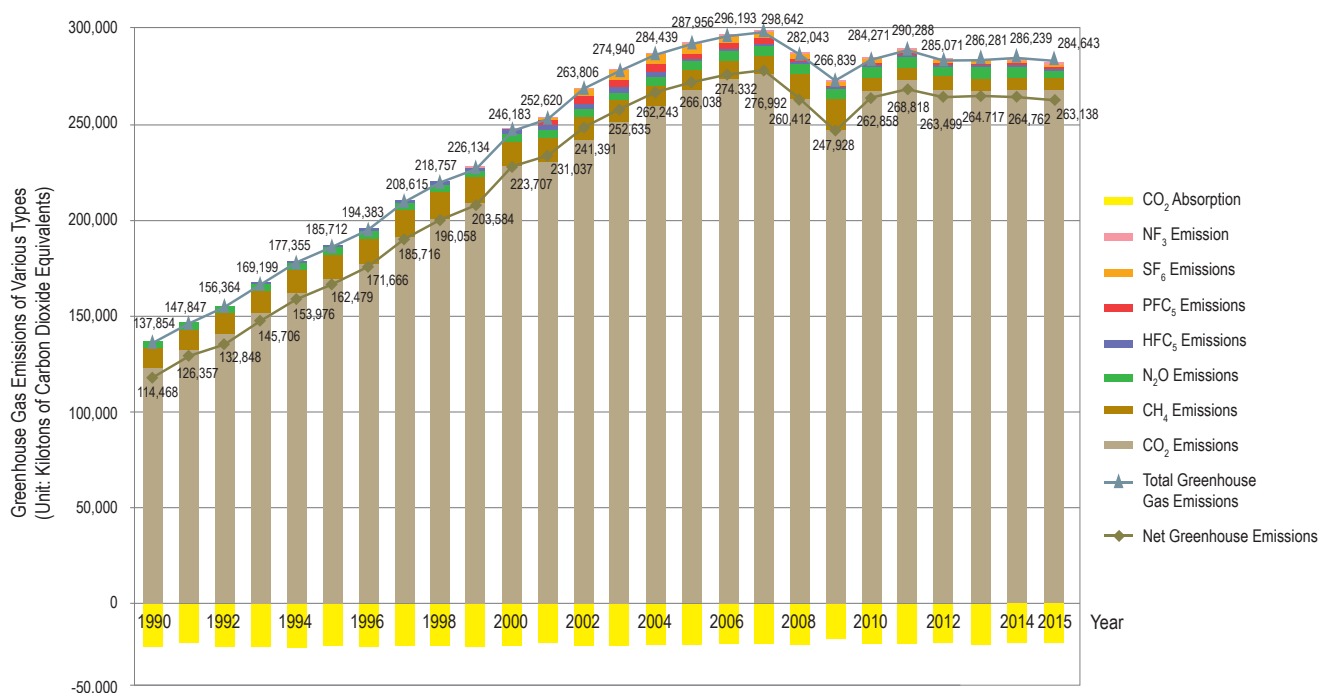


Figure ES2.1 Trends in Total GHG Emissions and Removals between 1990 and 2015 in Taiwan

Table ES2.1 Trends in GHG Emissions and Removals by GHG Category between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG	GWP	1990	1991	1992	1993	1994	1995	1996	1997	1998
CO ₂	1	124,077	133,543	142,017	153,630	160,883	168,479	176,292	190,297	199,871
CH ₄	25	10,882	11,157	11,206	11,603	12,364	13,108	13,539	13,559	13,579
N ₂ O	298	2,895	3,148	3,141	3,211	3,253	3,323	3,246	3,282	3,225
HFCs	HFC-134a: 1,430	NE	NE	NE	755	855	801	1,305	1,477	2,083
PFCs	PFC-14:7,390	NE	NE	NE	NE	NE	NE	NE	NE	NE
SF ₆	22,800	NE	NE	NE	NE	NE	NE	NE	NE	NE
NF ₃	17,200	NE	NE	NE	NE	NE	NE	NE	NE	NE
CO ₂ Removals	1	-23,386	-21,490	-23,516	-23,493	-23,379	-23,233	-22,717	-22,899	-22,699
Net GHG Emissions		114,468	126,357	132,848	145,706	153,976	162,479	171,666	185,716	196,058
Total GHG Emissions		137,854	147,847	156,364	169,199	177,355	185,712	194,383	208,615	218,757
GHG	GWP	1999	2000	2001	2002	2003	2004	2005	2006	2007
CO ₂	1	207,499	226,923	230,022	237,562	248,338	257,269	264,294	273,688	277,098
CH ₄	25	13,713	13,002	12,215	11,630	11,124	10,420	9,949	9,316	8,821
N ₂ O	298	3,184	3,796	3,845	3,943	3,958	4,106	4,163	4,699	4,784
HFCs	HFC-134a: 1,430	1,609	2,319	2,619	2,216	2,397	2,451	1,070	987	1,093
PFCs	PFC-14:7,390	3	13	2,939	4,143	4,198	4,341	3,070	3,264	2,972
SF ₆	22,800	116	120	746	3,914	4,385	5,193	4,683	3,590	3,114
NF ₃	17,200	11	10	235	398	540	659	726	650	759
CO ₂ Removals	1	-22,550	-22,476	-21,583	-22,415	-22,305	-22,196	-21,918	-21,861	-21,650
Net GHG Emissions		203,584	223,707	231,037	241,391	252,635	262,243	266,038	274,332	276,992
Total GHG Emissions		226,134	246,183	252,620	263,806	274,940	284,439	287,956	296,193	298,642
GHG	GWP	2008	2009	2010	2011	2012	2013	2014	2015	
CO ₂	1	263,999	249,949	267,700	274,356	270,480	271,494	271,899	271,013	
CH ₄	25	8,134	7,515	6,967	6,576	6,243	5,859	5,663	5,449	
N ₂ O	298	4,372	4,537	4,943	4,839	4,759	4,564	4,545	4,506	
HFCs	HFC-134a: 1,430	1,046	980	934	1,016	869	981	1,010	982	
PFCs	PFC-14:7,390	1,682	1,143	1,354	1,365	725	929	1,139	931	
SF ₆	22,800	2,644	2,176	2,155	1,755	1,647	1,722	1,355	1,139	
NF ₃	17,200	166	538	219	381	349	734	627	623	
CO ₂ Removals	1	-21,631	-18,911	-21,413	-21,470	-21,572	-21,564	-21,477	-21,505	
Net GHG Emissions		260,412	247,928	62,858	268,818	263,499	264,717	264,762	263,138	
Total GHG Emissions		282,043	266,839	284,271	290,288	285,071	286,281	286,239	284,643	

Note: 1. Global Warming Potential (hereinafter referred to as GWP) is cited from the IPCC Fourth Assessment Report.

2. NE (not estimated), refers to the exclusion of estimation on existing emissions and sequestration.

Table ES2.2 Trends in CO₂ Emissions and Removals between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG Emission Source and Sinks	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1. Energy Sector	109,491	118,414	125,918	135,058	142,841	150,429	158,104	170,599	181,241	190,159	209,168	213,220	220,797	230,785
1.A.1. Energy Industry	49,118	55,403	58,795	66,180	70,862	76,800	81,519	92,436	100,959	107,029	122,195	126,437	130,556	140,966
1.A.2. Manufacturing Industry and Construction	30,154	31,657	32,982	33,252	34,239	34,988	36,051	37,818	38,498	39,753	42,830	42,339	44,641	43,669
1.A.3. Transport	19,646	20,888	24,033	26,103	27,540	28,822	29,801	30,536	31,844	32,772	33,207	33,246	34,542	34,509
1.A.4. Other Sectors	10,572	10,466	10,107	9,523	10,200	9,820	10,733	9,809	9,940	10,605	10,937	11,198	11,058	11,641
1.A.4.a Commercial/Institutional	3,621	3,529	2,989	2,490	3,018	2,445	3,175	2,483	2,948	3,155	3,220	3,562	3,493	3,961
1.A.4.b Residential	4,005	4,238	4,446	4,359	4,461	4,597	4,754	4,851	4,952	5,410	5,354	5,181	5,107	4,869
1.A.4.c Agriculture/Forestry/Fishing	2,946	2,700	2,672	2,675	2,721	2,777	2,805	2,475	2,041	2,040	2,362	2,455	2,459	2,811
2. Industrial Processes and Product Use Sector	14,424	14,975	15,895	18,378	17,797	17,501	17,651	19,460	18,386	17,156	17,365	16,168	16,059	17,053
2.A Mining Industry (Non-Metal Process)	10,584	10,698	11,854	13,879	13,259	12,766	12,645	13,394	11,564	10,746	10,486	9,974	10,648	10,270
2.B Chemical Industry	563	539	565	609	762	850	992	1,020	1,003	1,075	1,143	1,232	1,313	1,384
2.C Metal Process	3,275	3,735	3,474	3,888	3,774	3,884	4,013	5,045	5,817	5,333	5,734	4,960	4,096	5,397
2.H Others	2.05	2.03	1.99	2.08	2.05	1.87	1.75	1.66	1.91	1.83	1.78	1.75	1.60	1.61
3. Agriculture Sector	142	146	139	131	135	151	151	134	127	119	131	94	93	83
4. Land Use, Land-use Change and Forestry Sector	-23,386	-21,490	-23,516	-23,493	-23,379	-23,233	-22,717	-22,899	-22,699	-22,550	-22,476	-21,583	-22,415	-22,305
5. Waste Sector	20.5	8.3	65.0	63.1	110.1	397.9	386.6	104.9	116.7	65.0	259.0	539.9	612.1	417.3
Net CO ₂ Emissions	100,691	112,053	118,501	130,137	137,504	145,246	153,575	167,398	177,172	184,949	204,447	208,439	215,147	226,033
Total CO ₂ Emissions	124,077	133,543	142,017	153,630	160,883	168,479	176,292	190,297	199,871	207,499	226,923	230,022	237,562	248,338
GHG Emission Source and Sinks	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
1. Energy Sector	239,333	246,007	253,069	256,720	245,103	233,439	249,430	255,320	251,138	251,962	254,367	253,921		
1.A.1. Energy Industry	146,632	153,821	160,602	164,428	158,443	148,936	159,910	163,547	161,112	160,260	165,815	164,694		
1.A.2. Manufacturing Industry and Construction	44,800	43,460	44,944	46,711	42,891	40,792	44,814	46,768	45,755	47,395	43,497	43,198		
1.A.3. Transport	35,859	36,846	36,771	35,419	33,385	33,711	34,824	35,293	34,502	34,472	34,951	35,759		
1.A.4. Other Sectors	12,041	11,881	10,752	10,163	10,385	9,999	9,881	9,712	9,769	9,835	10,104	10,269		
1.A.4.a Commercial/Institutional	4,118	4,231	4,248	4,192	4,200	4,226	4,203	3,962	3,958	4,177	4,412	4,496		
1.A.4.b Residential	4,947	5,023	4,857	4,879	4,820	4,775	4,737	4,813	4,770	4,649	4,616	4,675		
1.A.4.c Agriculture/Forestry/Fishing	2,977	2,627	1,647	1,091	1,364	998	941	937	1,041	1,009	1,076	1,098		
2. Industrial Processes and Product Use Sector	17,340	17,877	20,089	19,758	18,396	16,300	18,008	18,835	19,139	19,334	17,346	16,952		
2.A Mining Industry (Non-Metal Process)	10,691	11,257	11,014	10,369	9,289	8,467	8,616	9,577	9,333	9,866	8,728	8,345		
2.B Chemical Industry	1,485	1,552	1,530	1,654	1,457	1,514	1,599	1,637	1,503	1,572	1,603	1,605		
2.C Metal Process	5,162	5,066	7,544	7,733	7,648	6,317	7,792	7,620	8,301	7,894	7,013	7,000		
2.H Others	1.70	1.74	1.85	1.77	1.73	1.83	1.74	1.69	1.82	1.70	2	2		
3. Agriculture Sector	84	62	60	58	57	56	54	53	55	45	40	38		
4. Land Use, Land-use Change and Forestry Sector	-22,196	-21,918	-21,861	-21,650	-21,631	-18,911	-21,413	-21,470	-21,572	-21,564	-21,477	-21,505		
5. Waste Sector	512.4	347.8	469.6	562.1	443.2	154.3	208.2	148.7	148.5	153.4	146	103		
Net CO ₂ Emissions	235,073	242,376	251,827	255,448	242,368	231,038	246,287	252,886	248,908	249,930	250,422	249,508		
Total CO ₂ Emissions	257,269	264,294	273,688	277,098	263,999	249,949	267,700	274,356	270,480	271,494	271,899	271,013		

Table ES2.3 Trend in CH4 Emissions between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG Emission Source and Sinks	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1. Energy Sector	254	270	293	310	328	344	359	370	390	409	430	436	446	466
2. Industrial Processes and Product Use Sector	5	7	6	7	8	10	11	12	10	12	14	18	19	22
3. Agriculture Sector	1,873	1,901	1,864	1,863	1,832	1,855	1,839	1,723	1,622	1,644	1,618	1,565	1,479	1,394
3.A Enteric Fermentation	670	731	738	775	789	822	822	732	674	694	692	660	636	626
3.B Livestock Manure Management	206	236	234	240	247	259	266	219	192	205	210	201	194	192
3.C Rice Cultivation	960	908	845	825	775	767	745	765	751	738	702	689	637	567
3.F Field Burning of Agricultural Residues	38	25	48	22	21	7	7	7	6	7	14	15	13	9
5. Waste Sector	8,750	8,980	9,044	9,423	10,196	10,899	11,329	11,454	11,556	11,648	10,941	10,196	9,686	9,242
5.A Solid Waste Disposal	5,832	5,917	5,928	6,323	7,061	7,719	8,080	8,212	8,372	8,604	8,024	7,305	6,821	6,310
5.B Biological Treatment of Solid Waste	11	1	1	0	0	1	0	1	0	2	0	0	0	2
5.D Wastewater Treatment and Discharge	2,907	3,062	3,115	3,100	3,135	3,179	3,249	3,241	3,184	3,042	2,916	2,891	2,864	2,930
Total	10,882	11,157	11,206	11,603	12,364	13,108	13,539	13,559	13,578	13,713	13,002	12,215	11,630	11,124
GHG Emission Source and Sinks	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
1. Energy Sector	484	490	491	493	474	466	481	490	485	490	486	498		
2. Industrial Processes and Product Use Sector	28	29	33	39	37	33	35	27	35	38	37	39		
3. Agriculture Sector	1,320	1,387	1,368	1,341	1,299	1,281	1,274	1,301	1,300	1,304	1,286	1,268		
3.A Enteric Fermentation	614	623	614	609	584	571	578	590	583	579	566	573		
3.B Livestock Manure Management	193	195	195	185	180	175	176	180	172	166	164	163		
3.C Rice Cultivation	505	561	551	543	529	530	514	526	540	555	552	529		
3.F Field Burning of Agricultural Residues	8	8	8	5	6	5	5	5	5	3	4	4		
5. Waste Sector	8,588	8,043	7,425	6,948	6,322	5,735	5,177	4,758	4,423	4,027	3,854	3,643		
5.A Solid Waste Disposal	5,763	5,219	4,656	4,135	3,601	3,066	2,597	2,222	1,887	1,595	1,349	1,140		
5.B Biological Treatment of Solid Waste	7	10	11	14	16	18	21	26	24	23	20	20		
5.D Wastewater Treatment and Discharge	2,818	2,815	2,757	2,798	2,705	2,651	2,559	2,510	2,512	2,410	2,484	2,484		
Total	10,420	9,949	9,316	8,821	8,134	7,515	6,967	6,576	6,243	5,859	5,663	5,449		

2015. The emission from PFCs decreased from 3 kilotons of carbon dioxide equivalents in 1999 to 931 kilotons of carbon dioxide equivalents in 2015; while the emission from SF6 increased from 116 kilotons of carbon dioxide equivalents in 1999 to 1,139 kilotons of carbon dioxide equivalents in 2015. The emission from SF3 increased from 11 kilotons of carbon dioxide equivalents in 1999 to 623 kilotons of carbon dioxide equivalents in 2015. For total emission of fluorinated greenhouse gases, it decreased from 1,738 kilotons of carbon dioxide equivalents in 1999 (about 0.77% of total greenhouse gas emission for 1999) to 3,675 kilotons of carbon dioxide

equivalents in 2015 (about 1.29% of total greenhouse gas emission for 2015), with emissions increased by 111.44%. Compared to 2014, the 2015 emission decreased by 11.06%.

ES.3 Emission Estimation and Trends Overview for Emission Source and Sinks Classification

The energy sector, among all segments, has long been the one accounting for the largest total greenhouse gas emissions in Taiwan over the years. The GHG emission for the energy sector was responsible for approximately 89.82% of the total emissions in 2015 (excluding land-use change and forestry removals), the industrial processes and product use

Table ES2.4 Trend in N2O Emissions between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG Emission Source and Sinks	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1. Energy Sector	537	578	651	702	739	772	816	861	912	960	1,047	1,071	1,122	1,175
1.A.1 Energy Industry	138	158	183	207	221	239	267	302	332	364	432	453	475	529
1.A.2 Manufacturing Industry and Construction	91	94	99	99	101	101	105	107	110	113	124	128	136	134
1.A.3 Transport	291	309	353	382	402	418	428	438	456	469	475	475	496	495
1.A.4 Other Sectors	17	17	15	14	15	14	16	14	14	14	15	16	16	17
2. Industrial Processes and Product Use Sector	166	352	325	301	318	345	186	374	383	312	625	714	743	833
3. Agriculture Sector	1,897	1,933	1,866	1,897	1,883	1,872	1,907	1,710	1,609	1,583	1,794	1,720	1,729	1,597
3.B Livestock Manure Management	48	50	52	54	59	61	67	70	71	72	73	71	70	71
3.D Agricultural Soils	1,837	1,876	1,800	1,837	1,818	1,808	1,838	1,638	1,536	1,509	1,717	1,644	1,655	1,524
3.F Field Burning of Agricultural Residues	12	8	15	7	7	2	2	2	2	2	4	5	4	3
5. Waste Sector	296	285	298	311	313	334	337	337	321	329	331	340	348	353
Total	2,895	3,148	3,141	3,211	3,253	3,323	3,246	3,282	3,225	3,184	3,796	3,845	3,943	3,958
GHG Emission Source and Sinks	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
1. Energy Sector	1,219	1,255	1,288	1,298	1,240	1,206	1,243	1,262	1,244	1,241	1,240	1,239		
1.A.1 Energy Industry	549	576	604	624	604	574	581	583	578	569	569	557		
1.A.2 Manufacturing Industry and Construction	139	136	142	153	142	137	150	160	156	162	154	153		
1.A.3 Transport	513	527	527	508	480	483	500	507	498	498	505	517		
1.A.4 Other Sectors	18	17	15	13	14	13	12	12	12	12	12	13		
2. Industrial Processes and Product Use Sector	834	960	1,432	1,531	1,290	1,457	1,834	1,762	1,674	1,539	1,514	1,507		
3. Agriculture Sector	1,710	1,598	1,629	1,595	1,514	1,547	1,528	1,469	1,496	1,432	1,427	1,397		
3.B Livestock Manure Management	69	71	72	71	72	71	70	71	71	71	73	74		
3.D Agricultural Soils	1,639	1,524	1,554	1,522	1,440	1,474	1,456	1,396	1,424	1,359	1,353	1,321		
3.F Field Burning of Agricultural Residues	2	2	3	1	2	2	2	2	2	1	1	1		
5. Waste Sector	343	350	351	360	328	327	337	346	344	352	364	363		
Total	4,106	4,163	4,699	4,784	4,372	4,537	4,943	4,839	4,759	4,564	4,545	4,506		

Table ES2.5 Trend in Fluorinated Greenhouse Gas Emissions between 1993 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG Emission Source and Sinks	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total HFCs Emissions	755	855	801	1,305	1,477	2,083	1,609	2,319	2,619	2,216	2,397	2,451
Total PFCs Emissions	NE	NE	NE	NE	NE	NE	3	13	2,939	4,143	4,198	4,341
Total SF ₆ Emissions	NE	NE	NE	NE	NE	NE	116	120	746	3,914	4,385	5,193
Total NF ₃ Emissions	NE	NE	NE	NE	NE	NE	11	10	235	398	540	659
Total	755	855	801	1,305	1,477	2,083	1,738	2,462	6,538	10,671	1,520	12,643
GHG Emission Source and Sinks	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Total HFCs Emissions	1,070	987	1,093	1,046	980	934	1,016	869	981	1,010	98	
Total PFCs Emissions	3,070	3,264	2,972	1,682	1,143	1,354	1,365	725	929	1,139	931	
Total SF ₆ Emissions	4,683	3,590	3,114	2,644	2,176	2,155	1,755	1,647	1,722	1,355	1,139	
Total NF ₃ Emissions	726	650	759	166	538	219	381	349	734	627	623	
Total	9,549	8,490	7,939	5,538	4,838	4,661	4,516	3,589	4,365	4,132	3,675	

Note: NE (not estimated), refers to the exclusion of estimation on existing emissions and removals.

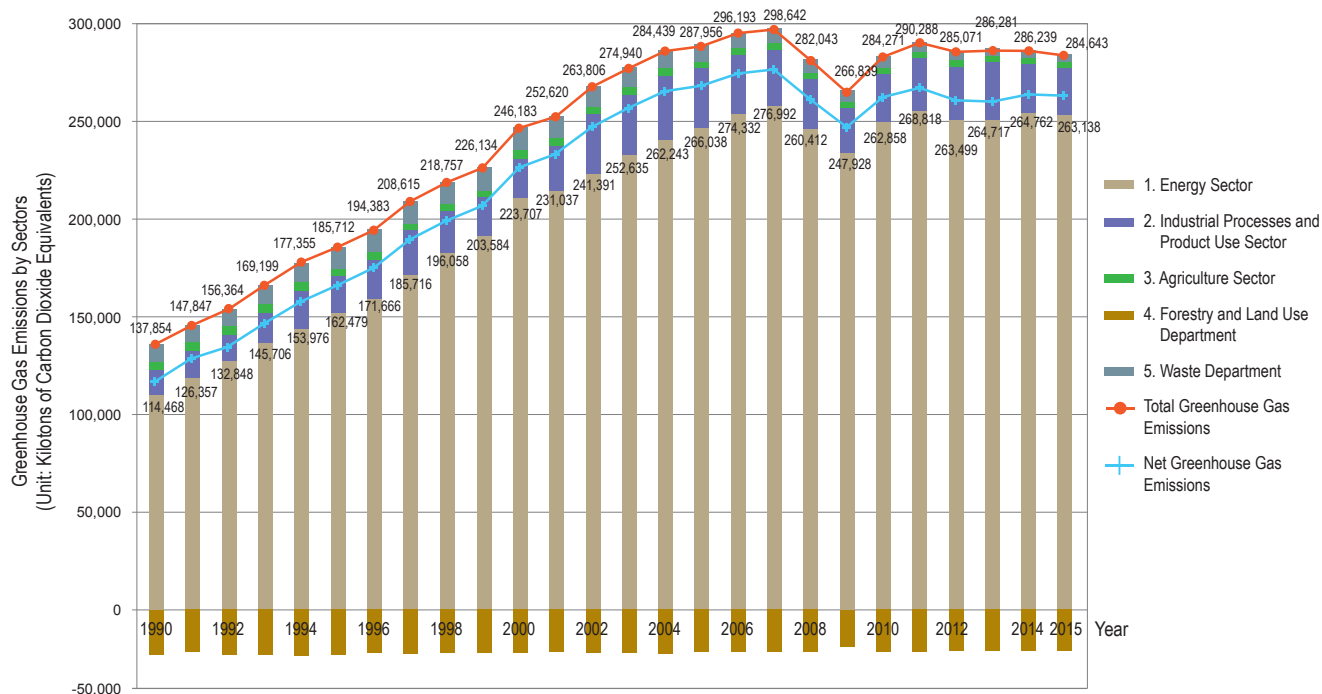


Figure ES2.2 Trend in GHG Emissions in Each Sector between 1990 and 2015 in Taiwan

sector 7.79%, agriculture sector 0.95%, and the waste sector 1.44%. The GHG emission and trends for Taiwan from year 1990 to 2015 by sector are shown in Figure ES3.1 and Table ES3.1. Between 1990 and 2015, the GHG emissions from energy sector increased by 131.82% with an average annual growth rate of 3.10%, the industrial processes and product use sector increased by 51.93% with an average growth rate of 1.49%, the agriculture sector decreased by 30.90% with an average annual growth rate of -1.54%, a negative growth. The GHG emissions from the waste sector decreased by 54.68% with an average annual growth rate of -3.20% a negative growth while the GHG removals for the land use, land-use change and forestry sector decreased by 8.16% with an average annual growth rate of -0.35%. The total greenhouse gas emission for Taiwan in 2014 was increased by 0.33%, compared to that in 2013. In particular, the GHG emission from the energy sector

was up by 0.77%, industrial processes and product use sector down by 3.01%, agriculture sector down by 1.01%, and the waste sector down by 4.87%. Additionally, the carbon dioxide removals of the land use, land-use change and forestry sector was down by 8.04% with an average annual growth rate of 0.003%.

The total greenhouse gas emission from the energy sector in 1990 was 110,281 kilotons of carbon dioxide equivalents and increased to 255,658 kilotons of carbon dioxide equivalents in 2015 with an average growth by 131.82% and annual average growth of 3.10%, as shown in ES3.2. During this period, the greenhouse gas emission from the energy sector showed a downward trend in 2008 for the first time and declined again in 2009, followed by more reduction in 2012 and 2015. The total greenhouse gas

Table ES3.1 Trend in GHG Emissions in Each Sector between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG Emission Source and Sinks	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1. Energy Sector	110,281	119,261	126,862	136,070	143,908	151,546	159,279	171,829	182,543	191,528	210,645	214,727	222,366	232,426
2. Industrial Processes and Product Use Sector	14,595	15,333	16,227	19,441	18,977	18,658	19,154	21,323	20,862	19,218	20,465	23,438	27,492	29,428
3. Agriculture Sector	3,911	3,980	3,869	3,890	3,850	3,878	3,897	3,567	3,359	3,345	3,543	3,379	3,301	3,074
4. Land Use, Land-use Change and Forestry Sector	-23,386	-21,490	-23,516	-23,493	-23,379	-23,233	-22,717	-22,899	-22,699	-22,550	-22,476	-21,583	-22,415	-22,305
5. Waste Sector	9,066	9,273	9,407	9,798	10,619	11,631	12,053	11,896	11,993	12,042	11,530	11,076	10,646	10,012
Net GHG Emissions (excluding Land-use Change and Forestry Removals)	114,468	126,357	132,848	145,706	153,976	162,479	171,666	185,716	196,058	203,584	223,707	231,037	241,391	252,635
Total GHG Emissions (excluding Land-use Change and Forestry Removals)	137,854	147,847	156,364	169,199	177,355	185,712	194,383	208,615	218,757	226,134	246,183	252,620	263,806	274,940
GHG Emission Source and Sinks	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
1. Energy Sector	241,036	247,752	254,848	258,511	246,818	235,111	251,155	257,072	252,867	253,693	256,093	255,658		
2. Industrial Processes and Product Use Sector	30,846	28,416	30,044	29,266	25,261	22,628	24,539	25,141	24,437	25,275	23,030	22,174		
3. Agriculture Sector	3,114	3,047	3,056	2,993	2,870	2,884	2,856	2,823	2,851	2,781	2,753	2,703		
4. Land Use, Land-use Change and Forestry Sector	-22,196	-21,918	-21,861	-21,650	-21,631	-18,911	-21,413	-21,470	-21,572	-21,564	-21,477	-21,505		
5. Waste Sector	9,444	8,741	8,245	7,871	7,094	6,216	5,722	5,252	4,916	4,532	4,364	4,109		
Net GHG Emissions (excluding Land-use Change and Forestry Removals)	262,243	266,038	274,332	276,992	260,412	247,928	262,858	268,818	263,499	264,717	264,762	263,138		
Total GHG Emissions (excluding Land-use Change and Forestry Removals)	284,439	287,956	296,193	298,642	282,043	266,839	284,271	290,288	285,071	286,281	286,239	284,643		

Table ES3.2 Trend in GHG Emissions in Energy Sector between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG Emission Source and Sinks	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Carbon Dioxide Emission	109,491	118,414	125,918	135,058	142,841	150,429	158,104	170,599	181,241	190,159	209,168	213,220	220,797	230,785
1.A.1. Energy Industry	49,118	55,403	58,795	66,180	70,862	76,800	81,519	92,436	100,959	107,029	122,195	126,437	130,556	140,966
1.A.2. Manufacturing Industry and Construction	30,154	31,657	32,982	33,252	34,239	34,988	36,051	37,818	38,498	39,753	42,830	42,339	44,641	43,669
1.A.3. Transport	19,646	20,888	24,033	26,103	27,540	28,822	29,801	30,536	31,844	32,772	33,207	33,246	34,542	34,509
1.A.4. Other Sectors	10,572	10,466	10,107	9,523	10,200	9,820	10,733	9,809	9,940	10,605	10,937	11,198	11,058	11,641
Total CH ₄ Emissions	254	270	293	310	328	344	359	370	390	409	430	436	446	466
1.A.1. Energy Industry	26	29	28	31	33	38	37	44	50	57	67	67	68	78
1.A.2. Manufacturing Industry and Construction	46	48	51	50	51	51	53	54	56	57	63	66	71	70
1.A.3. Transport	152	163	187	202	216	228	239	245	257	266	270	272	278	287
1.A.4. Other Sectors	30	29	28	26	28	27	29	26	27	28	29	30	30	32
Total N ₂ O Emissions	537	578	651	702	739	772	816	861	912	960	1,047	1,071	1,122	1,175
1.A.1. Energy Industry	138	158	183	207	221	239	267	302	332	364	432	453	475	529
1.A.2. Manufacturing Industry and Construction	91	94	99	99	101	101	105	107	110	113	124	128	136	134
1.A.3. Transport	291	309	353	382	402	418	428	438	456	469	475	475	496	495
1.A.4. Other Sectors	17	17	15	14	15	14	16	14	14	14	15	16	16	17
Total Emissions in Energy Sector	110,281	119,261	126,862	136,070	143,908	151,546	159,279	171,829	182,543	191,528	210,645	214,727	222,366	232,426
GHG Emission Source and Sinks	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
Total Carbon Dioxide Emission	239,333	246,007	253,069	256,720	245,103	233,439	249,430	255,320	251,138	251,962	254,367	253,921		
1.A.1. Energy Industry	146,632	153,821	160,602	164,428	158,443	148,936	159,910	163,547	161,112	160,260	165,815	164,694		
1.A.2. Manufacturing Industry and Construction	44,800	43,460	44,944	46,711	42,891	40,792	44,814	46,768	45,755	47,395	43,497	43,198		
1.A.3. Transport	35,859	36,846	36,771	35,419	33,385	33,711	34,824	35,293	34,502	34,472	34,951	35,759		
1.A.4. Other Sectors	12,041	11,881	10,752	10,163	10,385	9,999	9,881	9,712	9,769	9,835	10,104	10,269		
Total CH ₄ Emissions	484	490	491	493	474	466	481	490	485	490	486	498		
1.A.1. Energy Industry	83	84	89	95	95	85	89	89	90	91	89	94		
1.A.2. Manufacturing Industry and Construction	73	72	75	82	76	74	81	88	86	90	85	85		
1.A.3. Transport	295	303	298	289	276	281	285	288	284	284	286	293		
1.A.4. Other Sectors	33	32	29	27	27	26	26	25	25	25	26	26		
Total N ₂ O Emissions	1,219	1,255	1,288	1,298	1,240	1,206	1,243	1,262	1,244	1,241	1,240	1,239		
1.A.1. Energy Industry	549	576	604	624	604	574	581	583	578	569	569	557		
1.A.2. Manufacturing Industry and Construction	139	136	142	153	142	137	150	160	156	162	154	153		
1.A.3. Transport	513	527	527	508	480	483	500	507	498	498	505	517		
1.A.4. Other Sectors	18	17	15	13	14	13	12	12	12	12	12	13		
Total Emissions in Energy Sector	241,036	247,752	254,848	258,511	246,818	235,111	251,155	257,072	252,867	253,693	256,093	255,658		

Table ES3-3 Trend in GHG Emissions in Industrial Processes and Product Use Sector between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG Emission Source and Sinks	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total CO ₂ Emission	14,424	14,975	15,895	18,378	17,797	17,501	17,651	19,460	18,386	17,156	17,365	16,168	16,059	17,053
2.A Mining Industry (Non-Metal Process)	10,584	10,698	11,854	13,879	13,259	12,766	12,645	13,394	11,564	10,746	10,486	9,974	10,648	10,270
2.B Chemical Industry	563	539	565	609	762	850	992	1,020	1,003	1,075	1,143	1,232	1,313	1,384
2.C Metal Production	3,275	3,735	3,474	3,888	3,774	3,884	4,013	5,045	5,817	5,333	5,734	4,960	4,096	5,397
2.H Other	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total CH ₄ Emissions	5	7	6	7	8	10	11	12	10	12	14	18	19	22
Total N ₂ O Emissions	166	352	325	301	318	345	186	374	383	312	625	714	744	833
2.B Chemical Industry	166	352	325	301	318	345	186	374	383	312	625	714	743	831
2.C Metal Production	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0	2
2.E Electronics Industry	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Total HFCs Emissions	NE	NE	NE	755	855	801	1,305	1,477	2,083	1,609	2,319	2,619	2,216	2,397
2.B Chemical Industry	NE	NE	NE	755	855	801	1,305	1,477	2,083	1,609	2,319	2,567	2,157	1,937
2.E Electronics Industry	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	51	59	59
2.F Product Uses as Substitutes for ODS	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	401
Total PFCs Emissions (2.E Electronics Industry)	NE	NE	NE	NE	NE	NE	NE	NE	NE	3	13	2,939	4,143	4,198
Total SF ₆ Emissions	NE	NE	NE	NE	NE	NE	NE	NE	NE	116	120	746	3,914	4,385
2.C Metal Production	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1,027	1,027
2.E Electronics Industry	NE	NE	NE	NE	NE	NE	NE	NE	NE	116	120	746	944	1,415
2.G Other Product Manufacture and Use	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1,943	1,943
Total NF ₃ Emissions (2.E Electronics Industry)	NE	NE	NE	NE	NE	NE	NE	NE	NE	11	10	235	398	540
Total Emissions in Industrial Processes and Product Use	14,595	15,333	16,227	19,441	18,977	18,658	19,154	21,323	20,862	19,218	20,465	23,438	27,492	29,428
GHG Emission Source and Sinks	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
Total CO ₂ Emission	17,340	17,877	20,089	19,758	18,396	16,300	18,008	18,835	19,139	19,334	17,346	16,952		
2.A Mining Industry (Non-Metal Process)	10,691	11,257	11,014	10,369	9,289	8,467	8,616	9,577	9,333	9,866	8,728	8,345		
2.B Chemical Industry	1,485	1,552	1,530	1,654	1,457	1,514	1,599	1,637	1,503	1,572	1,603	1,605		
2.C Metal Production	5,162	5,066	7,544	7,733	7,648	6,317	7,792	7,620	8,301	7,894	7,013	7,000		
2.H Other	2	2	2	2	2	2	2	2	2	2	2	2		
Total CH ₄ Emissions	28	29	33	39	37	33	35	27	35	38	37	39		
Total N ₂ O Emissions	834	960	1,432	1,531	1,290	1,457	1,834	1,762	1,674	1,539	1,514	1,507		
2.B Chemical Industry	834	960	969	996	784	1,006	1,170	1,195	1,016	780	728	691		
2.C Metal Production	NE	NE	94	95	90	76	119	NE	NE	NE	NE	NE		
2.E Electronics Industry	NE	NE	369	439	416	375	546	568	658	759	786	817		
Total HFCs Emissions	2,451	1,070	987	1,093	1,046	980	934	1,016	869	981	1,010	982		
2.B Chemical Industry	1,710	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE		
2.E Electronics Industry	59	73	91	171	118	168	164	134	86	169	182	132		
2.F Product Uses as Substitutes for ODS	682	996	896	922	928	812	770	881	783	812	828	851		
Total PFCs Emissions (2.E Electronics Industry)	4,341	3,070	3,264	2,972	1,682	1,143	1,354	1,365	725	929	1,139	931		
Total SF ₆ Emissions	5,193	4,683	3,590	3,114	2,644	2,176	2,155	1,755	1,647	1,722	1,355	1,139		
2.C Metal Production	1,357	1,063	770	440	144	235	212	134	109	55	56	45		
2.E Electronics Industry	1,783	2,117	2,050	1,721	1,605	1,239	1,648	1,339	1,352	1,524	1,276	1,075		
2.G Other Product Manufacture and Use	2,053	1,503	770	953	895	703	295	282	186	142	24	19		
Total NF ₃ Emissions (2.E Electronics Industry)	659	726	650	759	166	538	219	381	349	734	627	623		
Total Emissions in Industrial Processes and Product Use	30,846	28,416	30,044	29,266	25,262	22,628	24,539	25,141	24,437	25,275	23,030	22,174		

Note: NE (not estimated), refers to the exclusion of estimation on existing emissions and removals.

emission from the energy sector in 2015 accounted for 89.82% of total greenhouse gas emissions in Taiwan. In particular, 1.A.1 "Energy Industry" was responsible for 165,345 kilotons of carbon dioxide equivalents, accounting for 64.67% of the total greenhouse gas emission from the energy sector. 1.A.2 "Manufacturing Industry and Construction" was responsible for 43,436 kilotons of carbon dioxide equivalents (accounting for 16.99%). 1.A.3 "Transport" was responsible for 36,568 kilotons of carbon dioxide equivalents (accounting for 14.30%), and finally 1.A.4 "Other Sector" (including Commercial/Institutional, Residential, and Agriculture/Forestry/Fishing) was responsible for 10,308 kilotons of carbon dioxide equivalents (accounting for 4.03%).

The greenhouse gas emission from the industrial processes and product use sector in 1990 was 14,595 kilotons of carbon dioxide equivalents and increased to 22,174 in 2015 with an average growth by 51.93% and annual average growth of 1.49%, as shown in ES3.3. The total greenhouse gas emission in 2015 accounted approximately for 7.79% of the total greenhouse gas emissions in Taiwan. In particular, 2.A "Mineral Industry (Non-metallic Products)" was responsible for 8,345 kilotons of carbon dioxide equivalents, accounting for 37.63% of the greenhouse gas from the industrial processes and product use sector, followed by 2.C. "Metal Production" responsible for 7,045 kilotons of carbon dioxide equivalents (accounting for 31.77%), 2.E. "Electronics Industry" responsible

Table ES3.4 Trend in GHG Emissions in Agriculture Sector between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG Emission Source and Sink	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total CO ₂ Emissions	142	146	139	131	135	151	151	134	127	119	131	94	93	83
Total CH ₄ Emissions	1,873	1,901	1,864	1,863	1,832	1,855	1,839	1,723	1,622	1,644	1,618	1,565	1,479	1,394
3.A Enteric Fermentation	670	731	738	775	789	822	822	732	674	694	692	660	636	626
3.B Livestock Manure Management	206	236	234	240	247	259	266	219	192	205	210	201	194	192
3.C Rice Cultivation	960	908	845	825	775	767	745	765	751	738	702	689	637	567
3.F Burning of Agricultural Residues	38	25	48	22	21	7	7	7	6	7	14	15	13	9
Total N ₂ O Emissions	1,897	1,933	1,866	1,897	1,883	1,872	1,907	1,710	1,609	1,583	1,794	1,720	1,729	1,597
3.B Livestock Manure Management	48	50	52	54	59	61	67	70	71	72	73	71	70	71
3.D Agricultural Soils	1,837	1,876	1,800	1,837	1,818	1,808	1,838	1,638	1,536	1,509	1,717	1,644	1,655	1,524
3.F Burning of Agricultural Residues	12	8	15	7	7	2	2	2	2	2	4	5	4	3
Total Emissions in Agriculture Sector	3,911	3,980	3,869	3,890	3,850	3,878	3,897	3,567	3,359	3,345	3,543	3,379	3,301	3,074
GHG Emission Source and Sink	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
Total CO ₂ Emissions	84	62	60	58	57	56	54	53	55	45	40	38		
Total CH ₄ Emissions	1,320	1,387	1,368	1,341	1,299	1,281	1,274	1,301	1,300	1,304	1,286	1,268		
3.A Enteric Fermentation	614	623	614	609	584	571	578	590	583	579	566	573		
3.B Livestock Manure Management	193	195	195	185	180	175	176	180	172	166	164	163		
3.C Rice Cultivation	505	561	551	543	529	530	514	526	540	555	552	529		
3.F Burning of Agricultural Residues	8	8	8	5	6	5	5	5	5	3	4	4		
Total N ₂ O Emissions	1,710	1,598	1,629	1,595	1,514	1,547	1,528	1,469	1,496	1,432	1,427	1,397		
3.B Livestock Manure Management	69	71	72	71	72	71	70	71	71	71	73	74		
3.D Agricultural Soils	1,639	1,524	1,554	1,522	1,440	1,474	1,456	1,396	1,424	1,359	1,353	1,321		
3.F Burning of Agricultural Residues	2	2	3	1	2	2	2	2	2	1	1	1		
Total Emissions in Agriculture Sector	3,114	3,047	3,056	2,993	2,870	2,884	2,856	2,823	2,851	2,781	2,753	2,703		

for 3,578 kilotons of carbon dioxide equivalents (accounting for 16.14%), 2.B. "Chemical Industry" responsible for 2,335 kilotons of carbon dioxide equivalents (accounting for 10.53%), 2.F. "Product Uses as Substitutes for ODS" responsible for 851 kilotons of carbon dioxide equivalents (accounting for 3.84%), 2.G. "Other Product Manufacture and Use" responsible for 19 kilotons of carbon dioxide equivalents (accounting for 0.1%), and 2.H. "Other" responsible for 2 kilotons of carbon dioxide equivalents (accounting for 0.01%).

In 2015, greenhouse gas emissions from the agricultural sector totaled 2,703 kilotons of carbon dioxide equivalents, accounting for 0.95% of total greenhouse gas emission in Taiwan, approximately down by 30.90% when compared to 3,911 kilotons of carbon dioxide equivalents in 1990, with an average annual growth rate of -1.54%, as shown in ES3.4. The greenhouse gas emission from the agriculture sector in 2015 was down by 1.83%, compared to that in 2014. In particular, 3.D. N₂O emission from "Agricultural Soils" accounted for 48.89%, CH₄ emission from 3.A. "Enteric Fermentation" accounted for 21.19%, CH₄ emission from 3.C. "Rice Cultivation" accounted for 19.56%, CH₄ emission from 3.B. "Livestock Manure Management" accounted for 6.02%, N₂O emission from 3.B. "Livestock Manure Management" accounted for 2.73%, CO₂ emission from 3.H "Urea Application" accounted for 1.39%, CH₄ emission from 3.F. "Burning of Agricultural Residues" accounted for 0.16%, and N₂O emission from "Burning of Agricultural Residues" accounted for 0.05%.

The main source of greenhouse gas removed in the land use and forestry sector is carbon dioxide. The annual removals show insignificant changes, which was mainly due to the annual growth of forest resources; the removals from afforestation and the reduction in forest disturbance are relatively small. The greenhouse gas emission the from land use and forestry sector for Taiwan from year 1990 to 2015 (mainly consisting of carbon dioxide removals by forest resources) is shown in ES3.5. The 2015 removal was 21,505 kilotons of carbon dioxide equivalents, up by 0.13% compared to that in 2014. The carbon dioxide absorption between 1990 and 2015 was down by 8.04%, with an average annual growth rate of 0.003%.

The greenhouse gas emission from the waste sector in 2015 was 4,109 kilotons of carbon dioxide equivalents, approximately accounting for 1.44% of total greenhouse gas

emission in Taiwan (as shown in Table ES3.6), down by 54.68% compared to that in 1990, with an average annual growth rate of -3.20%. Among the emissions in the waste sector in 2015, CH₄ emission from 5.D "Wastewater Treatment and Discharge" accounted for 60.45%, followed by CH₄ from 5.A "Solid Waste Disposal" accounting for 27.74%, N₂O emission from 5.D "Wastewater Treatment and Discharge" accounting for 8.26%, CO₂ emission from 5.C "Incineration and Open Burning of Waste" accounting for 2.50%, CH₄ emission from 5.B "Biological Treatment of Solid Waste" accounting for 0.48%, N₂O emission from 5.B "Biological Treatment of Solid Waste" accounting for 0.43%, and NO₂ from 5.C "Incineration and Open Burning of Waste" accounting for 0.15%.

ES.4 Other Information

According to the Durban Platform, all countries listed on Annex 1 shall submit the National Inventory Report, Biennial Report, and National Communications while countries not listed in Annex 1 shall submit Biennial Update Report and National Communications. These national reports all relate to the content of National Greenhouse Gas Inventory. Taiwan is currently taking the initiative in establishing a national system that is feasible to conform to Taiwan customs, division of labor in sectors and the hierarchical management of database. In addition to formulating regulations governing national greenhouse gas inventory review, Taiwan also established a review committee, a review on greenhouse gas inventory, and a sound management system to comply with procedures of Measurement Reporting, Verification (MRV). Moreover, in order to cooperate with UNFCCC, Taiwan shall apply 2006 IPCC Guidelines starting in 2015. We have started preparing a national greenhouse gas inventory with 2006 IPCC Guidelines based statistical foundation and framework in addition to designing and establishing a registration platform for electronic national greenhouse gas inventory starting in 2013. At the same time, the relevant departments will test run this registration platform and submit the national greenhouse gas inventory statistics online. Taiwan is scheduled to comprehensively apply (or adopt) the 2006 IPCC Guidelines in step with UNFCCC starting in 2015.

Table ES3.5 Trend in GHG Removals in Forestry Sector between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

Year	Existing Forest Land		Other Land Transformed into Forest Land	Change in GHG Removals (Δ CO ₂)
	(Δ CO _{2G})	(Δ CO _{2L})	(Δ CO _{2G})	
1990	-23,902	607	-91	-23,386
1991	-23,902	2,503	-91	-21,490
1992	-23,713	333	-136	-23,516
1993	-23,524	216	-185	-23,493
1994	-23,335	190	-233	-23,379
1995	-23,146	202	-288	-23,233
1996	-22,957	559	-319	-22,717
1997	-22,768	266	-397	-22,899
1998	-22,579	326	-446	-22,699
1999	-22,390	401	-561	-22,550
2000	-22,201	389	-665	-22,476
2001	-22,012	1,112	-683	-21,583
2002	-21,823	167	-759	-22,415
2003	-21,633	227	-899	-22,305
2004	-21,444	243	-995	-22,196
2005	-21,255	369	-1,031	-21,918
2006	-21,066	251	-1,046	-21,861
2007	-20,877	308	-1,080	-21,650
2008	-20,688	199	-1,142	-21,631
2009	-20,499	2,753	-1,166	-18,911
2010	-20,392	218	-1,240	-21,413
2011	-20,409	140	-1,202	-21,470
2012	-20,435	145	-1,283	-21,572
2013	-20,473	135	-1,226	-21,564
2014	-20,508	197	-1,166	-21,477
2015	-20,546	189	-1,148	-21,505

Table ES3.6 Trend in GHG Emissions in Waste Sector between 1990 and 2015 in Taiwan

(Unit: Kilotons of Carbon Dioxide Equivalents)

GHG Emission Source and Sinks	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total CO ₂ Emissions	20	8	65	63	110	398	387	105	117	65	259	540	612	417
Total CH ₄ Emissions	8,750	8,980	9,044	9,423	10,196	10,899	11,329	11,454	11,556	11,648	10,941	10,196	9,686	9,242
5.A Solid Waste Disposal	5,832	5,917	5,928	6,323	7,061	7,719	8,080	8,212	8,372	8,604	8,024	7,305	6,821	6,310
5.B Biological Treatment of Solid Waste	11	1	1	0	0	1	0	1	0	2	0	0	0	2
5.D Wastewater Treatment and Discharge	2,907	3,062	3,115	3,100	3,135	3,179	3,249	3,241	3,184	3,042	2,916	2,891	2,864	2,930
Total N ₂ O Emissions	296	285	298	311	313	334	337	337	321	329	331	340	348	353
5.B Biological Treatment of Solid Waste	10	0	1	0	0	1	0	1	0	2	0	0	0	2
5.C Incineration and Open Burning of Waste	1	0	4	3	6	18	19	4	6	3	8	30	26	24
5.D Wastewater Treatment and Discharge	285	284	294	307	307	316	318	332	315	324	322	310	321	327
Total Emissions in Waste Sector	9,066	9,273	9,407	9,798	10,619	11,631	12,053	11,896	11,993	12,042	11,530	11,076	10,646	10,012
Total Emission from Waste Sector	9,066	9,273	9,407	9,798	10,619	11,631	12,053	11,896	11,993	12,035	12,018	12,018	12,018	11,504
GHG Emission Source and Sinks	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
Total CO ₂ Emissions	512	348	470	562	443	154	208	149	149	153	146	103		
Total CH ₄ Emissions	8,588	8,043	7,425	6,948	6,322	5,735	5,177	4,758	4,423	4,027	3,854	3,643		
5.A Solid Waste Disposal	5,763	5,219	4,656	4,135	3,601	3,066	2,597	2,222	1,887	1,595	1,349	1,140		
5.B Biological Treatment of Solid Waste	7	10	11	14	16	18	21	26	24	23	20	20		
5.D Wastewater Treatment and Discharge	2,818	2,815	2,757	2,798	2,705	2,651	2,559	2,510	2,512	2,410	2,484	2,484		
Total N ₂ O Emissions	343	350	351	360	328	327	337	346	344	352	364	363		
5.B Biological Treatment of Solid Waste	6	9	10	13	15	16	19	23	22	20	18	18		
5.C Incineration and Open Burning of Waste	23	27	30	30	21	9	11	9	9	9	9	6		
5.D Wastewater Treatment and Discharge	314	314	310	318	293	302	307	313	314	323	337	339		
Total Emissions in Waste Sector	9,444	8,741	8,245	7,871	7,094	6,216	5,722	5,252	4,916	4,532	4,364	4,109		
Total Emission from Waste Sector	11,039	10,377	9,781	9,047	8,519	8,114	7,306	6,387	5,849	5,322	4,908	4,908		

2017 Taiwan Greenhouse Gas Inventory

Report Summary



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