Ministry of the Environment
of the Czech Republic

2019

FOURTH BIENNIAL REPORT
OF
THE CZECH REPUBLIC

Table of Contents

1 Introduction

The Fourth Biennial Report of the Czech Republic (BR4) was prepared in accordance with the Decision 2/CP.17 of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC).

This document is structured according to an outline defined in Annex 1 of the Decision 2/CP.17. It builds on information presented in the Seventh National Communication of the Czech Republic and the Third Biennial Report (both December 2017), taking into account recommendations presented by the expert review team in its Technical Review Report (July 2018).

Tabular information as defined and required by the UNFCCC Biennial Report Guidelines is enclosed in the CTF Annex at the end of this document. The information was also submitted electronically through the UNFCCC Application and Network Access Portal.

2 Information on GHG emissions and trends

2.1 Introduction and summary information from the Czech national GHG inventory

This chapter describes greenhouse gas (GHG) emissions trends over time, covering the period between 1990 and 2017. It is based on the official inventory submission to the Secretariat of the UNFCCC from April 2019.

In 2017, the most important GHG in the Czech Republic was CO_2 contributing 82.1% to total national GHG emissions and removals expressed in CO_2 eq., followed by CH_4 10.5% and N_2O 4.5%. PFCs, HFCs, SF_6 and NF_3 contributed for 2.9% to the overall GHG emissions in the country.

Over the period 1990-2017 CO_2 emissions and removals decreased by 35.69%, CH_4 emissions decreased by 42.49% during the same period mainly due to lower emissions from (1) Energy, (3) Agriculture and (5) Waste; N_2O emissions decreased by 39.27% over the same period due to emission reduction in (3) Agriculture and despite increase from the (1.A.3) Transport category. Emissions of HFCs and PFCs increased by orders of magnitude, whereas SF_6 emissions kept steady trend over the whole period.

In 2017, 98 936.38 kt CO_2 eq., that are 78.19% of national total emissions (including 4 Land Use, Land-Use Change and Forestry) arose from 1 Energy; 96.33% of these emissions arise from fuel combustion activities. The most important sub-category of (1) Energy with 52.32% of total sectoral emissions in 2017 is (1.A.1) Energy Industries, (1.A.2) Manufacturing Industries and Construction is responsible for 10.54% and (1.A.3) Transport for 18.86% of total sectoral emissions. From 1990 to 2017 emissions from (1) Energy decreased by 36.23%.

(2) Industrial Processes is the second largest category with 12.37% of total GHG emissions (including 4 Land Use, Land-Use Change and Forestry) in 2017 (15 656.35 kt CO_2 eq.); the largest sub-category is (2.C) Metal Production with 44.74% of sectoral share. From 1990 to 2017 emissions from (2) Industrial Processes decreased by 8.51%.

(3) Agriculture is the third largest category in the Czech Republic with 6.66% share of total GHG emissions (including 4 Land Use, Land-Use Change and Forestry) in 2017 (8 432.99 kt CO_2 eq.); 40.76% of these emissions arose from (3.D) Agricultural Soils. From 1990 to 2017 emissions from (3) Agriculture decreased by 46.76%.

(4) Land Use, Land-Use Change and Forestry is the only category where removals exceed emissions. Net removals from this category decreased from 1990 to 2017 by 59.15% to –2 134.94 kt CO_2 eq.

4.46% of the national total GHG emissions (including 4 Land Use, Land-Use Change and Forestry) in 2017 arose from (5) Waste. 87.96% share of GHG emissions arose from (5.A) Solid waste disposal. Emissions from (5) Waste increased from 1990 to 2017 by 80.81% to 5 649.33 kt CO_2 eq.

2.2 Description and interpretation of emission trends

Tab. 2-1 presents a summary of GHG emissions excl. bunkers incl. indirect emissions for the period from 1990 to 2017. For CO_2, CH_4 and N_2O the base year is 1990; for F-gases the base year is 1995.

Tab. 2-1 GHG emissions from 1990-2017 excl. bunkers [kt CO_2 eq.]

	CO_2[1]	CH_4[3]	N_2O[3]	HFCs	PFCs	NF_3	SF_6	Total emissions[4]	
								excl. LULUCF	incl. LULUCF
1990	164203.58	23536.29	9652.77				84.24	199242.03	194016.12
1991	148893.58	21958.59	8310.67				84.08	180813.24	172389.55
1992	144618.05	20626.39	7429.86		NO		85.41	174226.57	164959.49
1993	138636.10	19723.93	6651.99				86.56	166528.47	157663.33
1994	132374.36	18610.78	6524.97				87.66	158971.61	152444.19
1995	131605.98	18184.77	6884.19	27.14	0.01	NO	88.68	158129.08	151133.43
1996	134959.57	18051.69	6672.05	87.51	0.68	NO	98.31	161150.01	153975.21
1997	130729.08	17651.91	6600.01	193.55	1.73	NO	96.10	156515.32	149999.15
1998	125313.44	16953.34	6461.40	264.81	1.66	NO	94.98	150311.11	143709.68
1999	116618.38	16218.18	6270.97	324.77	1.10	NO	95.94	140672.38	133634.26
2000	127059.68	15392.53	6398.81	444.51	4.69	NO	108.40	150494.63	142607.16
2001	126952.46	15151.82	6398.66	561.53	9.75	NO	98.82	150215.36	141987.33
2002	123888.60	14734.68	6143.80	682.36	16.39	NO	121.28	146571.01	138711.07
2003	127376.02	14761.72	5753.65	820.07	8.55	NO	144.69	149809.57	143463.16
2004	128110.18	14334.89	6217.51	921.91	12.81	NO	120.61	150633.08	144112.12
2005	125671.32	14706.39	6041.45	1037.04	14.89	NO	111.84	148549.40	141512.53
2006	126447.34	14951.78	5864.27	1308.41	31.09	NO	105.12	149698.81	144871.75
2007	128260.88	14534.67	5841.03	1716.51	29.00	NO	93.79	151389.49	148825.84
2008	122973.82	14641.79	5970.61	2009.94	39.76	NO	88.67	146644.93	140811.55

	CO_2[1]	CH_4[3]	N_2O[3]	HFCs	PFCs	NF_3	SF_6	Total emissions[4]	
								excl. LULUCF	incl. LULUCF
2009	115223.65	14285.90	5574.71	2090.49	45.44	NO	89.05	138175.33	131268.68
2010	117459.82	14489.36	5372.34	2381.07	48.04	0.15	82.76	140702.10	135163.23
2011	115005.47	14492.03	5568.04	2639.20	8.24	0.59	88.64	138701.26	131849.77
2012	110904.82	14478.16	5511.41	2757.66	6.19	0.89	92.44	134603.55	127913.10
2013	106376.58	13893.61	5473.34	2906.60	4.08	1.41	83.04	129496.54	123521.28
2014	104014.52	13894.91	5713.45	3104.77	3.02	2.37	79.90	127560.13	121640.15
2015	104786.44	13958.29	5691.57	3317.83	1.93	2.15	78.27	128564.93	123482.61
2016	106599.14	13734.03	5939.00	3462.58	1.44	2.15	78.63	130508.90	125350.87
2017	105607.27	13548.91	5868.20	3640.80	1.37	2.75	74.31	129383.52	127248.59
%[2)]	-35.69	-42.43	-39.21	13316.64	15390.29	NA	-11.79	-35.06	-34.41

Note: Global warming potentials (GWPs) used (100 years time horizon): CH_4 = 25; N_2O = 298; SF_6 = 22 800; NF_3 = 17 200; HFCs and PFCs consist of different substances, therefore GWPs have to be calculated individually depending on substances

[1]GHG emissions excluding emissions/removals from LULUCF

[2] relative to base year

[3]incl. LULUCF

[4] incl.indirect emissions

Source: CHMI

GHG emissions and removals have significantly decreased in the period 1990-1995, mainly driven by the economy transition and pursuing major dropdown in heavy industry activities in the country. The fast decrease has stopped around 158 000 kt CO_2 eq. in 1995 (see **Chyba! Nenalezen zdroj odkazů.**). From 2010 to 2017, the total GHG emissions (incl. indirect emissions and incl. LULUCF) decreased by approximately 6% or -7 914.64 kt CO_2 eq. resulting in total emissions of 127 248.59 kt CO_2 eq. The decrease was caused by CO_2, CH_4, PFCs emissions and SF_6 emissions (decreased by 10%; 6%; 97%; and 10%) despite increase in HFCs emissions and N_2O emissions (raised by 53%; 9%) compared to previous year (excl. LULUCF).

The total GHG emissions and removals in 2017 were -34% below the base year level incl. LULUCF and indirect emissions and -35%, when excl. LULUCF.

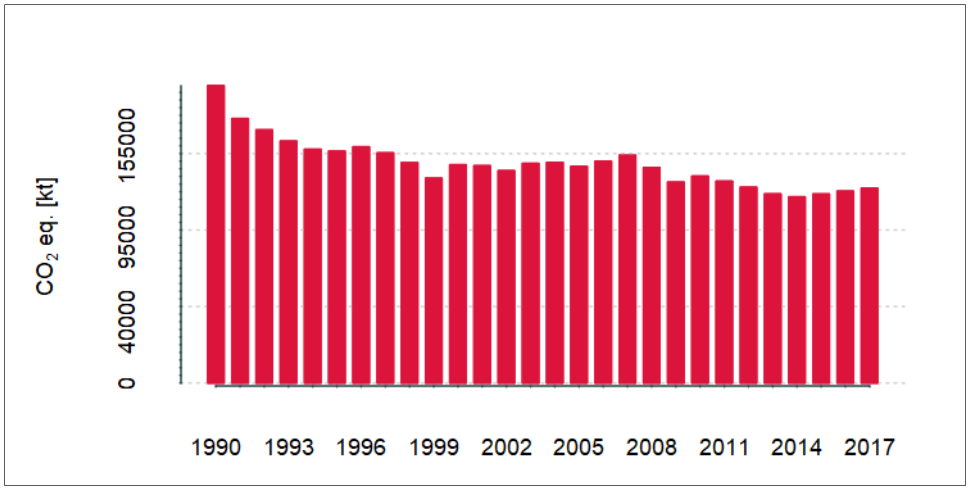


Figure 2-1 Total trend of GHG emissions [kt CO_2 eq.] Source: CHMI

In 1989, the then Czechoslovak economy was one of the centrally planned economies with high level of monopolization. All economic processes were controlled through central planning. For all practical purposes, there was no real market and this situation resulted in an ever deepening economic and technological lag which resulted in high energy and material inefficiency. Since 1989 to the present the economy transformed successfully to a developed market-driven economy. The transformation led to a decline in production, investment in environmental protection, energy efficiency, fuel switch and increasing use of renewable energy. Greenhouse gases emission trend between 2007 and 2009 and supposedly up to present days passed through significant change driven mainly by economic recession.

Source: CHMI

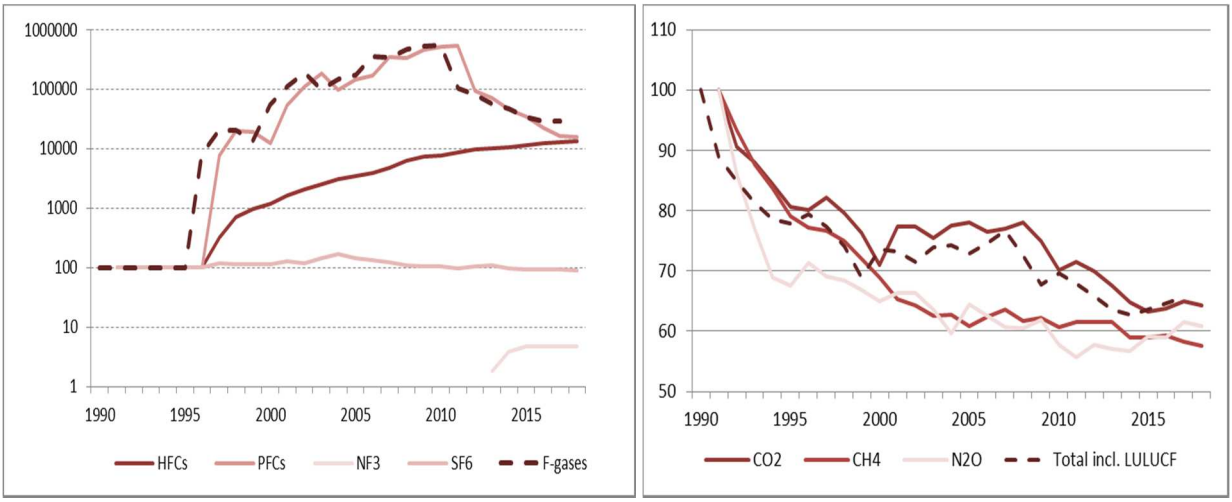


Figure 2-2 Trend in CO_2, CH_4 and N_2O emissions 1990-2017 in index form (base year = 100%) and Trend in HFCs, PFCs (1995–2017) and SF_6 (1990–2017) actual emissions in index form (base year = 100%

2.2.1 Description and interpretation of emission trends by gas

The major greenhouse gas in the Czech Republic is CO_2, which represents 82% of total GHG emissions and removals in 2017, compared to 83% in the base year (excl. indirect emissions, excl. LULUCF). It is followed by CH_4 (10% in 2017, 12% in the base year), N_2O (5% in 2017, 5% in the base year) and F-gases (3% in 2017, 0.04% in 1990). The trend of individual GHG emissions relative to emissions in the respective base years is presented in Fig. 2-2.

CO_2

CO_2 emissions have been rapidly decreasing in early 90's, after 1994 the emissions have kept at average of 68% of the amount produced in 1990. Inter-annual decrease in CO_2 emissions (excl. LULUCF, excl. indirect emissions) from 2010 to 2017 by 10% results in the total decrease of 36% from 1990 to 2017. Quoting in absolute figures, CO_2 emissions and removals decreased from 164 203.58 to 105 607.27 kt CO_2 in the period from 1990 to 2017, mainly due to lower emissions from the (1) Energy category (mainly 1.A.2 Manufacturing Industries & Construction, 1.A.4.a Commercial/Institutional and 1.A.4.b Residential).

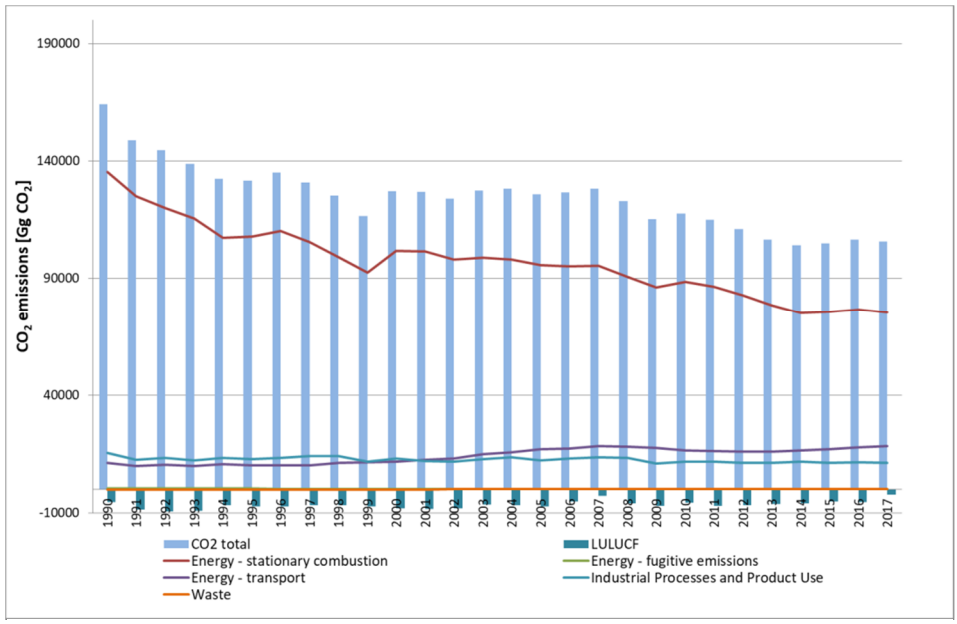


Figure 2-3 Trends of CO_2 emissions and shares of individual sectors in the Czech Republic 1990–2017 (Gg CO_2) Source: CHMI

The main source of CO_2 emissions is fossil fuel combustion; within the (1.A) Fuel Combustion category, (1.A.1) Energy Industry and (1.A.4) Other sectors are the most important. CO_2 emissions increased remarkably between 1990 and 2017 from the (1.A.3) Transport category from 11 218.46 to 18 418.22 kt CO_2 eq.

CH_4

CH_4 emissions share decreased almost steadily during the period from 1990 to 2004, from 2004 methane fluctuated around 60% of its base year emissions. In 2017, CH_4 emissions were 42% below the base year level (incl. LULUCF), mainly due to lower contribution of (1.B) Fugitive Emissions from Fuels and emissions from (3) Agriculture and despite increase from the (5) Waste category. The main sources of CH_4 emissions are (1.B) Fugitive Emissions from Fuels (solid fuel), (3) Agriculture

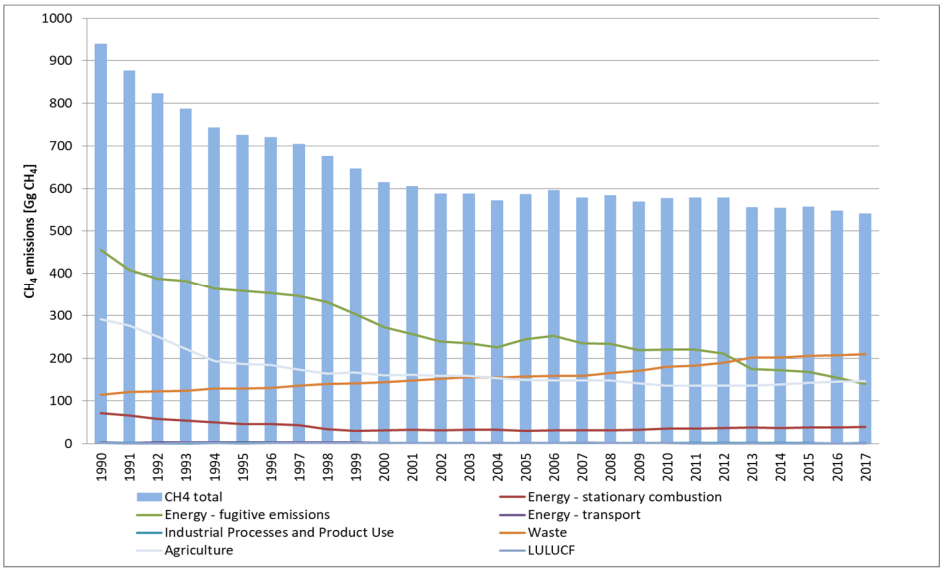


Figure 2-4 Trends of CH_4 emissions and shares of individual sectors in the Czech Republic in the 1990–2017 period (Gg CH_4) Source: CHMI

(3.A Enteric Fermentation and 3.B Manure Management) and (5) Waste (5.A Solid Waste Disposal on Land and 5.D Wastewater Treatment and Discharge).

N_2O

N_2O emissions strongly decreased from 1990 to 1994 by 32% over this period and then show slow decreasing trend with inter-annual fluctuation. N_2O emissions decreased between 1990 and 2017 from 9 652.77 to 5 868.20 kt CO_2 eq. (incl. LULUCF). In 2017, N_2O emissions were 39% below the base year level, mainly due to lower emissions from (3) Agriculture and (2.B) Chemical Industry and despite increase from the (1.A.3) Transport category.

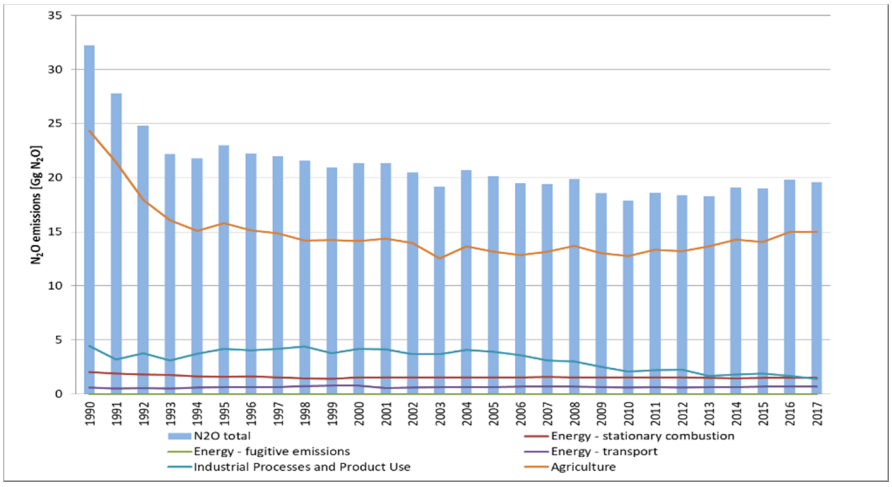


Figure 2-5 Trends of N_2O emissions and shares of individual sector in the Czech Republic in the 1990–2017 period (Gg N_2O) Source: CHMI

The main source of N_2O emission is category (3.D) Agricultural Soils (others less important sources are 1.A Fossil Fuel Combustion and 2 Industrial Processes – 2.B Chemical Industry).

HFCs

HFCs actual emissions increased remarkably between 1995 and 2017 from 27.14 to 3 640.80 kt CO_2 eq. The rapid increase of emissions was driven mainly by increased consumption of HFCs in subcategory (2.F.1) Refrigeration and Air Conditioning. In 2017, HFCs emissions were more than 134-times higher than in the base year 1995.

The main sources of HFCs emissions are (2.F) Product Uses as ODS substitutes (specifically above mentioned subcategory 2.F.1 Refrigeration and Air Conditioning). HFCs and PFCs have not been imported and used before 1995.

PFCs

PFCs emissions rapidly increased between 1995 and 2010. Since 2010, PFCs emissions are decreasing to the current level 1.37 kt CO_2 eq. The rapid decrease of emissions is caused by the reduced consumption of PFCs.

The main sources of PFCs emissions are (2.E) Semiconductor Manufacture and (2.F.1) Refrigeration and Air Conditioning equipment.

SF_6

SF_6 emissions in 1995 accounted for 88.68 kt CO_2 eq. Between 1995 and 2017, they inter-annually fluctuated with maximum of 144.69 kt CO_2 eq. In 2017, SF_6 reached the amount of 74.31 kt, the level was 16% lower than the base year (1995).

The main source of SF_6 emissions is (2.G) Other product manufacture and use.

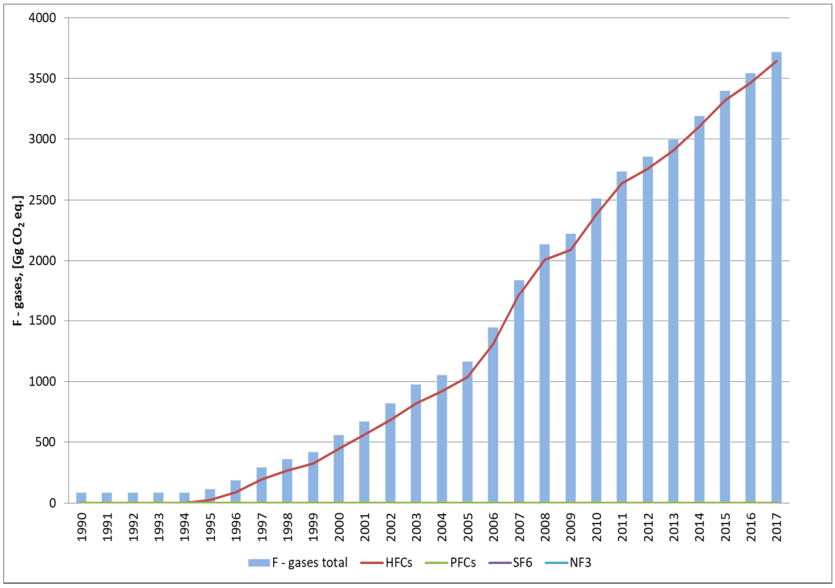


Figure 2-6 F-gases inventories in the 1990–2017 period (Gg CO_2 eq.) Source: CHMI

NF_3

With the technological progress, a new gas has been used since 2010 in semiconductor manufacturing. The NF_3 is a gas used mainly for the manufacturing of LCD displays, solar panels, and etching semiconductors. The base year for this gas is 1995. In 2017, the emissions of NF_3 equaled to 2.75 kt CO_2 eq.

2.2.2 Description and interpretation of emission trends by category

Fig. 2-7 presents a summary of GHG emissions by categories for the time period 1990 to 2017:

- Category 1 Energy
- Category 2 Industrial Processes and Product Use
- Category 3 Agriculture
- Category 4 LULUCF
- Category 5 Waste

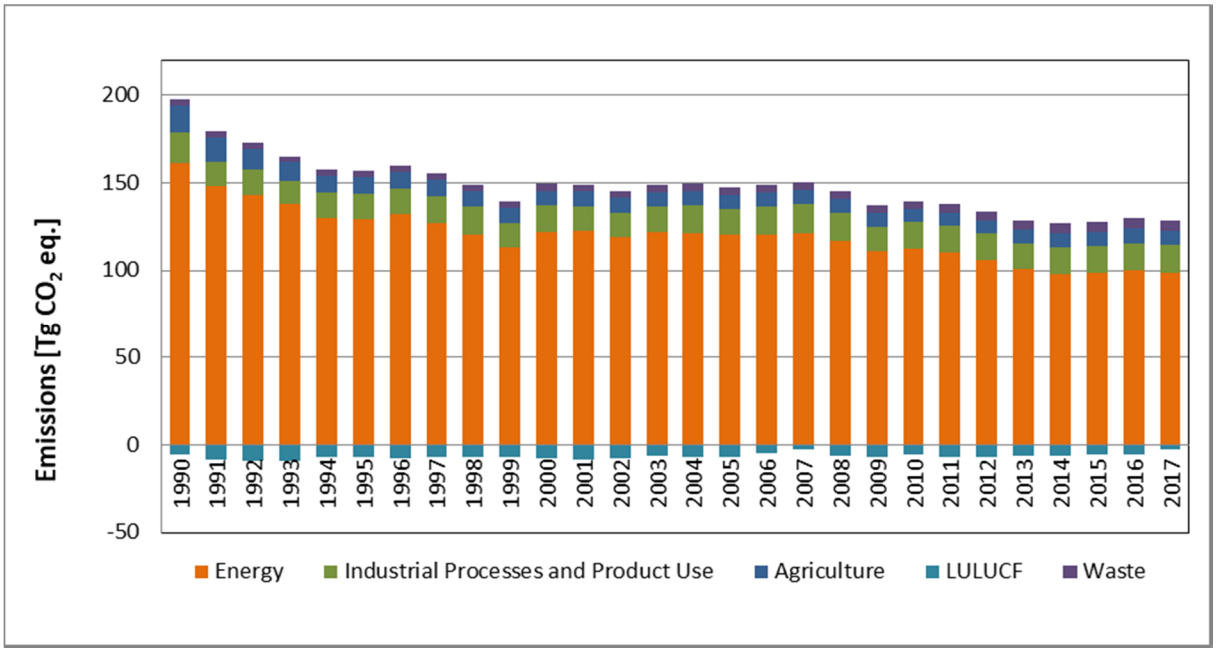


Figure 2-7 Trends in greenhouse gas emissions in the 1990–2017 period by sectors (Tg CO_2 eq.)

Source: CHMI

The dominant category is the (1) Energy sector, which caused 77% of total GHG emissions in 2017 (82% in 1990) excl. LULUCF and indirect emissions, followed by the categories (2) Industrial Processes and Product Use and (3) Agriculture, which caused 12% and 7% of total GHG emissions in 2017 (9% and 8% in 1990, resp.), (5) Waste category covered 4% and (4) LULUCF category removed 2 134.94 kt CO_2 eq. which represents a share of 2% of all GHG emissions.

The trend of GHG emissions by categories is presented in Fig. 2-8 (indexed relative to the base year).

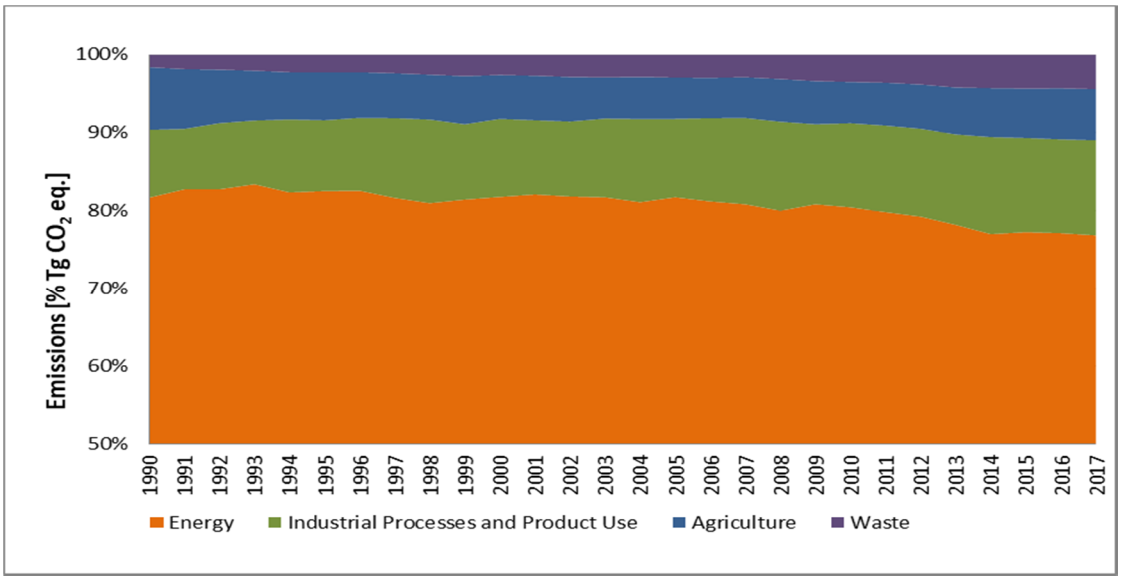


Figure 2-8 Share of individual sectors in total GHGs for the time period 1990–2017 (excluding LULUCF) (%)

Source: CHMI

Tab. 2-2 Summary of GHG emissions by category 1990-2017 [kt CO_2 eq.]

	1 Energy	2 IPPU	3 Agriculture	4 LULUCF	5 Waste
1990	161315.59	17113.01	15839.59	-5225.91	3124.51
1991	148334.86	13847.99	13732.22	-8423.69	3266.79
1992	142963.34	14609.67	11838.17	-9267.08	3275.76
1993	137686.90	13451.41	10523.14	-8865.14	3356.73
1994	129784.15	14690.24	9539.83	-6527.42	3503.45
1995	129387.75	14202.28	9616.63	-6995.65	3510.88
1996	131980.34	14903.04	9337.48	-7174.80	3549.21
1997	126749.69	15822.55	8921.83	-6516.18	3665.98
1998	120701.98	15949.40	8554.82	-6601.43	3792.03
1999	113611.61	13431.38	8599.40	-7038.12	3806.09
2000	122170.35	14916.43	8393.28	-7887.46	3853.46
2001	122455.72	14153.58	8494.36	-8228.03	3993.32
2002	119132.82	13939.64	8306.07	-7859.94	4126.98
2003	121633.74	14989.07	7850.92	-6346.41	4285.11
2004	121399.88	15925.09	8064.87	-6520.96	4234.83
2005	120608.01	14790.38	7801.18	-7036.87	4294.58
2006	120719.51	15828.73	7679.47	-4827.06	4371.05
2007	121583.10	16604.19	7835.16	-2563.65	4314.32
2008	116565.26	16565.03	7972.44	-5833.38	4511.55
2009	110966.55	14054.54	7572.38	-6906.65	4621.05
2010	112462.86	15022.88	7386.47	-5538.87	4861.48
2011	110014.66	15253.97	7567.38	-6851.49	4917.13

	1 Energy	2 IPPU	3 Agriculture	4 LULUCF	5 Waste
2012	106004.88	15029.48	7585.97	-6690.45	5077.39
2013	100676.98	14896.85	7744.22	-5975.26	5373.05
2014	97662.04	15752.16	7940.86	-5919.98	5403.39
2015	98771.14	15402.41	8092.55	-5082.32	5511.73
2016	100133.52	15573.79	8482.36	-5158.03	5567.01
2017	98936.38	15656.35	8432.99	-2134.94	5649.33
[1]%	-1.20	0.53	-0.58	-58.61	1.48
[2]%	-38.67	-8.51	-46.76	-59.15	80.81
[1] Difference relative to previous year					
[2] Difference relative to base year					

Source: CHMI

Energy (IPCC Category 1)

The trend for GHG emissions from the (1) Energy category shows a decreasing trend of emissions. They strongly decreased from 1990 to 1994 and then fluctuated until 2002. After 2002, they stayed relatively stable until 2007. In the period 2002-2007, emissions kept around 120 000 kt CO_2 eq. The total decrease between the years 1990 and 2017 is 39%. Between 2016 to 2017, emissions from the category (1) Energy slightly decreased by 1%.

From the total of 98 936.38 kt CO_2 eq. in 2017, 96% comes from (1.A) Fuel Combustion, the rest from (1.B) Fugitive Emissions from Fuels (mainly Solid Fuels). The (1.B) Fugitive Emissions from Fuels is the largest source for CH_4, which represented 26% of all CH_4 emissions in 2017. 33% of all CH_4 emissions in 2017 originated from the (1) Energy category.

The CO_2 emissions from fossil fuels combustion (category 1.A Energy) are the main source in Czech Republic's inventory with a share of 89% in total emissions from the (1) Energy sector. CO_2 emissions from the category (1) Energy contributes for 73% of the total GHG emissions, CH_4 to 4% and N_2O to 1% in 2017 (excl. LULUCF).

Industrial Processes and Product Use (IPCC Category 2)

The GHG emissions from the (2) Industrial Processes and Product Use category fluctuated with a decreasing trend during the whole period 1990-2017. In early 90's, emissions decreased rather rapidly, then reached a decade minimum in 1999 and subsequently decreased reaching a total minimum in 2009 (global economic recession). Between 1990 and 2017, emissions from this category decreased by 9%. In 2017, emissions amounted to 15 656.35 kt CO_2 eq.

The main categories in the (2) Industrial Processes and Product Use category are (2.C) Metal Industry (41%), (2.F) Product Uses as ODS substitutes (23%), (2.A) Mineral Industry (18%), and (2.B) Chemical Industry (14%) of the sectoral emissions in 2017.

The most important GHG of the (2) Industrial Processes and Product Use category was CO_2 with 73% of sectoral emissions, followed by F-gases (24%).

Agriculture (IPCC Category 3)

GHG emissions from the category (3) Agriculture decreased relatively steadily over the period from 1990 to 2003, and then fluctuated. In 2010, the emissions reached a minimum level which is 53% below the base year level.

Agriculture amounted to 8 432.99 kt CO_2 eq. in 2017 which corresponds to 7% of national total emissions (excl. indirect emissions, excl. LULUCF). The most important sub-category (3.D) Agricultural Soils (N_2O emissions) contributed by 43% to the sectoral total in 2017, followed by the (3.A) Enteric Fermentation (CH_4 emissions, 35%).

(3) Agriculture is the largest source of N_2O and the second largest source of CH_4 emissions (77% of total emissions of N_2O and 27% of total emissions of CH_4, excl. LULUCF). However, its emission trend steadily decreased over the whole observed period.

Land Use, Land-Use Change and Forestry (IPCC Category 4)

GHG removals from the (4) Land Use, Land-Use Change and Forestry category vary through the whole-time series with a maximum of -9267.08 kt CO_2 eq. in 1992 and minimum in 2017. Emissions and removals amounted to -2134.94 kt CO_2 eq. in 2017, which corresponds to 2% of total national emissions. Emissions and removals are calculated from all categories and are in line with IPCC 2006 Gl. (IPCC 2006).

The LULUCF category is the largest sink for CO_2. Net CO_2 removals from this category amounted to -2203.50 kt CO_2 eq. in 2017. CH_4 emissions amounted to 38.08 kt CO_2 eq., N_2O to 30.48 kt CO_2 eq.

Waste (IPCC Category 5)

GHG emissions from the category (5) Waste substantially increased during the whole period. In 2017, emissions amounted to 5 649.33 kt CO_2 eq., which is 81% above the base year level. The increase of emissions is mainly due to higher emissions of CH_4 from (5.A) Solid Waste Disposal and due to higher emissions in (5.C) Incineration and open burning of waste. The share of category (5) Waste in total emissions was 4% in 2017.

The main source of GHG emissions is (5.A) Solid Waste Disposal, which accounted to 66% of sectoral emissions in 2017, followed by (5.D) Wastewater Treatment and Discharge (19%) and (5.B) Biological treatment of solid waste (13%).

93% of all emissions from the (5) Waste category are CH_4 emissions; CO_2 contributes by 2% and N_2O by 5%.

2.3 Inventories of Greenhouse Gases

2.3.1 Introduction

Inventories of GHGs for the purposes of the UNFCCC emissions and sinks monitoring include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), partly or completely fluorinated hydrocarbons (HFCs, PFCs), sulphur fluoride (SF_6) and nitrogen trifluorid (NF_3). In addition, precursors are registered: volatile organic compounds (NMVOC), carbon monoxide (CO), nitrogen oxides (NO_X) and sulphur dioxide (SO_2). Emphasis is placed on the accurate calculations of GHG emissions with a direct radiation absorption effect (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3). The total impact of emissions of these gases is given as the aggregated emissions, expressed as the equivalent amount of carbon dioxide, taking into account the Global Warming Potentials (GWPs) for a time period of 100 years.

2.3.2 Institutional arrangements

Person responsible for the international reporting of GHG emissions:

Mr. Pavel Zámyslický, Director of Energy and Climate Protection Dept., Ministry of the Environment

pavel.zamyslicky@mzp.cz.

Person responsible for the coordination and compilation of the GHG inventory:

Ms. Eva Krtková, NIS Coordinator, Czech Hydrometeorological Institute

eva.krtkova@chmi.cz

The Czech Hydrometeorological Institute (CHMI), under the supervision of the Ministry of the Environment, is designated as the coordinating and managing organization responsible for the compilation of the national GHG inventory and reporting its results. The main tasks of the CHMI consists in inventory management, general and cross-cutting issues, QA/QC, communication with the relevant UNFCCC and EU bodies, etc.

The sectoral inventories are prepared by sectoral experts from sector-solving institutions, which are coordinated and controlled by the CHMI:

- KONEKO marketing Ltd. (KONEKO), Prague, is responsible for the compilation of the inventory in sector 1. Energy, for stationary sources including fugitive emissions;
- Transport Research Centre (CDV), Brno, is responsible for the compilation of the inventory in sector 1. Energy, for mobile sources;
- Czech Hydrometeorological Institute (CHMI), Prague, is responsible for the compilation of the inventory in sector 2. Industrial Processes and Product Use;
- Institute of Forest Ecosystem Research Ltd. (IFER), Jílové u Prahy, is responsible for the compilation of the inventory in sectors 3. Agriculture and 4. Land Use, Land Use Change and Forestry;
- Charles University Environment Centre (CUEC), Prague, is responsible for the compilation of the inventory in sector 5. Waste.

The official submission of the national GHG Inventory is prepared by the CHMI and approved by the MoE. Moreover, the MoE provides contacts and cooperates with other relevant governmental bodies, such as the Czech Statistical Office, the Ministry of Industry and Trade and the Ministry of Agriculture, etc.

One of the main pillars of the National Inventory System (NIS) is the allocation of responsibilities to institutions involved in the inventories of individual sectors. The NIS Coordinator (CHMI) is primarily responsible for:

- Management (coordination of cooperation among individual sector experts);
- General and cross-section issues including determining the uncertainties;
- QA/QC (Quality Assessment/Quality Control) control procedures;
- Data reporting in prescribed format – CRF (Common Reporting Format);
- Preparation of National Inventory Report (NIR);
- Cooperation with relevant UNFCCC and EU bodies;
- Operation of complete archiving and documentation management system for the inventory.

2.3.3 Methodological aspects

Inventories of emissions and removals of GHGs were prepared according to the IPCC methodology: IPCC 2006 Guidelines (IPCC, 2006). A detailed description of the methodology, emission factors employed and activity data is contained in the National Inventory Report, which is updated annually.

The inventory of GHG emissions is a multi-level process including data collection, estimating emission sources and sinks, checks and verification, determining uncertainties, and reporting. The main phases of inventory are the following:

Data collection: Data collection is the most significant stage and, in many cases, it is the most difficult phase, directly affecting the accuracy of emission determination. The methodological instructions require assessment as to the appropriateness of existing data sources, and potentially undertaking own emission measurements, or searching for new and more exact data sources.

The data collection process utilizes expertise and methods in place at data providers. Various data sources, from official national data to international statistics, to authorized collecting at operators or sectoral associations, are relevant. Regular communication and consulting takes place throughout the process (from data collection until final completion).

Determining uncertainties: This process provides valuable information for inventory compilers and for inventory users. Uncertainties must be defined for each separate category of sources, as well as for total emissions and their trends. The determination of uncertainties is one of the important principles of good practice as it helps inventory compilers to better focus on those categories that considerably contribute to larger uncertainty in emission estimates (including allocation of funding) and to gradual improvement of quality, respectively.

Identification of key categories: Good practice requires that key categories will be identified. Key categories are important for the use of development diagrams during the selection of appropriate

method, and the inventory coordinator seeks to apply more sophisticated higher tiers methods of inventory to these key categories.

QA/QC control procedures: The application of QA/QC processes represents an important phase in compiling the NIR. The QA/QC processes include planning, conducting controls and reviewing relevant documentation, verification of data and their review by independent providers. The correct application of QA/QC processes is also one of the good practice principles, allowing for the removal of potential errors and discrepancies.

Reporting inventory results: Reporting to the UNFCCC takes place annually on April 15. The documents submitted include:

- National Inventory Report
- Export of complete data inventory – in xml format
- CRF tables (Common Reporting Format)
- SEF tables (Standard Electronic Format)

Reporting to the European Commission takes place in two stages, first as of 15th January and the final version as of 15th March each year, reporting for the European Commission matches the extent and quality of the report for the UNFCCC.

The text below specifies some other tools ensuring the required quality of reporting:

Tier approach: Tiers are levels of methodological complexity. Usually, there are three tiers. Tier 1 represents the basic method, using standard recommended default emission factors, directly tabulated in manuals (IPCC, 2006); Tier 2 requires territorial (national) specific information (such as territory-specific emission factors, or other parameters necessary to estimate emissions). Tier 3 represents the most complex and sophisticated methods; emissions estimates are often based on modelling. Tier 2 and Tier 3 are called higher tiers and their use is required for those categories of sources that have significant impact on total national GHG emissions or which could contribute to uncertainties (these are the so-called “key categories,” see below).

Key categories: The key categories concept lies in the identification of categories having significant impact on total national GHG emissions or which could contribute to uncertainties (trends) since 1990. Key categories contribute to the total uncertainty of emission estimate in an actual year or in determining trends. The key categories enjoy special attention while compiling the National Inventory, demanding more complex methods and a thorough application of QA/QC processes, and while conducting more rigorous methods in planning the inventory improvement. The prioritization of funding allocation is directly tied to the output of the key categories’ analyses.

Adherence to good practice principles leads to achieving all required quality criteria, which include: Transparency, Completeness, Consistency, Comparability and Accuracy.

Transparency: Transparency means transparent and clear documenting of applied processes, allowing the understanding of how the inventory was compiled and whether all relevant principles of good practice were taken into account.

Completeness: The national inventory must include all categories of sources and sinks of GHG emissions. Any missing categories must be clearly identified and an appropriate justification provided

of why they could not be included in the inventory or what steps are being taken for their future inclusion.

Consistency: Ensuring consistency of time series is important for demonstrating credibility of trends. The methodological manual describes ways of ensuring this consistency. Inventory emissions for the entire period must be determined using identical methods and same or similar data sources. The time series should encompass development of emissions over time and not potential changes in methods applied during the monitored period.

Comparability: The national inventory of GHGs shall be complied in a manner allowing comparison with inventories taken in other countries. This may be achieved by the application of unified IPCC methods, including identical classification of sources and sinks, the identification of key sources, prescribed manner of reporting, etc.

Accuracy: The national inventory should not be over or under-estimated. It is therefore necessary to avoid systematic mistakes in estimating emissions.

Following the IPCC methodology (IPCC, 2006), recalculations in estimating emissions and sinks are undertaken also in those cases when new and more credible data are obtained, or when there is a change in methodology leading to more accurate results. Having in mind the principle of consistency, these recalculations are undertaken for the entire time series.

2.3.4 Key source categories

Inventories of GHG emissions are based on a differentiated approach to important and less important emission categories. Key categories, by definition, contribute to 90% of the overall uncertainty in a level (in emissions per year) or in a trend. This is related to the individual sectors or subsectors of the inventories and the individual GHGs or groups (F-gases). Key categories were identified both on the basis of level assessment (LA) and also on the basis of trend assessment (TA). A total of 29 key categories were identified, of which 20 met the criteria for level assessment. The key categories are listed in Tab. 2-3 below. The combustion of solid fuels is the most important key category, corresponding to roughly 40% of total GHG emissions. More detailed information about key categories can be found in Chapter 1.5 of the NIR, as well as in the Annex 1 of the same document.

The procedure of the Approach 2 is based on the results of the uncertainty analysis. The key categories were considered to be those whose cumulative contribution is less than 90%. For the trend assessment, a similar procedure is used, with the difference that here the decisive quantity is defined as the product of the relative contribution to the total emissions (determined in the previous case) and the absolute value of the relative deviation of the individual trends from the total trend.

Tab. 2-3 Identification of key categories by level assessment (LA) and trend assessment (TA) for 2017 evaluated with LULUCF (Approach 2)

IPCC Source Categories	GHG	Cumulative Total (LA, %)	Cumulative Total (TA, %)	KC type
1.A.1 Energy industries - Solid Fuels	CO_2	33.65	32.88	LA, TA
1.A.3.b Transport - Road transportation	CO_2	46.37	44.53	LA,TA
1.A.4 Other sectors - Gaseous Fuels	CO_2	51.65	66.55	LA, TA
2.C.1 Iron and Steel Production	CO_2	56.50	95.63	LA
5.A Solid Waste Disposal on Land	CH_4	60.58	74.76	LA, TA
1.A.2 Manufacturing industries and construction - Gaseous Fuels	CO_2	64.52	84.76	LA, TA
2.F.1 Refrigeration and Air Conditioning Equipment (CO_2 eq.)	HFC	67.98	61.61	LA, TA
1.A.4 Other sectors - Solid Fuels	CO_2	70.88	32.88	LA, TA
1.A.2 Manufacturing industries and construction - Solid Fuels	CO_2	73.69	20.02	LA, TA
3.A Enteric Fermentation	CH_4	75.97	89.76	LA, TA
3.D.1 Agricultural Soils, Direct N_2O emissions	N_2O	78.23	99.15	LA
1.B.1.a Coal Mining and Handling	CH_4	80.43	70.89	LA, TA
1.A.1 Energy industries - Gaseous Fuels	CO_2	82.45	82.81	LA, TA
2.A.1 Cement Production	CO_2	83.64	98.04	LA
4.A.1 Forest Land remaining Forest Land	CO_2	84.60	80.75	LA, TA
2.B.8 Petrochemical and Carbon Black Production	CO_2	85.55	90.42	LA, TA
5.D Wastewater treatment and discharge	CH_4	86.48	93.67	LA
1.A.4 Other sectors - Liquid Fuels	CO_2	87.35	86.07	LA, TA
4.G Harvested wood products	CO_2	88.19	93.21	LA
5.B Biological treatment of solid waste	CH_4	89.03	87.29	LA, TA
4.E.2 Land converted to Settlements	CO_2	89.82	97.82	LA
3.B Manure Management	N_2O	90.60	95.52	LA

1.A.2 Manufacturing industries and construction - Liquid Fuels	CO_2	97.95	78.24	TA
1.A.4 Other sectors - Solid Fuels	CH_4	95.45	88.11	TA
3.G Liming	CO_2	98.24	88.91	TA

Source: CHMI

Tab. 2-4 Identification of key categories by level assessment (LA) and trend assessment (TA) for 2017 evaluated without LULUCF (Approach 2)

IPCC Source Categories	GHG	Cumulative Total (LA, %)	Cumulative Total (TA, %)	KC type
1.A.1 Energy industries - Solid Fuels	CO_2	34.93	34.60	LA, TA
1.A.3.b Transport - Road transportation	CO_2	48.13	59.31	LA, TA
1.A.4 Other sectors - Gaseous Fuels	CO_2	53.61	69.82	LA, TA
2.C.1 Iron and Steel Production	CO_2	58.65		LA
5.A Solid Waste Disposal on Land	CH_4	62.88	78.38	LA, TA
1.A.2 Manufacturing industries and construction - Gaseous Fuels	CO_2	66.97	86.24	LA, TA
2.F.1 Refrigeration and Air Conditioning Equipment (CO_2 eq.)	HFC	70.56	64.62	LA, TA
1.A.4 Other sectors - Solid Fuels	CO_2	73.57	47.02	LA, TA
1.A.2 Manufacturing industries and construction - Solid Fuels	CO_2	76.49	20.73	LA,TA
3.A Enteric Fermentation	CH_4	78.85	90.55	LA, TA
3.D.1 Agricultural Soils, Direct N_2O emissions	N_2O	81.20		LA
1.B.1.a Coal Mining and Handling	CH_4	83.49	74.29	LA, TA
1.A.1 Energy industries - Gaseous Fuels	CO_2	85.59	84.15	LA, TA
2.A.1 Cement Production	CO_2	86.82		LA
2.B.8 Petrochemical and Carbon Black Production	CO_2	87.80		LA
5.D Wastewater treatment and discharge	CH_4	88.77		LA

IPCC Source Categories	GHG	Cumulative Total (LA, %)	Cumulative Total (TA, %)	KC type
1.A.4 Other sectors - Liquid Fuels	CO_2	89.67	87.58	LA
5.B Biological treatment of solid waste	CH_4	90.54	88.86	LA, TA
1.A.2 Manufacturing industries and construction - Liquid Fuels	CO_2	98.13	81.98	TA
1.A.4 Other sectors - Solid Fuels	CH_4	95.76	89.71	TA

Source: CHMI

Tab. 2-5 Identification of key categories by level assessment (LA) and trend assessment (TA) for 2017 evaluated with LULUCF (Approach 1)

IPCC Source Categories	GHG	Cumulative Total (LA, %)	Cumulative Total (TA, %)	KC type
1.A.1 Energy industries - Solid Fuels	CO_2	36.25	29.09	LA,TA
1.A.3.b Transport - Road transportation	CO_2	49.94	39.48	LA, TA
1.A.4 Other sectors - Gaseous Fuels	CO_2	55.69	62.62	LA, TA
2.C.1 Iron and Steel Production	CO_2	60.58	58.18	LA, TA
1.A.2 Manufacturing industries and construction - Gaseous Fuels	CO_2	64.86	84.05	LA, TA
1.A.4 Other sectors - Solid Fuels	CO_2	67.99	49.51	LA, TA
1.A.2 Manufacturing industries and construction - Solid Fuels	CO_2	71.01	16.80	LA, TA
5.A Solid Waste Disposal on Land	CH_4	73.83	74.16	LA, TA
2.F.1 Refrigeration and Air Conditioning Equipment (CO_2 eq.)	HFC	76.56	100.00	LA
3.A Enteric Fermentation	CH_4	78.78	94.29	LA, TA
1.A.1 Energy industries - Gaseous Fuels	CO_2	80.98	82.22	LA, TA
1.B.1.a Coal Mining and Handling	CH_4	83.18	77.46	LA, TA
3.D.1 Agricultural Soils, Direct N_2O emissions	N_2O	85.30	70.81	LA, TA
2.A.1 Cement Production	CO_2	86.61	85.61	LA, TA

1.A.4 Other sectors - Liquid Fuels	CO_2	87.53	88.12	LA, TA
4.A.1 Forest Land remaining Forest Land	CO_2	88.30	66.96	LA, TA
2.B.8 Petrochemical and Carbon Black Production	CO_2	89.06	90.57	LA, TA
5.D Wastewater treatment and discharge	CH_4	89.73	89.86	LA, TA
3.D.2 Agricultural Soils, Indirect N_2O emissions	N_2O	90.37	99.88	LA
3.B Manure Management	N_2O	91.00	87.06	LA, TA
4.G Harvested wood products	CO_2	91.59	91.27	LA, TA
2.B.1 Ammonia Production	CO_2	92.15	91.94	LA, TA
3.B Manure Management	CH_4	92.71	96.92	LA
2.A.2 Lime Production	CO_2	93.22	92.54	LA, TA
4.A.2 Land converted to Forest Land	CO_2	93.72	93.15	LA, TA
5.B Biological treatment of solid waste	CH_4	94.22	93.73	LA, TA
4.E.2 Land converted to Settlements	CO_2	94.66	95.35	LA, TA
1.A.4 Other sectors - Biomass	CH_4	95.10	96.61	LA
1.B.2.b Natural Gas	CH_4	95.53	89.06	LA, TA
1.A.1 Energy industries - Liquid Fuels	CO_2	95.89	94.29	LA
1.A.2 Manufacturing industries and construction - Liquid Fuels	CO_2	97.29	80.37	TA
3.G Liming	CO_2	98.58	94.83	TA
1.A.4 Other sectors - Solid Fuels	CH_4	96.43	95.83	TA

Source: CHMI

Tab. 2-6 Identification of key categories by level assessment (LA) and trend assessment (TA) for 2017 evaluated without LULUCF (Approach 1)

IPCC Source Categories	GHG	Cumulative Total (LA, %)	Cumulative Total (TA, %)	KC type
1.A.1 Energy industries - Solid Fuels	CO_2	37.25	31.02	LA,TA
1.A.3.b Transport - Road transportation	CO_2	51.32	42.13	LA,TA
1.A.4 Other sectors - Gaseous Fuels	CO_2	57.23	66.53	LA,TA
2.C.1 Iron and Steel Production	CO_2	62.25	61.79	LA,TA
1.A.2 Manufacturing industries and construction - Gaseous Fuels	CO_2	66.65	85.99	LA,TA
1.A.4 Other sectors - Solid Fuels	CO_2	69.86	52.59	LA,TA
1.A.2 Manufacturing industries and construction - Solid Fuels	CO_2	72.97	17.56	LA,TA
5.A Solid Waste Disposal on Land	CH_4	75.87	73.51	LA,TA
2.F.1 Refrigeration and Air Conditioning Equipment (CO_2 eq.)	HFC	78.67	100.00	LA
3.A Enteric Fermentation	CH_4	80.96	79.36	LA,TA
1.A.1 Energy industries - Gaseous Fuels	CO_2	83.22	84.00	LA,TA
1.B.1.a Coal Mining and Handling	CH_4	85.47	69.96	LA,TA
3.D.1 Agricultural Soils, Direct N_2O emissions	N_2O	87.65	82.03	LA,TA
2.A.1 Cement Production	CO_2	89.00	87.64	LA,TA
1.A.4 Other sectors - Liquid Fuels	CO_2	89.95	88.74	LA,TA
2.B.8 Petrochemical and Carbon Black Production	CO_2	90.73	92.93	LA,TA
5.D Wastewater treatment and discharge	CH_4	91.42	90.58	LA,TA
3.D.2 Agricultural Soils, Indirect N_2O emissions	N_2O	92.08	91.38	LA,TA
3.B Manure Management	N_2O	92.72	92.18	LA,TA
2.B.1 Ammonia Production	CO_2	93.30	93.64	LA,TA
3.B Manure Management	CH_4	93.87	94.34	LA,TA
2.A.2 Lime Production	CO_2	94.39	94.98	LA,TA

IPCC Source Categories	GHG	Cumulative Total (LA, %)	Cumulative Total (TA, %)	KC type
5.B Biological treatment of solid waste	CH_4	94.90	95.60	LA,TA
1.A.4 Other sectors - Biomass	CH_4	95.35	96.92	LA
1.B.2.b Natural Gas	CH_4	95.80	89.73	LA
1.A.2 Manufacturing industries and construction - Liquid Fuels	CO_2	97.61	76.55	TA

Source: CHMI

2.3.5 Inventory uncertainties

The determination of uncertainties is one of the most important principles of good practice in the emission inventory. An analysis of uncertainties characterizes the extent (i.e. possible interval) of results of the entire national inventory, as well as of its individual components. The knowledge of partial and overall uncertainties allows compilers to better understand the inventory process which includes appropriate input data collection and their evaluation. An analysis of uncertainties assists in identifying those categories of emission sources and shares contributing the most to total uncertainties and determining priorities for further quality improvement.

The analysis of uncertainties is based on partial uncertainties of activity data for individual categories of sources and their shares, as well as on uncertainties corresponding to emission factors and other parameters required for calculation. These partial uncertainties are expressed in the form of statistical characteristics, or on the basis of an expert assessment (if there is a lack of data for determining statistical characteristics). The resulting values are then the uncertainties of total GHG emissions and their trends. To this end, one can use the method of error propagation based on mathematical-statistical relations for calculation of sum variations or product from corresponding variations of its individual terms. The IPCC methodology (IPCC, 2006) provides a solid ground for this calculation which is also being used for the Czech national inventory of GHGs. The recommended more robust method for determining uncertainties (Tier 2), which works better with partially dependent values (also used in case of the national inventory) and asymmetric interval of reliability, is based on stochastic modelling using the Monte Carlo method. Numerically, uncertainties on all levels are expressed using a reliability interval at 95% level of probability. In practice, uncertainty is usually expressed by relative value expressed in per cent.

Uncertainty analysis of Tier 1, which is presented in current volume of NIR, employs the same source categorization as used in the key categories assessment. The actual results of the uncertainty analysis for 2017 are given in Annex 2 of the NIR.

Further, uncertainty bases are yearly evaluated for LULUCF, Waste and 1.A.3 Transport, and then further used for the overall uncertainty analysis.

The results of uncertainty assessment were obtained (i) for all sectors including the LULUCF and (ii) for comparison also for all sectors without the LULUCF. The estimated overall uncertainty in level assessment (case with LULUCF) reached 4.03%. The corresponding uncertainty in trend is 3.09%. For

the cases without LULUCF, the estimated overall uncertainty in level assessment is 3.7% and 2.34% in trend.

2.3.6 QA/QC control procedures

The QA/QC processes are carried out annually pursuant to an updated plan. The plan preparation reflects institutional arrangements: Each institution prepares its own QA/QC procedures, including the authorization of responsible QA/QC expert for each sector. The sector QA/QC plan is an integral part of the entire QA/QC plan, which is prepared by a QA/QC manager. The national inventory of GHGs is a part of client processes at the CHMI following the ISO 9001 quality standard (CHMI obtained certification). The processes relating to national inventory are elaborated in the form of development diagrams and include all main principles that need to be adhered to during the compilation of the inventory including the QA/QC processes.

QC processes include routine technical inspections of inventory quality to ensure consistency, integrity, accuracy, and completeness of the data and to reveal and remove any error and omissions. The QC processes are applied to all fundamental processes carried out during the inventory: Data collection, selection of appropriate method and emission factors, and calculations of emissions and processes documentation. These QC procedures are carried out in line with the IPCC methodology (IPCC, 2006). Sector compilers undertake parts of these processes; the rest is carried out by the NIS coordinator. The sector compilers focus primarily on activity data control, emission factors, and applied sector-specific methods, the NIS coordinator reviews the appropriateness of method selection, and analyses trends and compares data from several possible sources. The sector compilers and the NIS coordinator use control tools available in the CRF Reporter.

The QA processes include control activities and reviews by third parties not directly involved in the national inventory compilation, but rather competent experts in the given field. The CHMI cooperates on the QA processes with Slovak experts from the Slovak Hydrometeorological Institute (SHMI), who are involved in the preparation and compilation of the Slovak national inventory. Also, the QA cooperation was broadened two year ago by including in the processes experts from the Hungarian and Polish national inventory teams.

The regular international inspections undertaken by the UNFCCC play a significant role in increasing the quality of the national inventory. The inspections identify shortcomings and provide recommendations that are thoroughly analysed by the Czech NIS team; inspection conclusions are used to improve the quality of the Czech national inventory.

A detailed QA/QC management explanation is provided in the NIR in chapter 1.2.3.

2.3.7 Systematic improvement of inventory quality

The plan for the improvement of inventory quality also constitutes one of the good practice tools besides being one of the fundamental provisions of the Kyoto Protocol (KP) (Art.10, para a-f). The NIS has prepared and annually updates the improvement plan for the existing inventory system. One of the basic tools for this planning is, among others, analyses of the key categories. Newly evaluated country specific computational approaches are used every year as either emission, oxidation or other computational factors are needed for specific sectors.

3 Quantified economy-wide emission reduction target

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20% compared to 1990 levels. Since this target under the UNFCCC has only been submitted by the EU-28 and not by each of its Member States (MS), there are no specified targets for the individual MS. Therefore, the Czech Republic, as part of the EU-28, takes on a quantified economy-wide emission reduction target jointly with all the EU MS.

The definition of the EU target under the UNFCCC for 2020 is documented in the revised note provided by the UNFCCC Secretariat on the "Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention"[1]. In addition, the EU provided additional information relating to its quantified economy-wide emission reduction target in a submission as part of the process of clarifying the developed country Parties' targets in 2012[2].

The EU clarified that the accounting rules for the target under the UNFCCC are more ambitious than the current rules under the KP, for example, including international aviation, adding an annual compliance cycle for emissions under the Effort Sharing Decision (ESD) or higher Clean Development Mechanism (CDM) quality standards under the EU Emissions Trading System (EU ETS)[3]. Accordingly, the following assumptions and conditions apply to the EU's 20% target under the UNFCCC:

- The EU pledge under the UNFCCC does not include emissions/removals from LULUCF, but it is estimated to be a net sink over the relevant period. EU inventories also include information on emissions and removals from LULUCF in accordance with relevant reporting commitments under the UNFCCC. Accounting for LULUCF activities only takes place under the KP.

- The target refers to 1990 as a single base year for all gases and all MS.

- Emissions from international aviation to the extent it is included in the EU ETS are included in the target[4].

- A limited number of Certified Emission Reductions (CERs), Emission Reduction Units (ERU and units from new market-based mechanisms may be used to achieve the target: In the ETS, the use of international credits is capped (up to 50% of the reduction required from EU ETS sectors by 2020). Quality standards also apply to the use of international credits in the EU ETS, including a ban on credits from LULUCF projects and certain industrial gas projects. In the Effort Sharing Decision (ESD) sectors, the annual use of international credits is limited to up to 3% of each MS's ESD emissions in 2005, with a limited number of MS being permitted to use an additional 1% from projects in Least Developed Countries (LDCs) or Small Island Developing States (SIDS), subject to conditions.

- The GWPs used to aggregate GHG emissions up to 2020 under the EU legislation were those based on the Second Assessment Report of the IPCC when the target was submitted. In its submission to clarify the 2020 target from March 2012, the EU announced that the implications of the Conference of the Parties Serving as the Meeting of the Parties to the

[1] FCCC/SB/2011/INF.1/Rev.1 of 7 June 2011

[2] FCCC/AWGLCA/2012/MISC.1

[3] FCCC/TP/2013/7

[4] In the EU, emissions covered by the category 'international aviation' go beyond the scope of the EU target, as emissions from international aviation are included in the EU Climate and Energy Package and the EU target under the UNFCCC to the extent to which aviation is part of the EU ETS. As such, emissions cannot be separated in the EU inventory nor in the projections for the entire time series, and thus emissions from international aviation have been considered in their entirety throughout the report. Over the relevant period, total emissions from international aviation amounted to between 1.2-2.9% of the annual total EU GHG emissions.

Kyoto Protocol's (CMP) Decision to revise the GWPs to those from the IPCC Fourth Assessment Report (AR4) are under review. This review has been completed and revised GWPs from AR4 were adopted for the EU ETS. For the revision of ESD targets, the revised GWPs were taken into account. For the implementation until 2020, GWPs from AR4 will be used consistently with the UNFCCC reporting guidelines for GHG inventories.

- The target covers the gases CO_2, CH_4, N_2O, HFCs, PFCs and SF_6.

The key facts about the UNFCCC target of the EU-28 are summarized in Tab. 3-1.

Tab. 3-1 Key facts of the UNFCCC target of the EU-28

Parameters	Target
Base Year	1990
Target Year	2020
Emission Reduction target	-20% in 2020 compared to 1990
Gases covered	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
Global Warming Potential	AR4
Sectors Covered	All IPCC sources and sectors, as measured by the full annual inventory and international aviation to the extent included in the EU ETS
Land Use, Land-Use Change, and Forests (LULUCF)	Accounted under KP, reported in EU inventories under the UNFCCC. Assumed to produce net removals
Use of international credits (JI and CDM)	Possible subject to quantitative and qualitative limits
Other	Conditional offer to move to a 30% reduction by 2020 compared to 1990 levels as part of a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities.

Source: European Commission

With the 2020 climate and energy package, the EU has set internal rules which underpin the implementation of the target under the UNFCCC. The 2020 climate and energy package introduced a clear approach to achieving the 20% reduction of total GHG emissions from 1990 levels, which is equivalent to a 14% reduction compared to 2005 levels. This 14% reduction objective is divided between two sub-targets, equivalent to a split of the reduction effort between ETS and non-ETS sectors of two thirds vs. one third.

These two sub-targets are:

- A 21% reduction target compared to 2005 for emissions covered by the ETS (including domestic and international aviation);
- A 10% reduction target compared to 2005 for ESD sectors, shared between the 28 MS through individual national GHG targets.

Under the revised EU ETS Directive[5], one single EU ETS cap covers the EU Member States and the three participating non-EU Member States (Norway, Iceland and Liechtenstein), i.e. there are no further differentiated caps by country. For allowances allocated to the EU ETS sectors, annual caps have been set for the period from 2013 to 2020; these decrease by 1.74% annually, starting from the average level of allowances issued by MS for the second trading period (2008-2012). The annual caps imply interim targets for emission reductions in sectors covered by the EU ETS for each year until 2020. For further information on the EU ETS and for information on the use of flexible mechanisms in the EU ETS see 4th Biennial Report of the European Union (EU-BR4), Chapter 3.2.2.1.

Non-ETS emissions are addressed under the Effort Sharing Decision[6] already mentioned above. The ESD covers emissions from all sources outside the EU ETS, except for emissions from international maritime, domestic and international aviation (which were included in the EU ETS from 1 January 2012) and emissions and removals from LULUCF. It thus includes a diverse range of small-scale emitters in a wide range of sectors: Transport (cars, trucks), buildings (in particular heating), services, small industrial installations, fugitive emissions from the energy sector, emissions of fluorinated gases from appliances and other sources, agriculture, and waste. Such sources currently account for about 60% of total GHG emissions in the EU.

While the EU ETS target is to be achieved by the EU as a whole, the ESD target was divided into national targets to be achieved individually by each MS. In the ESD, national emission targets for 2020 are set expressed as percentage changes from 2005 levels. The Czech Republic is allowed to increase its emissions in the ESD sectors by 9% against 2005. These changes have been transferred into binding quantified annual reduction targets for the period from 2013 to 2020[7+8], expressed in Annual Emission Allocations (AEAs). The final adjustment of the allocation was carried out in line with the Commission Decision (EU) 2017/1471 of 10 August 2017 amending Decision 2013/162/EU to revise Member States' annual emission allocations for the period from 2017 to 2020.

The quantified annual reduction targets 2013-2020 of the Czech Republic start from 62.5 million AEAs in 2013 and increase to 67.2 million AEAs in 2020. In 2017, verified emissions of stationary installations covered under the EU ETS in the Czech Republic summed up to 66.98 Mt CO_2 eq. With the total GHG emissions of 129.4 Mt CO_2 eq. (without LULUCF), the share of ETS emissions was 52%.

[5] Directive 2009/29/EC of the European Parliament and of the Council amending Directive 2003/87/EC to improve and extend the greenhouse gas emission allowance trading scheme of the Community

[6] Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

[7] Commission decision of 26 March 2013 on determining Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/EC of the European Parliament and of the Council (2013/162/EU)

[8] Commission Implementing Decision of 31 October 2013 on the adjustments to Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/ EC of the European Parliament and of the Council (2013/634/EU)

The monitoring process is harmonized for all European MS and laid down in the Monitoring Mechanism Regulation[9]. The use of flexible mechanisms is possible under the EU ETS and the ESD. For the use of CER and ERU under the ETS, please refer to the EU-BR4.

The ESD allows MS to make use of flexibility provisions for meeting their annual targets, with certain limitations. There is an annual limit of 3% for the use of project-based credits for each MS. If these are not used in any specific year, the unused part for that year can be transferred to other MS or be banked for own use until 2020.

For more detailed explanation on how the EU climate and energy package, as well as the EU target under the Convention and the KP are set up and related, please also refer to the EU-BR4.

A further target has been pledged to the Convention through the EU's Nationally Determined Contribution submitted under the Paris Agreement, and has been adopted by the EU under the 2030 Climate and Energy Framework[10]. The emission reduction target is a pledge to reduce emissions by at least 40% (compared to 1990 levels) by 2030, enabling the EU to move towards a low-carbon economy and implement its commitments under the Paris Agreement. In order to achieve this target:

- EU emissions trading system (ETS) sectors will have to cut emissions by 43% (compared to 2005) by 2030. This has been agreed under the Revised EU ETS Directive (2018/410)[11].
- Effort Sharing sectors will need to cut emissions by 30% (compared to 2005) by 2030 – this has been translated into individual binding targets for Member States. The target for the Czech Republic is 14% emissions reduction against 2005. This has been agreed under the Effort Sharing Regulation (2018/842)[12]. While the Effort Sharing Regulation does not cover the LULUCF sector as such, it does allows Member States to use up to 280 million credits from the land-use sector over the entire period 2021-2030 to comply with their national targets.
- Emissions and removals from the LULUCF sector are included for the first time in the EU climate target through the so-called LULUCF Regulation (2018/841)[13]. Each Member State will have to ensure that the LULUCF sector does not create debits, once specific accounting rules are applied. This is known as the "no debit" rule.

For Tabular summary of the information provided in this Chapter please see CTF Tables 2 and 3.

[9] Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC. This regulation shall be repealed with effect from 1 January 2021 and superseded by the Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action. However, by way of derogation, the provisions of Regulation (EU) No 525/2013 shall continue to apply as regards the second commitment period of the Kyoto Protocol.

[10] Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions. A policy framework for climate and energy in the period from 2020 to 2030 COM(2014) 015 final

[11] DIRECTIVE (EU) 2018/410 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814

[12] REGULATION (EU) 2018/842 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013

[13] REGULATION (EU) 2018/841 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU

4 Progress in achievement of quantified economy-wide emission reduction targets and relevant information

4.1 Introduction and summary on mitigation actions and their effects

The Czech Republic, as a party to the KP, has in the Protocol´s first commitment period contracted to reduce its GHG emissions between 2008 and 2012 by 8% in comparison to the year 1990, and to jointly fulfil with other EU MS its quantified objective in the second commitment period.

Concerning the first commitment period (2008-2012), the Czech Republic overachieved its set objective. Between 1990 and 2017 the total GHG emissions in the Czech Republic (excl. LULUCF) fell by 35.06%. For further information on this matter please see Chapter 2. The Czech Republic, therefore, did not use flexible mechanisms to meet its commitment in this time period. On the contrary, the Czech Republic sold more than 100 million Assigned amount units (AAUs) on international emission trading markets, which represented the majority of the anticipated surplus in the period 2008-2012. The revenues were used to finance the so-called Green Investment Savings Programme seeking to achieve further energy savings in the housing sector.

In the second commitment period (2013-2020), the Czech Republic is on track to jointly with other EU Member States exceed its 20% GHG reduction target set for 2020 as compared with 1990 levels. The latest available GHG projections for the year 2018 show that the EU-28's 2018 emissions total is 23.2% below 1990 levels.[14] Further, according to the scenario "with existing measures" (WEM), the EU´s GHG emissions would be reduced by 25% by 2020 and by 30% by 2030 compared to 1990 levels. Under the "With Additional Measures" (WAM) scenario, as reported by MS, the projected GHG emissions would decrease 26% by 2020 and by 36% by 2030 compared to 1990 levels. More detailed information on progress monitoring and meeting the objectives are available in the Report from the Commission to the European Parliament and the Council EU Climate Action Progress Report 2019 COM (2019) 559 final or the EEA report Trends and Projections in Europe 2019.

In the overview below, the climate related policies and measures as implemented or as planned to be implemented are reported. The development of GHG emissions is reported in CTF Table 4. Emissions in the LULUCF sector are not included under the UNFCCC target, therefore they are not included in CTF Tables 4 and 4(a).

For information on the Minimization of Adverse Impact see Chapter 15 of the National Inventory Report submitted in May 2019 to the UNFCCC. More information on the EU-wide assessment procedures is available in section 4.4 of the EU 4th Biennial Report.

It is also necessary to note that the following cross-cutting and sectoral policies and measures are anchored in the State Environment Policy 2012-2019, the Agenda 2030, and its main implementation platform the Strategic Framework Czech Republic 2030.

4.2 Domestic institutional arrangement

There were no significant changes in domestic institutional arrangements, including legal, administrative and procedural arrangements since the last Biennial Report.

[14] Approximated EU greenhouse gas inventory: Proxy GHG emission estimates for 2018 (EEA)

4.3 Cross-cutting policies and measures

4.3.1 Climate Protection Policy of the Czech Republic

The Policy defines GHG reduction targets for 2020 and 2030. It also includes indicative trajectories and objectives for 2040 and 2050. Further, the Policy defines policies and measures for specific sectors on national level. Most of the identified policies and measures will be implemented by the time of the next Policy update, which is planned in 2023.

The Government adopted the Climate Protection Policy of the Czech Republic in March 2017 and this document replaced the National Programme to Abate the Climate Change Impacts in the Czech Republic (2004). This Policy reflects significant recent developments at the EU, international and national level. The long-term perspective for gradual transition to low emission development until 2050 was included in such governmental document for the first time. The Strategic Impact Assessment of the Policy was carried out and completed with an affirmative statement in January 2017.

The Climate Protection Policy sets specific targets and measures for the particular sectors on national level in order to fulfill greenhouse gas reduction targets resulting from international agreements as well as EU legislation. This Policy should contribute to gradual transition to low emission development until 2050. The Policy further sets primary and indicative emission reduction targets, which should be reached in a cost-efficient manner. Measures are proposed in the following key areas: Energy, final energy consumption, industry, transport, agriculture and forestry, waste, science, research development, and voluntary tools.

The Policy also outlines some economic aspects for the greenhouse gas reductions on the national level. The European structural and investment funds represent the main source of financing in the programming period of 2014-2020. Another key financial source is represented by the auction revenues generated by the EU ETS. The Policy will be evaluated in 2021 and based on this evaluation the Policy will be updated by 2023.

Type of policy: Regulatory

Implementing entity: Ministry of the Environment (Government)

Period of implementation: 2017-2030

Implemented in scenario: WEM

Mitigation impact: The policy is a framework measure, therefore its mitigation effects is accounted under other specific measures.

Primary emission reduction targets

- Greenhouse gas reduction of 32 Mt CO_2 eq. compared to 2005 until 2020
- Greenhouse gas reduction of 44 Mt CO_2 eq. compared to 2005 until 2030

Indicative emission reduction targets

- Indicative level towards 70 Mt CO_2 eq. of emitted greenhouse gases in 2040
- Indicative level towards 39 Mt CO_2 eq. of emitted greenhouse gases in 2050

Sectors: Energy, Transport, Industrial Processes, Agriculture, LULUCF, Waste, Cross-cutting

Greenhouse gas coverage: CH_4, CO_2, N_2O, SF_6, NF_3

4.3.2 European Union Emission Trading System (EU ETS)

The EU ETS is one of the most important economic tools to reduce GHG emissions. The scheme for GHG emission allowance trading within the Community is established in the Directive 2003/87/EC amended or supplemented by Directives 2008/101/EC and 2009/29/EC, by Decision No. 1359/13/EU and by Regulation No. 421/2014/EU.

This legislation is transposed into the Czech legal system by Act No. 383/2012 Coll. on conditions for trading of emission allowances amending Acts No. 695/2004 Coll. and No. 164/2010 Coll. The Act 383/2012 is currently being amended to transpose the revised Directive 2003/87/EC which sets rules for the new trading period 2021-2030.

Type of policy: Economic

Implementing entity: Ministry of the Environment (Government)

Period of implementation: 2005-2040

Implemented in scenario: WEM

Timeframe: Three trading periods of the EU ETS have been agreed. During the first (2005–2007) and the second (2008–2012) period, allowances were allocated free of charge in the Czech Republic. In the third period (2013–2020), there is a single EU-wide cap and allowances are allocated on the basis of harmonized rules. The single EU-wide cap on emission allowances replaces the previous system of national caps. The cap is cut each year (by 1.74%) so that by 2020 emissions will be 21% below the 2005 level. The free allocation of allowances is progressively replaced by auctioning in this period.

The legislative framework of the EU ETS for the next trading period (phase 4) was revised in early 2018 to enable it to achieve the EU's 2030 emission reduction targets in line with the 2030 climate and energy policy framework and as part of the EU's contribution to the 2015 Paris Agreement. The revision focuses on:

- Strengthening the EU ETS as an investment driver by increasing the pace of annual reductions in allowances to 2.2% as of 2021;
- Reinforcing the Market Stability Reserve (the mechanism established by the EU in 2015 to reduce the surplus of emission allowances in the carbon market);
- Continuing the free allocation of allowances as a safeguard for the international competitiveness of industrial sectors at risk of carbon leakage;
- Helping industry and the power sector via several low-carbon funding mechanisms.

Manufacturing industry will continue to receive a share of free allowances also after 2020. Free allocation is carried out based on benchmarks of greenhouse gas emissions performance. Installations that meet the benchmarks should receive all the allowances they need. Those that do not reach the benchmark values will receive fewer allowances than they need. These installations will therefore have to reduce their emissions, or buy additional allowances to cover their emissions.

A product benchmark is based on a value reflecting the average greenhouse gas emission performance of the 10% best performing installations in the EU ETS.

The benchmarks have been established for various products. This means the benchmark methodology does not differentiate according to the technology, fuel used, or according to the size of an installation.

The EU ETS influences through the increase of electricity price also the industrial, domestic and commercial sectors. For example, a substitution of electricity intensive industrial products may be expected.

In the first two phases, the cap on allowances was set at national level through national allocation plans (NAPs). The phase one caps were set mainly on the basis of historic emissions data. The total allocation of EU ETS allowances exceeded demand and in 2007, the price of phase one allowances fell close to zero.

In the second period, the cap was cut by 6.5% compared to the 2005 level. Due to the economic crisis that began in late 2008, there was again a surplus of unused allowances. The aviation sector was brought into the EU ETS on January 1st 2012 through legislation adopted in 2008.

Some work on legislation accompanying the revised Directive 2003/87/EC has been finalized – that includes delegated regulation determining the free allocation rules, regulation on the Innovation Fund and decision determining the sectors deemed to be at risk of carbon leakage. Other implementing legislation, such as detailed rules for the Modernization Fund, an EU-wide fund that will support investments in modernizing the power sector and energy efficiency, is currently under development.

As mentioned above, In the Czech Republic, the EU ETS is controlled via Act No. 383/2012 Coll., on conditions of trading with greenhouse gas emission allowances. This Act defines what facilities are subject to the system and the rights and obligations of operators. Operators monitor their emissions, report to the Ministry of the Environment and receive allowances. Part of the allowances is allocated free of charge; the remainder may be bought at the marketplace or in auctions. Allowances exist and can be transferred between allowance accounts within the registry, which is administered by the Czech electricity and gas market operator OTE, a.s.

In 2017, approximately 310 facilities participated in the system. The volume of emissions covered by the trading system in the Czech Republic represented approximately 52% of total greenhouse gas emissions in the Czech Republic in 2017. Monitored greenhouse gases include CO_2 and N_2O.

Allocation plan represented the required premise before initiation of allowance trading in the first two trading periods. The NAP determines the quantity of allowances, which are to be distributed during the trading period to individual facility operators. The Ministry of the Environment has prepared the NAP in cooperation with the Ministry of Industry and Trade. The NAP2 (2008-2012) allocation plans covered the first Kyoto Protocol commitment period and directly followed NAP1 (2005-2007) created for the first trading period. When calculating the allocated volume of allowances, the Ministry of the Environment based its estimates on historical, only partially verifiable emissions between 2000 and 2004 (which means that the quality and availability of data for the preparation of NAP1 was limited) and on fully verified emissions for the period covering 2005 and 2006 (for NAP2). The third trading period 2013-2020 uses National Allocation Tables instead of NAP and these tables determine allocation per facility for each year according to benchmarks.

In case of NAP2 (2008-2012), the total level of allocation in the Czech Republic was decided on the 26th of March 2007 by the European Commission, which allocated 86.8 million allowances in average annually to the Czech Republic. This allocated volume includes a reserve for new entrants in the amount of 1.29 million allowances and a reserve for joint implementation (JI) projects amounting to 99 389 allowances.

In 2017, facilities covered by the EU ETS emitted 66.98 million t CO_2 eq. In comparison with 2016, there has been a reduction of emissions by 0.81%, which is 544 thousand t CO_2 eq. The Table 4-1 below

shows differences between allocated allowances and verified emissions in completed years (reporting periods).

Tab. 4-1: Allocated allowances vs. verified emissions [kt CO_2 eq.]

Sector	Information	2009	2010	2011	2012	2013	2014	2015	2016	2017
Combustion facilities	EUA allocated free-of-charge	66 437	66 571	69 008	69 001	35 922	30 980	26 121	6 049	5 459
	Verified emissions	58 892	62 066	60 655	56 285	54 597	53 257	53 297	52 894	51 726
	Difference	**7 545**	**4 505**	**8 353**	**12 716**	**-18 675**	**-22 277**	**-27 176**	**-46 845**	**-46 267**
Refineries of mineral oils	EUA allocated free-of-charge	1 088	1 088	1 088	1 088	977	901	885	1 090	1 069
	Verified emissions	980	1 054	988	951	820	914	925	1 039	1 321
	Difference	**108**	**34**	**100**	**137**	**157**	**-13**	**-40**	**52**	**-252**
Raw iron or steel	EUA allocated free-of-charge	10 169	10 195	8 083	8 086	8 926	8 791	8 629	5 203	8 466
	Verified emissions	7 555	6 081	5 922	5 861	5 916	5 904	5 704	6 287	5 651
	Difference	**2 614**	**4 114**	**2 161**	**2 225**	**3 010**	**2 887**	**2 925**	**-1 083**	**2 815**
Cement or lime	EUA allocated free-of-charge	4 043	4 043	4 043	4 043	3 590	3 527	3 463	3 333	3 224
	Verified emissions	3 846	3 368	3 752	3 422	3 144	3 369	3 486	3 542	3 659
	Difference	**197**	**675**	**291**	**621**	**446**	**158**	**-23**	**-209**	**-436**
Glass	EUA allocated free-of-charge	1 043	1 041	1 041	1 041	686	664	652	718	705
	Verified emissions	624	668	635	652	636	672	725	801	827
	Difference	**419**	**373**	**406**	**389**	**50**	**-8**	**-73**	**-83**	**-122**
Ceramic products	EUA allocated free-of-charge	816	819	806	803	24	438	433	431	392
	Verified emissions	474	409	442	418	393	389	380	403	411
	Difference			**364**	**385**	**59**	**49**	**53**	**29**	**-19**
Pulp, paper, cardboard	EUA allocated free-of-charge	866	880	881	869	347	355	350	318	310
	Verified emissions	645	648	585	593	502	480	476	451	452
	Difference			**296**	**-507**	**-155**	**-125**	**-126**	**-134**	**-142**

Total	EUA allocated free-of-charge	85 912	86 084	86 428	86 407	52 317	47 044	41 925	18 304	20 345
	Verified emissions	73 785	75 584	74 187	69 316	67 712	66 695	66 630	67 520	66 975
	Difference	**12 127**	**10 500**	**12 241**	**17 091**	**-15 395**	**-19 651**	**-24 705**	**-49 216**	**-46 630**

Source: MoE

It remains difficult to quantify the EU ETS effect on the development of emissions due to the fact that besides the EU ETS, companies are influenced also by developments in fuel prices or electricity and general economic development.

Sector: Civil aviation.

The new Directive 2009/29/ES of the European Parliament and of the Council of 23 April 2009 amending Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC included aviation activities in the scheme for greenhouse gas emission allowance trading within the Community. The new Directive, approved by decision of the Council 94/69/ES, reflecting the ultimate goal of UNFCCC i.e. to reach a stable concentration of GHG in atmosphere on the level which will prevent dangerous disruption of global climate system, should improve and extend the system of GHG´s emissions trading within the Community. The new Act 257/2014 Coll., which amended Act No. 383/2012 Coll. transposes the Directive 2009/29/ES into the Czech legal system.

Originally, the EU ETS was designed to cover all flights performed to/from and within the airports in the European Economic Area[15]. However, the Regulation (EU) No 421/2014 of the European Parliament and the Council limited the geographical scope of the EU ETS to intra-European Economic Area flights only for the 2013–2016 period. The main reason of limiting the EU ETS scope was to progress negotiation within the framework of International Civil Aviation Organization (ICAO) on development of the Global Market Based Measures to reduce international aviation emissions, which was finally concluded at the 39th ICAO Assembly (September 2016, Montreal).

The rules of the European Union applicable for monitoring, reporting and verification of aviation emissions are mainly contained in Directive 2003/87/EC of the European Parliament and in the Council and Commission Delegated Regulation (EU) 2019/1603 supplementing Directive 2003/87/EC. That Directive is the legal basis for the detailed provisions in this matter, contained in Commission Regulation (EU) 601/2012 and in Commission Implementing Regulations (EU) 2018/2066 and 2018/2067.

In general, there are two trading periods for the aviation sector in EU ETS. The first period was the year 2012 only. The second trading period is already harmonized with the third trading period for stationary sources (2013-2020). The volume of European emission allowances (EUAA) in the 1st trading period was determined at 97% of historic emissions (average emissions in the EU between 2004 and 2006). In the second trading period, this volume has been reduced to 95% of historic emissions. From this amount, 15% of allowances has been auctioned and the remaining allowances are allocated to aircrafts operator free-of-charge. Moreover, the special reserve of 3% for new and fast-growing operators has been also created within the second trading period. Allocation of emission allowances free-of-charge

[15] The European Economic Area is the area in which the Agreement on the European Economic Area provides for the free movement of persons, goods, services, and capital within the European Single Market. It covers EU Member States and Norway, Iceland and Lichtenstein.

to individual operators is determined on the basis of multiplication of a benchmark[16] and the volume of verified tonne-kilometres in 2010.

An aircraft operator included in the EU ETS is obliged to annually monitor and report CO2 emissions produced during the calendar year. Tonne-kilometre data are monitored and reported only for the purposes of applying for free allocation of emission allowances for trading periods or for allocation of free emission allowances from the special reserve.

Each aircraft operator performing flights included in the EU ETS scope is assigned to the administrations of one of the EU Member States as determined by the aircraft operator list which is published annually by the European Commission. The overview of EU ETS coverage in the Czech Republic is included in the Table 4-2 below.

Tab. 4-2 – The EU ETS coverage in the Czech Republic in the period 2012-2017

Year	Czech AOs			Foreign AOs			Total CO_2 emissions	Free EUAA allocation
	# of AOs administered	CO_2 emissions (tones)		# of AOs administered	CO_2 emissions (tones)			
		Domestic flights	International flights		Domestic flights	International flights		
2012	4	10 421	894 227	9	117	2 883	907 648	798 821
2013	2	8 562	404 040	2	84	1 400	414 086	374 780
2014	2	9 532	382 368	2	35	1 418	393 353	374 780
2015	3	12 454	416 523	2	35	1 417	430 429	374 780
2016	3	13 730	463 519	2	31	1 123	478 404	374 780
2017	3	12 766	480 630	3	64	1 546	495 007	374 780

Source: Moe

Mitigation impact: The estimate of EU ETS´ impact on emissions on the demand side is a result of a simulation model based on energy prices (derived from fuel prices without and with CO_2 price) and cost curves of emission reducing measures. For the demand side, the calculation involves emissions reduction of projects realized in frame of transitional free allocations of emission permits. The main assumptions are that the EU ETS directly influences about 41% of final energy consumption in the industrial sector, and indirectly about 75% heat consumers and 100% electricity consumers. Having in mind that the State Energy Policy envisages the elimination of most coal power plants and their replacement by nuclear power plants between 2030 and 2040, the gains from EU ETS are rather low. The following table shows a drop of GHG emissions caused by energy savings and changes in use of individual energy carriers. Table 4-3 and Table 4-4. show annual emissions savings from realized and planned investments in for free transitional allocations from the year 2015.

[16] The benchmark was determined by the European Commission by Decision No. 2011/638/EU

Tab. 4-3 Expected emissions reduction of EU ETS on the demand side

Emissions reduction [kt CO_2]	2015	2016	2020	2025	2030	2035
Households	98	74	319	535	892	1194
Services	99	76	292	447	656	877
Industry	188	135	419	568	842	1127
Total	**385**	**285**	**1 030**	**1 551**	**2 390**	**3 198**

Source: MoE

Tab. 4-4 Expected emissions reduction of EU ETS due to investments within the transition period

Emissions reduction [kt CO_2]	2015	2016	2017	2018	2019
	90.095	177.583	1 442.445	163.286	2 360.444

Source: MoE

The following table (Table 4.5) summarizes the total effect of the EU ETS.

Tab. 4-5 Total expected emissions reduction of EU ETS

Total emissions reduction [kt CO_2]	2015	2016	2020	2025	2030	2035
	475	553	2 740	3 424	6 624	7 432

Source: MoE

Additional information: It is expected that the EU ETS policy together with the Industrial Emissions Directive has forced emission polluters to not only phase-out or reconstruct (e.g. installation of new boilers) some less efficient and outdated facilities but also to switch to cleaner fuels like natural gas or biomass.

Sector: Energy sector (public and industrial), industrial technologies (refineries, chemical sector, metallurgy, coking plants, lime production, cement, glass-making, ceramics, paper and cellulose), aviation

Greenhouse gas coverage: CO_2, N_2O

4.3.3 Effort Sharing Legislation (Effort Sharing Decision, Effort Sharing Regulation)

The Effort Sharing legislation establishes annual targets for GHG emissions of the EU Member States between 2013-2020 (by the Effort Sharing Decision, further referred as "Decision" or "ESD"[17]) and 2021-2030 (Effort Sharing Regulation, henceforth "Regulation" or "ESR"[18]) which are legally binding and only refer to GHG emissions that are not included within the scope of the EU ETS, i.e. transport (except aviation), buildings, agriculture (excluding LULUCF) and waste.

Based on the ESD, which was adopted in 2009 and forms part of the EU´s climate and energy policy framework for 2020, the emission limit for the Czech Republic is +9 % by 2020 compared to 2005 levels.

In accordance with Article 14 of the Decision, the European Commission prepared an evaluation of the implementation of the ESD up to 2015. The evaluation concluded that the commitments under the Decision have contributed to stimulating new national policies and measures promoting effective reductions of greenhouse gas emissions. It also found that the Decision has resulted in MS becoming more active in considering new measures to reduce emissions in those sectors within the Decision's scope, as well as in improved coordination between national, regional and local governments.

The results of the evaluation were used by the Commission when preparing the Regulation, legislation setting out binding annual greenhouse gas emission targets for MS for the period 2021-2030. The Regulation was adopted in 2018 and maintains the main elements of the ESD architecture, including the binding annual greenhouse gas emission targets for each Member State. The main changes in the Regulation from the current Decision are as follows:

- Existing flexibilities under the ESD (e.g. banking, borrowing, buying and selling) are retained, and two new flexibilities are added to allow for a fair and cost-efficient achievement of the targets. These are:
    - A one-off flexibility to transfer a limited amount of allowances from the EU ETS: This allows eligible MS to achieve their national targets by covering some emissions in the non-ETS sectors with EU ETS allowances which would normally have been auctioned.
    - A new flexibility to transfer a limited amount of credits from the land use, land use change and forestry sector (LULUCF): To stimulate additional action in the LULUCF sector, the proposal permits MS to use up to 280 million credits over the entire period 2021-2030 from certain land use categories to comply with their national targets.
- Emission limits will be set for each year in the 10-year period up to 2030. The limit for each year is set according to a decreasing linear trajectory. This ensures year on year reductions and adds integrity to the 2030 target because it is the culmination of reductions over 10 years rather than a stand-alone point.

In 2017, the total amount of ESD emissions was 62.4 Mt CO_2 eq.

The EU is on track to overachieve its 2020 target of reducing GHG emissions by 10% compared to 2005 in the sectors covered by the legislation. In relation to ESR**,** by 2030 the national targets will collectively deliver a reduction of 30% compared to 2005 levels. The ESR translates this commitment into binding annual greenhouse gas emission targets for each MS based on the principles of fairness, cost-

[17] Decision No 406/2009/EC - Effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

[18] Regulation (EU) 2018/842 - Binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013

effectiveness, and environmental integrity. The resulting 2030 targets range from 0% to -40% compared to 2005 levels with the Czech Republic´s emission reduction target being -14 % compared to 2005 levels.

The sectors covered account for almost 60 % of total domestic EU emissions.

Type of policy: Regulatory, Economic

Implementing entity: Ministry of the Environment

Period of implementation: ESD 2013-2020, ESR 2021-2030

Implemented in scenario: WEM

Mitigation impact: As the ESD and Regulation are a framework measure, its mitigation impact is accounted under other measures.

Sector: Energy, Transport, Industrial Processes, Agriculture, Waste

Greenhouse gas coverage: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6

4.3.4 LULUCF regulation

The Regulation on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry (LULUCF) into the 2030 climate and energy framework (LULUCF Regulation) was adopted in 2018. Further information is provided in chapter 4.4.4 of this report.

4.3.5 Governance of the Energy Union

In 2018, the regulation on the governance of the Energy Union and Climate Action entered into force.

Agreed as part of the “Clean energy for all Europeans” package, the goals of the new regulation are:

- To implement strategies and measures which ensure that the objectives of the Energy Union, in particular the EU’s 2030 energy and climate targets, and the long-term EU greenhouse gas emissions commitments are consistent with the Paris agreement;
- To stimulate cooperation between EU Member States to achieve the objectives and targets of the Energy Union;
- To promote long-term certainty and predictability for investors across the EU and foster jobs, growth and social cohesion;
- To reduce administrative burdens, in line with the principle of better regulation. This was done by integrating and streamlining most of the current energy and climate planning and reporting requirements of EU countries as well as the European Commission's monitoring obligations;
- To ensure consistent reporting by the EU and its MS under the UNFCCC and the Paris agreement, replacing the existing monitoring (Regulation (EU) No 525/2013) and reporting system from 2021 onwards.

Further, according to Regulation (EU) 2018/1999 of the European Parliament and Council on Governance of the Energy Union and Climate Action, all MS shall prepare an Integrated National Energy and Climate Plan (NECP). The final version of such plan shall be submitted to the European Commission by the end of 2019. In these plans, the MS have to set out their objectives, targets and contributions

relating to the five dimensions of the Energy Union. These dimensions include decarbonisation, energy efficiency, energy security, internal energy market, research, innovation and competitiveness. The first plan will cover the time period 2021-2030. The projections will be prepared until 2040 for all dimensions of the Energy Union. Longer term perspectives in line with the objectives of the Paris Agreement should be included where relevant and possible.

According to the new rules laid out in the Governance regulation, EU countries are also required to develop national long-term strategies by 1 January 2020, and consistency between long-term-strategies and NECPs has to be ensured.

In November 2018, the European Commission presented its strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050. An EU-wide informed debate should allow the EU to adopt an ambitious strategy by early 2020.

Type of policy: Regulatory

Implementing entity: Ministry of the Environment (Government)

Period of implementation: 2021–2050

Implemented in scenario: WEM

Mitigation impact: As this is a framework measure, its mitigation impacts will be accounted under other measures.

Sector: Cross-sectoral

Greenhouse gas coverage: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6

4.3.6 Act No. 201/2012 Coll., on Air Protection

Act No. 201/2012 Coll., on Air Protection replaced Act No. 86/2002 Coll., and its objective is to prevent air pollution as well as to reduce the level of air pollution to limit health risks, lower the environmental burden of substances discharged into the air and harming ecosystems and setting the conditions allowing for the regeneration of the environment affected. The Act transposes a number of EU Directives in the area of air protection (such as Directive 2010/75/EU, 2008/50/ES, 2016/2284 etc.), regulates obligations of source operators, defines emission limits and other operational conditions for stationary source operators.

In the last two years, two amendments to the Air Protection Law, entered force. The Act. No. 369/2016 is effective from January 1st, 2017 and includes, inter alia the possibility to control use of combustion units (boilers and heaters) located in family houses, apartments or buildings for family recreations with a view to limit pollution caused by improper service, maintenance and use of inadequate fuels or burning waste. This amendment to the Air Protection Law also strengthened the requirements on the solid-fuel local space heaters put on market that will have to comply with the eco-design requirements (Commission Regulation 2015/1185) two years earlier than in the rest of EU, from January 1st, 2020.

Another Amendment to the Air Protection Law, Act No. 172/2018 Coll. entered force on 1st September 2019 with ambitions to further increase the level of air protection with introduction of new legal instrument. Municipalities have now the authority to declare a local ordinance which can limit use of certain fuels in the domestic boilers not fulfilling defined emission parameters. This amendment has also increased the efficiency of the compulsory regular inspections of solid fuel boilers and heaters up

to 300 kW, inter alia by introduction of obligation to report the outcome of the inspection to the on-line system, where the reports would be available to the municipalities with extended powers.

Type of policy: Regulatory

Implementing entity: Ministry of the Environment (Government)

Period of implementation: Since 2002 (amendments in 2017, 2019, 2020)

Implemented in scenario: WEM

Mitigation impact: This is a framework measure and its mitigation effect is accounted in other measures.

Sectors: Energy, Industrial Processes, Agriculture, Waste

Greenhouse gas coverage: CO_2, N_2O, CH_4

4.3.7 Emission Limits in Air Protection Act (201/2012 Coll.)

The Air Protection Act (No. 201/2012 Coll.) further focuses on the transposition of certain parts of the Directive 2010/75/EU on industrial emissions (the Industrial Emissions Directive, henceforth "IED") amending and subsequently repealing Directives 96/61/EC and 2008/1/EC.

The law provisions of the amended Directives were obligatory for new installations from the year 2003 and for existing installations from the year 2012. The new IED Directive is applied from 2016.

The IED sets stricter emission limits for selected basic pollutants (in comparison to repealing Directives) and requires the use of the best available techniques (henceforth "BAT").

The IED aims at minimizing pollution from various industrial sources. The operators of industrial installations operating activities covered by Annex I of the IED are required to obtain an integrated permit from the authorities in the EU countries. The permit conditions including emission limit values must be based on the use of BAT. The BAT conclusions (documents containing information on the emission levels associated with BAT) serve as references for setting permit conditions.

Certain parts of the IED are implemented into the Czech legislation also by the Act No. 69/2013 Coll. amending the Act No. 76/2002 Coll., on Integrated Prevention and Pollution Control.

Type of policy: Regulatory

Implementing entity: Ministry of the Environment (Government)

Implemented in scenario: WEM

Mitigation impact: The Air Protection Act and the Act on Integrated Prevention and Pollution Control have an indirect impact on GHG emissions through the emission limits for basic pollutants and through the use of BAT. The strict emission limits are expected to have an important impact especially on coal-fired power plants and combined power and heat plants. The CO_2 emission reduction is derived from expected decommissioning of electricity and heat sources. This is a framework measure and its mitigation effect is accounted in other measures.

Tab. 4-6 Expected emissions reduction of IPPC (IED)

	2015	2020	2025	2030	2035
Emissions reduction [kt CO_2]	500	2 600	2 746	2 746	2 746

Source: CHMI

It is expected that this Act has forced emission polluters not only to phase-out or reconstruct (e.g. installation of new boilers) some less efficient and outdated facilities, but also indirectly to switch to cleaner fuels like natural gas or biomass.

Sectors: Energy, Industrial Processes, Agriculture, Waste

Greenhouse gas coverage: CO_2

4.3.8 National Emissions Reduction Programme

The National Emissions Reduction Programme (henceforth "NERP") is the fundamental conceptual material in the area of air quality and reduction of emissions from air pollution sources. It is processed on the basis of Article 8 of the Act No. 201/2012 Coll., on Air Protection, as amended. The current Programme was approved in December 2015 by a resolution of the Czech Government No. 978. It comprises of analyses of the state of air and its development in the Czech Republic, causes of air pollution, emissions of pollutants from particular sectors of national economy, air pollution scenarios, international commitments of the Czech Republic as well as their fulfilment. The NERP also defines procedures and measures to remedy current substandard state of air, goals in the area of air pollution reduction, and terms of their attainment including the assignment of responsible authorities for the measures´ implementation.

For the implementation of the Programme a set of 23 measures has been introduced at the national level directly aimed to reduce emissions and to improve air quality. These measures are assigned to each central authority of the state administration to be accomplished and are described in detail on cards of measures. The measures are to be implemented in the transport sector (15 measures), agriculture sector and energy sector including household heating, predominantly in the form of legislative changes and economic instruments.

The programme establishes procedures and measures for the improvement of the unsatisfactory state of air quality, sets targets in the area of air pollutants reduction, sets measures for emission reduction, and assigns responsible authorities for their realization. The programme operates with various scenarios of potential future development and establishes unsurpassable national emission values for the year 2020 for pollutants including sulfur dioxide, nitrogen oxides, volatile organic compounds, ammonia and fine particulate matters $PM_{2.5}$ that go beyond the targets of the revised Gothenburg protocol and Directive 2016/2284 for 2020. To achieve these emission levels, specific sector-dependent emission ceilings have also been set.

Following the approval of the Directive 2016/2284 on the reduction of national emissions of certain atmospheric pollutants, the NERP is being updated to comply with the requirements of the National Air Pollution Control Plan required by the Directive. Approval of the update is envisaged for December 2019 or later, depending on the outcomes of the strategic environment assessment.

Type of policy: Regulatory

Implementing entity: Ministry of Environment (Government)

Implemented in scenario: WEM

Mitigation impact: This is a framework measure and its mitigation effect is accounted in other measures.

Sector: Energy; Industrial processes and product use; Transport, Agriculture**,**

Greenhouse gas coverage: CH_4, N_2O, CO_2

4.4 Sectoral Policies and Measures

4.4.1 Energy Sector

Policies and Strategies

a) State Energy Policy

The State Energy Policy (henceforth "SEP") is the main strategic document for the energy sector in the Czech Republic. The Policy is cross-sectional as it serves as the framework strategic document for the national level.

The new SEP was approved by the Government in May 2015 and replaced the previous SEP from the year 2004. The SEP is codified in Act No. 406/2000 Coll., on Energy Management. A time horizon of SEP is 25 years, with expected evaluation at least every five years and annual assessments of implementation measures. According to the aforementioned legislation, the SEP is binding for the government and state institutions and sets targets by the year 2040.

The main purpose of the SEP is to ensure reliable, secure and environmentally-friendly supply of energy to meet the needs of the population and economy of the Czech Republic, at competitive and acceptable prices under standard conditions. It must also secure uninterrupted energy supply in crisis situations to the extent necessary to ensure the functioning of the main components of the state and the survival of the population.

The SEP (2015) has three strategic objectives – the security of energy supply, competitiveness, and sustainability. These three strategic objectives are further translated into more concrete strategic priorities of the energy sector in the Czech Republic, namely i) balanced energy mix; ii) savings and efficiency; iii) infrastructure and international cooperation; iv) research, development and innovation; and v) energy security.

The indicative targets are set by the SEP for the year 2040 and are expressed in terms of corridors that ensure a balanced mix of sources for electricity generation and corridors for the composition of a diversified mix of primary energy sources. The use of domestic primary sources is prioritised (desired level of 80% of domestic sources in gross electricity production) as well as keeping import dependence at an acceptable level.

Target structure of electricity generation for the year 2040 is as follows:

Nuclear fuel	46-58%

Renewable and secondary sources	18-25%
Natural gas	5-15%
Brown and black coal	11-21%

Target structure of primary energy sources (for the year 2040):

Nuclear fuel	25-33%
Solid fuels	11-17%
Gas fuels	18-25%
Liquid fuels	14-17%
Renewable and secondary sources	17-22%

The SEP also includes other indicative indicators and targets. These should ensure the tracking of the progress and enable assessment of possible needs for SEP updates. The SEP has also a dedicated section for implementation instruments, those are mainly: i) legislative instruments; ii) instruments in the area of state administration; iii) fiscal and tax instruments; iv) foreign policy instruments; v) instruments in education and support for science and research; vi) exercise state ownership rights in energy companies in which the Czech Republic has an ownership interest; and vii) communication and media promotion.

Type of Policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: 2015-2040

Implemented in scenario: WEM

Mitigation impact: This is a framework measure and its mitigation effect is accounted in other measures.

Sectors: Energy, Transport, Industrial Processes (in general all combustion processes)

Greenhouse gas coverage: CO_2

b) National Renewable Energy Action Plan (NREAP)

The Plan implements the Renewable Energy Directive 2009/28 (henceforth "RED Directive") which requires the EU Member States to cover a specified percentage of final energy demand by renewable energy in 2020. The Czech Republic is committed to achieve 13% share of RES in 2020, while the total EU target is 20%.

The main aim of the RED Directive is to establish a common framework for the promotion of energy from renewable energy sources and its principal requirements include the following points:

- Mandatory national overall targets and measures for the use of energy from renewable sources;

- National renewable energy action plans;
- Calculation of the share of energy from renewable sources;
- Statistical transfers between Member States;
- Joint projects between Member States;
- Effects of joint projects between Member States;
- Joint projects between Member States and third countries;
- Effects of joint projects between Member States and third countries;
- Joint support schemes, etc.

The RED Directive requires that each EU Member State submits a National Renewable Energy Action Plan (henceforth "NREAP") describing how it plans to achieve its 2020 target. The Czech NREAP was submitted to the EC in July 2010 and was subsequently updated in July 2012 and in December 2015. The NREAP currently proposes for 2020 a higher share of RES in final energy consumption (15.3%) in comparison to the target of Directive 2009/28/EC (13%). The main renewable energy sources in the Czech Republic are biomass, followed by biofuels in transportation, biogas, hydropower and photovoltaic solar energy.

The NREAP is evaluated every two years by the Ministry of Industry and Trade. The results are reported to the Government and the European Commission.

Type of Policy: Economic, Fiscal

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: 2010-2020

Implemented in scenario: WEM

Mitigation impact: The plan establishes a framework for fulfilling the binding targets according to two following tables.

Tab. 4-7 Share of RES on final consumption of energy in 2005 and the target according to Directive 2009/28/EC

	2005	2020
RES consumption [PJ]	76.2	161.7
The share of RES [%]	6.1	13

Source: European Commission

Tab. 4-8 Share of RES on final consumption of energy according to NREAP (2015) and draft National Energy and Climate Plan based also on revised methodology for 2005 data (NECP, 2019)

	2005 (NREAP)	2020 (NREAP)	2005 (NECP)	2020 (NECP)
RES consumption [PJ]	76.2	172.9	82.5	182,8
The share of RES [%]	6.1	15.3	7.09	16,3

Source: MoE, MIT

The impacts of the plan are reported under other measures supporting the introduction of RES.

Sectors: Energy

Greenhouse gas coverage: CO_2, CH_4

c) National Energy Efficiency Action Plan (NEEAP)

The National Energy Efficiency Action Plan (henceforth "NEEAP") sets the national target for energy savings and describes existing and planned measures to reach this target. It implements the Directive 2012/27/EU that establishes a set of binding measures to reach the EU 20% energy efficiency target by 2020. Under the Directive, all EU countries are required to use energy more efficiently at all stages of the energy chain, from production to final consumption.

National measures must ensure major energy savings for consumers and industry, for example:

- Energy distributors or retail energy sales companies have to achieve 1.5% energy savings per year through the implementation of energy efficiency measures;
- EU countries can opt to achieve the same level of savings through other means, such as improving the efficiency of heating systems, installing double glazed windows or insulating roofs;
- The public sector should purchase energy efficient buildings, products and services;
- Every year, governments in EU countries must carry out energy efficient renovations on at least 3% (by floor area) of the buildings they own and occupy;
- Energy consumers should be empowered to better manage consumption. This includes easy and free access to data on consumption through individual metering;
- National incentives for SMEs to undergo energy audits;
- Large companies will make audits of their energy consumption to help them identify ways to reduce it;
- Monitoring efficiency levels in new energy generation capacities.

The NEEAPs set out estimated energy consumption, planned energy efficiency measures, and the improvements a country expect to achieve. Under the Energy Efficiency Directive, EU countries must draw up these plans every three years.

The indicative national target defined in Article 3 of Directive 2012/27/EU is a framework, non-binding target. The latest update of the NEEAP from 2017 sets the target for the Czech Republic at 51.10 PJ of new final energy savings by 2020. The slight increase of the target follows the revision of energy statistics by Eurostat.

Article 7 of the Directive establishes a binding end-use energy savings target by 2020 equivalent to achieving new annual savings of 1.5% of the annual energy sales to end customers.

Tab. 4-9 Calculation of the binding savings target stipulated in the Directive, Article 7 (2)

Year	2017	2018	2019	2020
Savings [PJ]	38.93	48.66	58.40	68.13

Source: MIT

Type of policy: Economic, Fiscal, Information, Voluntary

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: 2008-2020

Implemented in scenario: WEM

Mitigation impact: This is a framework measure, its mitigation effect is accounted in other measures

Sectors: Energy, Transport, Industrial Processes (in general all combustion processes)

Greenhouse gas coverage: CO_2

Legislative Instruments

a) Act No. 406/2000 Coll., on energy management

This Act transposes relevant EU legislation including the Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings, Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and subsequently repealing Directives 2001/77/EC and 2003/30/EC, Directive 2009/125/EC establishing a framework to set mandatory ecological requirements for energy-using and energy-related products, Regulation (EC) No 1222/2009 of the European Parliament and of the Council of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters, Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources on energy-related products, Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings and Directive 2012/27/EU of the European Parliament and the Council of 25 October 2012 on energy efficiency.

The Act stipulates requirements for efficiency of energy use (construction and reconstruction of the electricity generation plant, heat generation plant and combined heat and power generation plants, inspections of boilers and hot water supply, including the internal distribution of thermal energy in buildings and inspection of air conditioning systems). The Act further defines the requirements for the gradual reduction of energy consumption by 2020 and introduces energy performance certificates. It also includes energy performance requirements for electrical appliances and introduces their certificates, while also introducing mandatory and voluntary energy audit and energy assessment and setting professional requirements for energy specialists who can handle these instruments.

Act No. 318/2012 Coll., on energy management, the substantial amendment of Act No. 406/2000 Coll., stipulates specific measures leading to gradual reduction of energy intensity of buildings, in particular:

- Efficiency of energy use – A producer of electricity or thermal energy is obliged, in newly established installations, to provide for at least the minimum efficiency of energy use stipulated by an implementing legal regulation. This obligation also applies to installations for production of electricity or thermal energy in which a change is introduced in previously completed structures. Owners are obliged to regularly perform checks of operating boilers, and heat distribution and air conditioning systems.

- Energy intensity of buildings – A builder, building owner or association of owners of units must provide for compliance with the requirements on the energy intensity of buildings and compliance with comparative indicators and also compliance with the requirements stipulated by the relevant technical standards. An implementing legal regulation stipulates the requirements on the energy intensity of buildings, comparison indicators, the method of calculation of the energy intensity of buildings and other details. Buildings, which are owned by a public entity must have nearly zero energy consumption as of January 1, 2018.

- Energy Performance Certificate – In case of new building or building undergoing a renovation, or before a sale or a lease of a building, the owner: of the building is obliged to acquire an energy performance certificate.

- Energy audit – The Act regulates conditions for obligatory energy audits, which are focused on analyses and recommendations on how to reduce energy consumption and costs in a defined building or energy installation.

- Energy labelling – Energy-related products covered by the Commissions´ regulations are provided with a label in order to inform customers about the energy efficiency and other resources use of products, thereby encouraging them to buy more energy efficient goods. The label contains information that indicates the operating costs and the electricity consumption and is displayed on the product. It is the responsibility of the supplier to provide a label and a document with necessary information with the product.

- Eco-design – Specific requirements for each product group covered by Commission regulations are set in order to encourage manufacturers to design products in an environmentally friendly way with the lowest possible negative environmental impact. It is the responsibility of the manufacturer or the authorized representative that the product complies with the eco-design requirements when placed on market or put into service.

The Act No. 406/2000 Coll. was amended also by the Act No. 310/2013 Coll. specifically in the issues concerning persons authorized to build “RES-utilizing installations”, renewable sources of energy-utilizing installations.

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: Since 2000

Implemented in scenario: WEM

Mitigation impact: This is a framework measure and its mitigation effect is accounted in other measures. For instance, in relation to the application of eco-design, the annual energy savings were calculated in the NEEAP III of the amount of 1230 TJ/year by 2020.

Sectors: Energy

Greenhouse gas coverage: CO_2

b) Directive 2012/27/EU on energy efficiency (Article 5, Article 7)

According to the Article 5 of the Directive, 3 % of the total floor area of heated and/or cooled buildings owned and occupied by its central government has to be renovated each year to meet at least the minimum energy performance requirements.

According to the Article 7 of the Directive, the MS should annually achieve or secure specific amount of new energy savings (in PJ) on final energy consumption side through specific measures introduced by government or private entities or mix of both. The Czech Republic has decided to achieve its 50.67 PJ target by 2020 via so-called "alternative scheme" which counts the energy savings achieved thanks to individual governmental sub-programmes which are focused on support of households, municipalities and companies´ energy saving projects.

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: 2012-2030

Implemented in scenario: WEM

Mitigation impact: This is a framework measure and its mitigation effect is accounted in other measures.

Sectors: Energy

Greenhouse gas coverage: CO_2

c) Directive 2010/31/EU on the energy performance of buildings

The measure stipulates minimum requirements as regards the energy performance of new and existing buildings, requires the certification of their energy performance and the regular inspection of boilers and air conditioning systems in buildings.

The Directive is transposed by the Act No. 318/2012 Coll., on energy management. The directive defines new administrative tools to reduce energy consumption of buildings. It defines a building with nearly zero energy consumption. It tightens requirements for energy building performance with the aim to reduce energy consumption and emission of GHG by 20% and increase the share of renewable sources of energy (henceforth "RES").

Energy building performance is defined as calculated/measured typical energy consumption which also includes energy used for heating, ventilation, cooling, air-conditioning, hot water and lighting.

Not only energy performance, but also optimal economic costs are emphasized. In 2011 the European Commission issued a methodological framework for the calculation of optimal cost levels for minimal requirements on energy building performance.

Until 2020, all new buildings shall be buildings with nearly zero energy consumption. From 2019 all new buildings used or owned by public administration shall be buildings with nearly zero energy consumption. According to the Directive "a building with nearly zero energy consumption" is a building with very low energy consumption. The energy performance shall be estimated in compliance with the Directive methodology. The low consumption should be mainly covered by RES.

The energy performance certificates according to the Recast directive contain new information, e.g. besides energy performance and reference values (minimal requirements for energy performance) also recommendations for decreasing of energy consumption taking into account cost optimization. Contact to other information sources, especially regarding cost efficiency shall be included in the certificate as well.

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: Since 2010

Implemented in scenario: WEM

Mitigation impact: Emission reduction effects are shown in Table 4-10 below.

Tab. 4-10 Emissions reduction expected from implementation of Directive 2010/31/EU

Emissions reduction [kt CO_2 eq.]	2020	2025	2030	2035	2040
	532	474	446	446	446

Source: CHMI

Sectors: Energy

Greenhouse gas coverage: CO_2

d) Directive 2009/125/ES on eco-design

Eco-design is a method for the design and development of products, which also emphasizes a minimum negative impact of a product on the environment (including energy consumption). A set of requirements are imposed on products which must be met before products enter the market and which also ensures energy efficiency for manufacture, usage and disposal of products.

The eco-design directives have been implemented into the Czech legislation by the Energy Management Act No. 406/2000 Coll. and by its amendment 393/2007 Coll. Under the EU directive a set of regulations requires a minimal energy efficiency of new electric appliances. Products categories included in the regulations and reflected in the projections are:

- Air conditioners and comfort fans;
- Air heating and cooling products;
- Circulators;
- Computers;
- Domestic cooking appliances;
- Electric motors;
- External power supplies;

- Household dishwashers;
- Household washing machines;
- Industrial fans;
- Lighting products in the domestic and tertiary sectors;
- Local space heaters;
- Heaters and water heaters;
- Power transformers;
- Professional refrigerated storage cabinets;
- Refrigerators and freezers;
- Simple set-top boxes;
- Standby and off mode electric power consumption of household and office equipment, and network standby;
- Televisions;
- Vacuum cleaners;
- Ventilation units;
- Water pumps.

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: Since 2009

Implemented in scenario: WEM

Mitigation impact: Application of the eco-design leads to electricity savings. The annual energy savings were calculated in the NEEAP III of the amount of 1230 TJ/year by 2020. The expected emissions reduction effects are shown in the Table 4-11 below.

Tab. 4-11 Emissions reduction expected from implementation of Directive 2009/125/ES on eco-design

Emissions reduction [kt CO_2 eq.]	2020	2025	2030	2035	2040
	438	484	466	363	363

Source: CHMI

Sectors: Energy

Greenhouse gas coverage: CO_2

e) Act No. 165/2012 Coll., on supported sources of energy

This Act was amended by Act No. 310/2013 Coll., on support of energy sources (SES Act), as amended by Act No. 407/2012 Coll., and other laws. The amendment has cancelled the support provided to some types of new electricity generating facilities from renewable sources since 2014, with one-year transition, allowing completion of projects in progress. It also defines the maximum fee levied for the support of renewable sources, which will be collected from customers within the regulated price of electricity and introduces levy on electricity generated from solar radiation effective as of January 1st, 2014 for facilities put into operation in 2010.

The Act transposes Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

This Act regulates:

a) Support provided to generation of electricity, heat and bio-methane from RES, secondary energy sources ("secondary source"), highly efficient combined production of electricity and heat and decentralized electricity generation, exercise of state administration and related rights and obligations of persons involved,

b) Content and creation of the National Action Plan of the Czech Republic for energy from RES ("National Action Plan"),

c) Conditions for issue, record-keeping and acknowledging guarantees of energy originating from RES,

d) Conditions for certification on origins of electricity generated from highly efficient combined production of electricity and heat or from secondary sources,

e) Financing of the support of electricity generated from supported sources, heat from RES, decentralized electricity production, bio-methane and provision of subsidy to market operator to cover these expenses,

f) Levies on electricity generated from solar radiation,

g) Increase of the share of RES on consumption of primary energy sources,

h) Creation of conditions for the fulfilment of binding share of energy from RES on the gross final consumption of energy in the Czech Republic while simultaneously reflecting interests of the customers on minimising the impacts on energy prices in the Czech Republic.

The main purpose of this amendment to the SES Act was to introduce measures aimed to stabilize the impact of support for energy from RES on the Czech industry competitiveness and on the citizen's energy bills of the Czech Republic due to the increasing financial burden of this support.

Key changes to the SES Act included namely:

- Suspension of support for electricity from RES (excluding hydropower plants with an installed capacity of up to 10 MW) generated in plants commissioned after 31 December 2013;
- Suspension of support for production of bio-methane after 31 December 2013 (due to the length of time required to finish installations under construction;
- Support for wind power plants (with valid building permit as of 1 October 2013) commissioned by 31 December 2014 and hydropower plants with an installed capacity of over 10 MW commissioned by 31 December 2015 shall be maintained);
- Continued support for secondary sources, in particular waste for incinerators;
- Cessation of support for decentralized production;
- Continuation of solar levy for installations commissioned in the year 2010;

- Fixing the contribution to the supported RES in cost of electricity for end consumers.
- Separation of the price component for support of RES and other supported sources from the prices for electricity transmission and distribution and its inclusion in a special price to cover costs associated with support for electricity and heat and setting a ceiling for this price at CZK 495/MWh;
- Change in the solar levy on electricity generated after January 1st, 2013.
- As of 31 July 2014, aid recipients will be required to disclose their owners (in response to passing of Act No. 134/2013 Coll., on Certain Measures to Improve Transparency of Joint Stock Companies and on Amendments to Other Laws).

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: Since 2013

Implemented in scenario: WEM

Mitigation impact: This policy is a framework measure and thus its mitigation effect is accounted under other measures

Sectors: Energy

Greenhouse gas coverage: CO_2, CH_4

f) Directive 2009/28/ES on the promotion of the use of energy from renewable sources (Preferential feed-in tariffs for electricity produced from renewable energy sources)

Preferential feed-in tariffs (Act 165/2012 Coll.), together with obligation of distribution companies to connect sources using renewables and to purchase the produced electricity, serve as a main tool for the promotion of RES in the CR.

Act 165/2012 Coll. transposes Directive 2009/28/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market.

According to National Renewable Energy Action Plan 2020 the target of 15.3% share of renewable energy in electricity production will be met.

Type of policy: Economic

Implementing entity: Energy Regulatory Authority (Government)

Period of implementation: Since 2009

Implemented in scenario: WEM

Mitigation impact: We attributed 50% of new installation of biomass and biogas CHPs and 100% of new installations in solar, wind and small hydro power plants to this measure. The emission reduction was calculated from expected electricity production and average system emission coefficient for electricity production.

Tab. 4-12 Emissions reduction expected from introduction of preferential feed-in tariffs for electricity produced from RES

Emissions reduction [kt CO_2 eq.]	2015	2020	2025	2030	2035	2040
	3 229	3 242	3 873	4 047	3 610	3 191

Source: CHMI

Sectors: Energy

Greenhouse gas coverage: CO_2

g) Act No. 458/2000 Coll., on business conditions and public administration in the energy sectors (Energy Act)

The Act transposes relevant EU legislation[19], includes directly applicable EU legislation[20] and sets conditions for business, for public administration and for energy regulation (electricity, gas and heat) while also regulating rights and obligations of natural persons and legal entities. It concerns organization of business activities in the energy sector while maintaining economic competition, meeting the needs of consumers, rights of license holders and ensuring safe, secure and stable supply of electricity, gas and heating at acceptable prices.

The last amendment of the Act No. 131/2015 Coll. removed some administrative barriers for small photovoltaic installations (up to 10 kW), which are no longer subject to licensing and introduced support for heat from biomass installations.

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: Since 2000

Implemented in scenario: WEM

[19] Directive 2009/72/EC of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC.

Directive 2009/73/EC of the European Parliament and of the Council concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC.

Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC

Directive 2005/89/EC of the European Parliament and of the Council concerning measures to safeguard security of electricity supply and infrastructure investment.

Directive 2011/83/EU of the European Parliament and of the Council on consumer rights, amending Council Directive 93/13/EEC and Directive 1999/44/EC of the European Parliament and of the Council and repealing Council Directive 85/577/EEC and Directive 97/7/EC

[20] Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission network.

Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity.

Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators.

Council Regulation No 617/2010 of 24 June 2010 concerning the notification to the Commission of investment projects in energy infrastructure within the European Union.

Regulation (EU) No 994/2010 of the European Parliament and of the Council of 20 October 2010 concerning measures to safeguard security of gas supply.

Mitigation impact: This is a framework measure and its mitigation effect is included in other measures.

Sector: Energy

Greenhouse gas coverage: CO_2

Financial Schemes and Programmes

a) State Program to Support Energy Savings and Use of Renewable Energy Sources (EFEKT)

The EFEKT is a national plan developed to promote measures to increase energy efficiency and to incentivize the use of renewable and secondary energy sources in accordance with the approved State Energy Policy and sustainable development principles. Specifically, it supports energy information distribution, awareness raising activities, organization of public seminars, energy information centers and small investment actions leading to energy savings and the use of RES. The sectors covered are the state administration, local (municipalities) and regional governments, schools, social and health care facilities, private sector (undertakings), households and NGOs.

The State Programme to Promote Energy Savings and the Use of Renewable Sources of Energy was adopted by Government Resolution No. 1105/2004. Its scope and funding is defined in Act No. 406/2000 Coll., on energy management (as amended by Act No. 61/2009 Coll.).

This programme represents the implementation tool for the State Energy Policy and Czech commitments toward the EU in the area of energy efficiency. It is supplemental programme to energy programmes financed from the EU Structural Funds.

The State Programme to Promote Energy Savings and the Use of Renewable Sources of Energy focuses on reducing energy consumption, use of renewable and secondary energy sources in line with economic and social needs, sustainable development and protection of the environment. Besides that it focuses on education, energy planning, small-scale investment actions and pilot projects. The most significant emission reductions have been achieved in the energy sector, protection of the environment area, renewable sources energy (RES) and energy savings in industry and in housing sector.

The Programme has been implemented during its initial run (since 2005) not only by the Ministry of Industry and Trade (which coordinates the entire programme), but also by ten other ministries. Since 2007, the programme has been renamed to Programme EFEKT, and as such it has been fully implemented only by MIT. The Programme EFEKT has provided support for various projects during the 2007-2013 period.

In 2016, the programme has been amended for the 2017-2021 period and is now called *State programme to promote energy savings*. The yearly budget has been increased to CZK 150 mil. The new so called EFEKT 2 is particularly aimed at soft measures such as promoting education and raising awareness in the area of energy savings, but also at smaller scale investment actions and pilot projects. The new programme does not support the use of renewable energy anymore and focuses solely on energy efficiency measures. One of the most important supported areas of the programme is increasing energy efficiency in public lighting systems.

Type of policy: Economic (subsidies), Education, Information, Research

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: 2004-2016, since 2007 ongoing as the EFEKT Programme is implemented only by the Ministry of Industry and Trade

Implemented in scenario: WEM

Mitigation impact: The expected energy savings of the Programme EFEKT are shown in the table below.

Tab. 4-13 Expected energy savings of programme EFEKT

	2020	2025	2030	2035	2040
Energy savings [TJ]	298	298	298	298	298

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-14 Expected emissions reduction of programme EFEKT

	2020	2025	2030	2035	2040
Emissions reduction [kt CO_2 eq.]	21.81	20.10	19.29	17.72	15.07

Source: CHMI

Only new effects after 2015 are included in the tables.

The energy savings in 2020 are expected to be 298 TJ. The budget of the program is estimated to be CZK 0.1 bill. The programme undergoes annual evaluation to update contents and budgets of the individual parts of the programme.

Sector: Energy

Greenhouse gas coverage: CO_2

b) State Programme on the Promotion of Energy Savings (EFEKT 2)

The programme financially supports the increase of energy efficiency through awareness raising and educational activities, energy consultancy centres and expert training. It is a crosscutting programme and the target sectors are the state administration and local governments, private sector, households and NGOs. This programme also supports the following activities: measures to reduce energy intensity of public street lighting; heating system reconstruction and heat generation in buildings; publications, guides and informative materials about the energy sector; introduction of an energy management system; preparation of energy-saving projects financed using the Energy Performance Contracting method. The budget of the program is estimated to be CZK 0.7 bill. for the period 2017-2020. The program contributes to reach the energy target according to Directive 2012/27/EU on energy efficiency.

Type of policy: Economic (subsidies), Education, Information, Research

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: Since 2017

Implemented in scenario: WEM

Mitigation impact: The expected programme energy savings are shown in the following table.

Tab. 4-15 Expected energy savings of programme EFEKT 2

	2020	2025	2030	2035	2040
Energy savings [TJ]	778	778	778	778	778

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-16 Expected emissions reduction of programme EFEKT 2

	2020	2025	2030	2035	2040
Emissions reduction [kt CO_2 eq.]	57.05	52.58	50.46	46.35	39.43

Source: CHMI

Sectors: Energy

Greenhouse gas coverage: CO_2

c) New GREEN SAVINGS Programme 2013

The New Green Savings Programme 2013 was a subsidy program of the Ministry of the Environment (administrated by the State Environmental Fund) focused on energy savings and the use of renewable energy in single-family houses.

The program exclusively focused on the insulation of family houses in combination with the replacement of inefficient boilers using solid fuels. The program further supported the installation of solar systems for hot water.

Type of policy: Economic

Implementing entity: State Environmental Fund (Government)

Period of implementation: In 2013 only

Implemented in scenario: WEM

Mitigation impact: The expected programme energy savings are shown in the following table.

Tab. 4-17 Expected energy savings of the New Green Savings Programme 2013

	2020	2025	2030	2035	2040
Energy savings [TJ]	103	103	103	103	103

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-118 Expected emissions reduction related to energy savings of the New Green Savings Programme 2013

	2020	2025	2030	2035	2040
Emissions reduction [kt CO_2 eq.]	5.01	4.35	4.05	3.76	3.42

Source: CHMI

Sector: Energy, Residential

Greenhouse gas coverage: CO_2

d) New Green Savings Programme

This programme is a follow-up of previously implemented Green Savings Program and New Green Savings Program 2013. It is implemented by the State Environmental Fund of the Czech Republic and it aims at the improvement of energy performance of single- and multi-family buildings (insulation, replacement of old inefficient boilers by new boilers using e.g. biomass; installation of heat pumps and solar systems for hot water). The Program is financed from EU ETS auction revenues and the expected allocation until 2021 is 27 billion CZK.

The programme supports the following activities in single-family houses, multi-family houses and also in public sector buildings:

- Improvement of the energy performance of existing single- and multi-family buildings
- Construction of single- and multi-family buildings with very high energy performance
- Efficient use of energy sources (e.g. biomass boilers, biomass fireplace stoves with a heat exchanger, heat pumps, gas condensing boilers, solar systems for heating and hot water, installation of mechanical ventilation systems with heat recovery)

The expected annual budget for the period 2014-2020 is estimated to be about CZK 18.7 bill. (USD 719.2 mill.)

Type of policy: Economic

Implementing entity: State Environmental Fund (Government)

Period of implementation: 2014-2020

Implemented in scenario: WEM

Mitigation impact: The expected programme energy savings shows the following table.

Tab. 4-19 Expected energy savings of the New Green Savings Programme 2014–2020

Energy savings [TJ]	2020	2025	2030	2035	2040
	9 074	9 074	9 074	9 074	9 074

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-20 Expected emissions reduction related to energy savings of the New Green Savings Programme 2014–2020

Emissions reduction [kt CO_2 eq.]	2020	2025	2030	2035	2040
	529.50	467.67	437.83	404.26	364.01

Source: CHMI

Sector: Energy, Residential

Greenhouse gas coverage: CO_2

e) Programme PANEL / NEW PANEL / PANEL 2013 +

The Programme PANEL (NEW PANEL since 2009, PANEL 2013 + since 2013) supports complex renovation and upgrades of residential houses improving their value, lowering their energy intensity and fundamentally extending their lifetime. The program is managed by the State Housing Development Fund.

The Programme was established in 2001 by the Government Resolution No. 299/2001 Coll. According to the Resolution, support may be provided to:

- Natural persons or legal entities owning or co-owning a building;
- Natural persons or legal entities owning or co-owning flats or non-residential premises in a building;
- Flat-owners' associations.

Support was provided for specific types of measures or upgrades in panel houses using standardized construction systems. This support was later extended to all residential houses regardless of their construction system.

Projects supported include e.g.:

- Insulation of the building
- Replacement of old external doors and windows to decrease releasing of heat and outside noise
- Reparation and insulation of roofs

- Installation of a heating system regulation
- Modernization of a heating system, including the use of RES
- Repair or modernization of ventilation technology
- Installation of thermo-solar panels
- Installation of measurement devices for heat consumption, hot and cold water consumption
- Modernization of the hot water system (e.g. lever taps replacement, riser pipe insulation)
- Acquisition of building energy performance certificate

Support was provided in the form of:

- Guarantee for loan provided,
- Subsidy toward partial interest from loans.

Since 2013, this programme has been implemented pursuant to Government Resolution No. 468/2012. The support takes the form of a low-interest loan in the programme PANEL 2013 +.

The Ministry of Industry and Trade evaluation of the State Programme to Promote Energy Savings and the Use of Renewable Sources of Energy in 2016 demonstrated that energy savings in all so far renovated apartments receiving PANEL or New Panel support amounted to approximately 5 852 304 GJ.

The expected annual budget for the period 2014–2020 is estimated to be about CZK 4.5 bill.

Type of policy: Economic

Implementing entity: State Housing Fund (Government)

Period of implementation: Since 2001, temporarily suspended in 2010, continues in 2013, will continue until 2020 and includes annual evaluation and budgeting exercise

Implemented in scenario: WEM

Mitigation impact: The expected programme energy savings shows the following table.

Tab. 4-21 Expected energy savings of the PANEL programme

	2020	2025	2030	2035	2040
Energy savings [TJ]	204	204	204	204	204

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-22 Expected emissions reduction related to energy savings of the PANEL programme

	2020	2025	2030	2035	2040
Emissions reduction [kt CO_2 eq.]	17.16	16.05	15.54	14.58	13.29

Source: CHMI

Sectors: Energy, Residential

Greenhouse gas coverage: CO_2

f) Operational Programme Environment 2007-2013

The Operational Programme Environment 2007-2013 was focused on improving the quality of the environment in the Czech Republic. It helped to improve air, water and soil quality. It also addressed waste and industrial pollution. The program promoted landscape care, the use of renewable sources and the building of environmental infrastructure.

This program was primarily focused on the public sector (e.g. municipalities, regions, organizations partly funded from the public purse, state enterprises, non-governmental non-profit organizations). However, in certain areas also business entities and natural persons were included.

The Operational Programme Environment 2007-2013 had eight priority axes. In terms of energy savings, the priority axis 3 was the most significant. This priority axis supported projects for the construction or reconstruction of facilities using renewable energy sources and cogeneration and projects aimed at energy savings and the reuse of waste heat in the non-business sector. Priority axis 2 was also significant. It focused on improving air quality, which also resulted in reduction of energy consumption.

According to the final programme report, the total certified costs reported to the EC of realized projects were EUR 1,069 mill.

Type of policy: Economic

Implementing entity: State Environmental Fund (Government)

Timeframe: 2007-2013

Implemented in scenario: WEM

Mitigation impact: The final programme report declares the following energy savings.

Tab. 4-23 Energy savings of Operational Program Environment 2007–2013

	2020	2025	2030	2035	2040
Energy savings [TJ]	824	824	824	824	824

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-24 Emissions reduction related to energy savings of Operational Program Environment 2007–2013

Emissions reduction [kt CO_2 eq.]	2020	2025	2030	2035	2040
	92.77	81.25	74.07	65.50	53.32

Source: CHMI

Besides energy savings, the programme supported use of RES as well. The calculation of emissions savings uses amounts of electricity and heat produced from RES, again with respect to development of fuel mix used for electricity and heat production. The following table shows electricity and heat production from RES as indicated in the final programme report ant the derived emission drops.

Tab. 4-25 Energy production from RES and reached emissions reduction of Operational Program Environment 2007–2013

	2020	2025	2030	2035	2040
Electricity generation from RES [TJ]	2.3	2.3	2.3	2.3	2.3
Heat generation from RES [TJ]	242.3	242.3	242.3	242.3	242.3
GHG emissions reduction [kt CO_2 eq.]	26.9	23.8	22.2	20.4	17.9

Source: CHMI

Sectors: Energy

Greenhouse gas coverage: CO_2

g) Operational Programme Environment 2014-2020

The aim of the Operational Programme Environment 2014-2020 is to protect and improve the quality of the environment in line with the principles of sustainable development in the Czech Republic. Two priority axis relevant to GHG emission reductions are priority axis 2 - Improvement of Air Quality and priority axis 5 – Energy Savings. For the programming period 2014-2020 the total allocation is more than EUR 3 billion including about EUR 1 billion for activities improving air quality and energy efficiency. The priority axis 2 supports mainly the replacement of boilers burning solid fuels with more efficient low-emission boilers combusting biomass, liquid or gas fuels, and heat pumps. The priority axis 5 supports insulation and other energy efficiency measures in public sector and promotes increased use of renewable energy sources. It also supports the exemplary role of public administration by subsidizing construction of new public buildings in passive energy standard. The program projects are financed from the European Regional Development Fund (ERDF) and from the Cohesion Fund (CF). The expected program budget for energy savings and RES support is CZK 23.6 bill. (approx. EUR 907.7 mill.).

Type of policy: Economic

Implementing entity: Ministry of the Environment (Government)

Period of implementation: 2014-2020, all supported projects must be implemented by the end of 2023 at the latest.

Implemented in scenario: WEM

Mitigation impact: It is estimated that by 2023 the energy savings from Priority axis 2 should reach about 3 PJ and energy savings from Priority axis 5 about 2 PJ. The corresponding estimated reductions of GHG emissions are 320 kt CO_2eq for Priority axis 2 and about 300 kt CO_2eq for Priority axis 5.

The expected programme energy savings shows the following table.

Tab. 4-26 Energy savings of Operational Program Environment 2014-2020

	2020	2025	2030	2035	2040
Energy savings [TJ]	4 023	4 740	4 740	4 740	4 740

Notice: The table contains not only emissions drop resulting from higher efficiency of new boilers but also drop from switching from fossil fuels to RES, because RES were calculated as energy savings.

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-27 Emissions reduction related to energy savings of Operational Program Environment 2014-2020

	2020	2025	2030	2035	2040
Emissions reduction [kt CO_2 eq.]	372.15	467.35	426.09	376.79	306.70

Source: CHMI

Besides energy savings, the programme supports use of RES as well. The programme document envisages installing 30 MWe in RES sources and heat production from RES of 150 TJ by 2023. With respect to development of fuel mix used for electricity and heat generation, the resulting mitigation impact will be:

Tab. 4-28 Energy production from RES and reached emissions reduction of Operational Program Environment 2014–2020

	2020	2025	2030	2035	2040
Electricity generation from RES [TJ]	7.9	7.9	7.9	7.9	7.9
Heat generation from RES [TJ]	150.0	150.0	150.0	150.0	150.0
GHG emissions reduction [kt CO_2 eq.]	17.8	15.7	14.6	13.3	11.6

Source: CHMI

Sectors: Energy

Greenhouse gas coverage: CO_2

h) Integrated Regional Operational Programme (IROP)

The Integrated Regional Operational Programme (IROP) is divided into the following priority axis:

- Competitive, affordable and secure regions
- Improvement of public services and living conditions for residential regions
- Good governance and the efficiency of public institutions
- Community-led local development
- Technical assistance

The priority axis 2 and its investment priority 4c "Promoting energy efficiency, intelligent systems energy management and use of energy from renewable sources public infrastructures, including in public buildings and in housing" is dealing with energy savings as well as its objective 2.5 "Reduction of energy consumption in the residential sector".

Supported measures affecting the energy performance include:

- Insulation of residential building;
- Replacement and refurbishment of windows and doors;
- Passive heating and cooling, shielding;
- Installation of systems of controlled ventilation with heat recovery.

Measures affecting equipment for space and water heating include:

- Replacement of water heating boilers using solid or liquid fossil fuels by efficient biomass boilers;
- Heat pumps;
- Condensing gas boilers or equipment for combined electricity and heat generation using RES or natural gas and covering primarily the energy needs of buildings where located.

Financial allocation of the specific objective 2.5 is EUR 622 796 485 (approximately CZK 17 billion).

Type of policy: Economic

Implementing entity: Ministry of Regional Development (Government)

Period of implementation: 2014-2020

Implemented in scenario: WEM

Mitigation impact: The expected programme energy savings shows the following table.

Tab. 4-29 Expected energy savings of the Integrated Regional Operating Programme

	2020	2025	2030	2035	2040
Energy savings [TJ]	2,561	3,168	3,168	3,168	3,168

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-30 Expected emissions reduction related to energy savings of the Integrated Regional Operating Programme

Emissions reduction [kt CO_2 eq.]	2020	2025	2030	2035	2040
	164.08	248.65	240.83	225.96	205.91

Source: CHMI

The expected annual budget for the period 2014-2020 is estimated to be about CZK 13.2 bill. (EUR 507.7 mill.).

Sectors: Energy

Greenhouse gas coverage: CO_2

i) Operational Programme Prague – Growth Pole of the Czech Republic

The operational programme under the auspices of the City of Prague focuses on improving the energy performance of buildings and the technical equipment used to ensure the operation of municipal public and road transport, and the implementation of pilot projects to convert energy intensive municipal buildings into nearly-zero energy buildings. These measures fall within the priority axis 2: Sustainable mobility and energy savings. The expected annual budget for the period 2014-2020 is estimated to be about CZK 1.9 bill. (EUR 74.5 mill.)

Type of policy: Economic

Implementing entity: City of Prague

Period of implementation: 2014-2020

Implemented in scenario: WEM

Mitigation impact:

Tab. 4-31 Expected energy savings of the Operational Programme Prague Growth Pole

Energy savings [TJ]	2020	2025	2030	2035	2040
	34	36	36	36	36

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-32 Expected emissions reduction related to energy savings of the Operational Programme Prague Growth Pole

Emissions reduction [kt CO_2 eq.]	2020	2025	2030	2035	2040
	3.56	3.51	3.20	2.83	2.30

Source: CHMI

Sectors: Energy

Greenhouse gas coverage: CO_2

j) JESSICA Programme

The programme offers long-term low-interest loans for reconstruction or modernization of residential buildings. It is implemented by the Ministry of Regional Development. The programme is designed for all owners of residential houses:

- Municipalities
- Housing Cooperatives
- Other legal and natural persons owning residential building
- Community of apartment owners
- Non-profit organizations for social housing.
- The program focuses on:
- Insulation of internal structures and external cladding including replacement of windows and doors,
- Reconstruction of technical equipment (e.g. heating system, plumbing, heating, gas, water, air conditioning, elevators),
- Replacement or modernization of loggias, balconies, railings,
- Repairing static failures of supporting structures,
- Rehabilitation of foundations and waterproofing of substructures,
- Provision of modern social housing through renovation of existing buildings.
- The expected annual budget for the period 2014-2020 is estimated to be about CZK 0.6 bill. (USD 23.1 mill.).

Type of policy: Economic

Implementing entity: Ministry of Regional Development (Government)

Period of implementation: 2014-2016

Implemented in scenario: WEM

Mitigation impact: The expected programme energy savings shows the following table.

Tab. 4-33 Expected energy savings of the JESSICA programme

	2020	2025	2030	2035	2040
Energy savings [TJ]	24	24	24	24	24

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-34 Expected emissions reduction related to energy savings of the JESSICA programme

	2020	2025	2030	2035	2040
Emissions reduction [kt CO_2 eq.]	2.05	1.91	1.85	1.74	1.59

Source: CHMI

Sectors: Energy

Greenhouse gas coverage: CO_2

k) ENERG Programme

The programme of the Ministry of Industry and Trade is focused on the provision of soft and interest-free loans for the implementation of projects improving energy performance in the business sector. The administrator of the financial instrument is the Czech-Moravian Guarantee and Development Bank.

The expected annual budget for the period 2017-2020 is estimated to be about CZK 0.1 bill. (EUR 3.9 mill.).

Type of policy: Economic

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: Since 2017

Implemented in scenario: WEM

Mitigation impact: The expected programme energy savings are shown in the following table.

Tab. 4-35 Expected energy savings of the ENERG Programme

	2020	2025	2030	2035	2040
Energy savings [TJ]	40	40	40	40	40

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-36 Expected emissions reduction related to energy savings of the ENERG programme

Emissions reduction [kt CO_2 eq.]	2020	2025	2030	2035	2040
	4.05	3.67	3.49	3.20	2.70

Source: CHMI

Sectors: Energy

Greenhouse gas coverage: CO_2

I) Operational Programme Enterprise and Innovation (OPEI): Eco-Energy

The Priority axis 3 (Eco-Energy) of the OPEI supported by The Ministry of Industry and Trade (MIT) had seven priority axes (e.g. Development of firms, Innovation, Business development services, Technical assistance) out of which priority axis 3 (Effective Energy or Eco-Energy) focused on energy savings and on the use of RES (renewable energy sources), thus aiming at GHG reduction. The program aimed at reducing energy intensity in production processes, reducing fossil fuel consumption and at increasing the use of renewable and secondary energy sources. The aid beneficiaries were not only small- or medium-sized, but also large enterprises.

The support also focused on the construction of new facilities for generation and transmission of electricity and thermal energy generated from RES and on the reconstruction of existing production facilities in order to use renewable energy sources. Further support was provided for the modernization of existing energy production facilities to increase their efficiency and for implementation of systems measuring and regulating energy. Further, modernization and loss reduction in the transmission of electricity to heat and to the use of waste energy in industrial processes were encouraged.

Funding was derived in part from European Regional Development Fund (ERDF) (85%) and partly from the state budget (15%). The support was provided in the form of subsidies or subsidized loans for all projects on the territory of the Czech Republic except the capital city. Half of the funds allocated to this priority were designated for energy savings and another half for the use of RES.

The aim of the program was to use the grants to stimulate enterprises in reducing the production energy requirements and the consumption of primary energy sources, and to promote a higher utilization of renewable and secondary energy sources.

According to the latest programme annual report, the eligible costs of realized projects were EUR 777.8 mill. The corresponding subsidies from the EU and national funds were EUR 303.3 mill.

Type of policy: Economic (subsidies)

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: 2007-2013

Implemented in scenario: WEM

Mitigation impact: The expected programme energy savings are shown in the following table.

Tab. 4-37 Energy savings of the OPEI programme

	2020	2025	2030	2035	2040
Energy savings [TJ]	1 105	1 105	1 105	1 105	1 105

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-38 Emissions reduction resulting from energy savings of the OPEI programme

	2020	2025	2030	2035	2040
Emissions reduction [kt CO_2 eq.]	107.10	98.41	95.24	88.66	75.82

Source: CHMI

Besides energy savings, the programme supported use of RES as well. The calculation of emissions savings uses amounts of electricity and heat produced from RES, again with respect to development of fuel mix used for electricity and heat production.

Tab. 4-39 Energy production from RES and corresponding emissions reduction of the OPEI programme

	2020	2025	2030	2035	2040
Electricity generation from RES [TJ]	451.8	451.8	451.8	451.8	451.8
Heat generation from RES [TJ]	58.5	58.5	58.5	58.5	58.5
GHG emissions reduction [kt CO_2 eq.]	86.8	86.8	86.8	86.8	86.8

Source: CHMI

Sectors: Energy, Manufacturing industries and construction, Agriculture

Greenhouse gas coverage: CO_2, CH_4, N_2O

m) Operational Programme Enterprise and Innovation for Competitiveness (2014–2020)

The Operational Programme Enterprise and Innovations for Competitiveness (OP EIC) is focused on increasing the competitiveness of the Czech economy by supporting the business environment, promoting innovations in the production and services sectors, energy treatment and the development of ICT. EU funding allocation reached EUR 4.33 billion. Direct impact on effective energy management and use of renewable sources is apparent for Priority Axis 3 ‘Efficient energy management, development of energy infrastructure and renewable energy sources, support for the introduction of new technologies in the management of energy and secondary raw materials’. The Priority Axis 3 covers 28.1% of the allocation of the OP EIC and is directly linked to the fulfilment of selected key objectives of the Europe 2020 strategy.

The programme is financed by the European Regional Development Fund (ERDF) to support enterprises, mostly SMEs. Four priority axes are the main content of the programme from which priority axis 3 “Improving energy efficiency and support for new low-carbon technologies” is aimed at reducing GHG emissions. The thematic focus of priority axis 3 is the development of smart energy distribution, transmission and storage systems that include also integration of distributed generation from renewable sources. The Priority Axis 3 comprises the following specific objectives:

- Increasing share of energy from renewable sources in gross final consumption;
- Energy savings in the business sector;
- Increasing the application of smart grids in distribution networks;
- Low-carbon technology transition and use of secondary raw materials;
- Co-generation of combined heat and power for heat supply;
- Strengthening the energy security of the transmission system.

The indicated specific objectives comprise numerous activities among which are the following once:

- Installation of a remote co-generation unit using biogas from biogas plant;
- Construction and reconstruction of heat sources and combined production of electricity; and heat from biomass and subsequent heat extraction;
- Use of waste energy in production processes;
- Installation of cogeneration units for internal consumption of the enterprise;
- Installation of electricity accumulation units;
- Implementation of measures to improve the energy performance of buildings in the business sector (replacement and renovation of windows and doors, building insulation, installation of waste heat recuperation and air-conditioning, etc.);
- Support for extra costs for achieving the standard of a nearly zero energy consumption of existing and new constructions of business buildings;
- Introduction of innovative low-carbon technologies in the fields of energy production, buildings, transport, processing and use of secondary raw materials;
- Installation of renewable energy sources for internal industrial consumption;
- Construction and reconstruction of transmission networks and transformer stations;
- The total program budget for energy savings and of RES support is CZK 19 bill. (approx. EUR 730 mill.).

The specification of aid conditions within the OP EIC include an obligation to comply with sustainable development. Compliance with the principles of sustainable development is required at the individual project level of interventions involving construction works, purchase of technology, equipment, appliances, i.e. interventions showing a high probability of impacts on the environment or efficient use of resources (in particular energy resources), investments in scope of such interventions have to meet the highest standards. As a general rule, no projects with adverse effects on sustainable development will be promoted under the OP EIC. The OP EIC also contains environmental indicators which are monitored for relevant specific objectives at the project level, to be further aggregated for the needs of the Partnership Agreement. Environmental indicators mainly concern the indicator ‘Reduction in final energy consumption in supported entities’, ‘Additional capacity of renewable energy production’, ‘Estimated annual decrease of GHG’, ‘Reduction in emissions of primary particles and secondary particulate precursors’ and other related indicators. In connection with the termination terms of physical realization of supported projects these indicators have not begun to be fulfilled so far. Estimated energy saving in this period is about 20 PJ.

Type of policy: Economic (subsidies)

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: 2014-2020

Implemented in scenario: WEM

Mitigation impact: The expected programme energy savings shows the following table.

Tab. 4-40 Expected energy savings of the programme Operational Programme Enterprise and Innovation for Competitiveness

Energy savings [TJ]	**2020**	**2025**	**2030**	**2035**	**2040**
	10 640	13 030	13 030	13 030	13 030

Source: CHMI

Using emission factors, which respect changes in the fuel mix in power and heat generation and in the final energy consumption, we obtain the following reductions in greenhouse gases emissions.

Tab. 4-41 Expected emissions reduction resulting from energy savings of the programme Operational Programme Enterprise and Innovation f or Competitiveness

Emissions reduction [kt CO_2 eq.]	**2020**	**2025**	**2030**	**2035**	**2040**
	799.37	1160.04	1122.63	1045.09	893.72

Source: CHMI

Besides energy savings, the programme supports use of RES as well. The programme document envisages installing 70 MW in RES sources that will lead to drop in GHG emissions of 300 kt by 2023. Assuming electricity to heat ratio equal to 2:1 and with respect to development of fuel mix used for electricity and heat generation, the resulting mitigation impact will be:

Tab. 4-42 Expected energy production from RES and corresponding emissions reduction of the programme Operational Programme Enterprise and Innovation for Competitiveness

	2020	**2025**	**2030**	**2035**	**2040**
Electricity generation from RES [TJ]	427.4	1 424.6	1 424.6	1 424.6	1 424.6
Heat generation from RES [TJ]	213.7	712.3	712.3	712.3	712.3
GHG emissions reduction [kt CO_2 eq.]	99.4	280.2	258.0	216.2	163.9

Source: CHMI

Additional information: The total program budget for energy savings and of RES support is CZK 19 bill. (approx. USD 730 mill.).

Sectors: Energy

Greenhouse gas coverage: CO_2

4.4.2 Industrial Processes and Product Use

Policies and Strategies

The Czech Republic does not have one comprehensive industrial strategy or policy. Instead, it has more sub-strategies focused on specific areas. The Industry 4.0 document adopted by the Government in 2016 can also be understood as a partial strategy of industrial development in the Czech Republic. Many of these strategies focus on the relationship between industry and environmental protection. Those that affect greenhouse gas emissions are described below.

Ozone layer protection

Policies and strategies adopted in the field of ozone layer protection were adopted back in 2004 and 2005. They were aimed at the timely phase out of certain uses, notably the CFCs in metered dose inhalers, HCFCs in the refrigeration and air conditioning (henceforth as "RAC") sector, and halons in the fire-fighting sector. The objective of all respective strategic documents were met, thus all those were made obsolete roughly by the year of 2015. The only strategic document that has been recently "revived" is the one aimed on the use of halons in the fire- fighting sector. The Ministry of the Environment has adopted a new strategic document with the objective of collection/destruction/regeneration of the remaining halons being still installed in certain critical use applications. The underlying objective is the full phase-out of all critical use applications by the year 2040.

The implementation of the F-gas regulation is not subject to any strategic document. The national legislation implements both the F-gas and the Ozone Depleting Substances (henceforth as "ODS") regulation with their main objectives:

- To make both regimes identical for the "end user ";
- To adhere strictly to the minimum EU requirements on the qualification of personnel and make them applicable both to the ODS and F-gasses in the same manner;
- To keep the recovery criteria of ODS and F-gases from refrigeration and firefighting equipment as strict as possible, beyond the EU legislation.

Legislative Instruments

a) Act No. 76/2002 Coll., on integrated pollution prevention and control, on the integrated pollution register (Integrated Prevention Act), as amended

Integrated pollution prevention and control, abbreviated as IPPC, refers to the minimising of pollution from various industrial sources throughout the EU. The Integrated Prevention Act, as amended, transposes EU legislation, at the beginning Directive 96/61/EC (later replaced by codified wording under No. 2008/1/EC) on Integrated Pollution Prevention and Control (henceforth as "IPPC"). The current Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) have been transposed into national legislation in 2013 according to Article 80(1) of the Directive by amending the Act. The Regulation requires industrial and agricultural activities with a high pollution potential to have a permit; this permit can only be issued if certain environmental conditions are met, so that the companies themselves bear responsibility for preventing and reducing any pollution they may cause. The IPPC Directive is based on several principles, namely an integrated approach, best available techniques, flexibility and public participation. The implementing regulation to Act No. 76/2002 Coll. is regulation No. 288/2013 Coll. The main objective of integrated prevention is protection of the environment as a whole against industry and agriculture pollution by regulation of operations

of selected facilities listed in Annex No. 1 of the Act. Issuance of integrated permit replaces several other administrative acts according to corresponding legislation.

Prevention of pollution by implementing the so-called best available techniques (henceforth as "BAT") represents a higher degree of protection of the environment.

In the area of greenhouse gas emissions, which are generated by production and use of heat and electricity, the Act allows the regulator to apply the BAT concept, which should lead to increased energy efficiency of production. BAT includes technologies used as well as the manner in which the facility is designed, built, operated, maintained and decommissioned. This Act also allows application of emission limits or equivalent technical parameters, which are based on advanced technologies used in affected industrial sectors. Nevertheless, the possibility of imposing emission limits directly with respect to greenhouse gas emissions remains limited by law on integrated prevention only in cases where it is required, in order to prevent serious pollution at the site.

The manner and scope of ensuring information exchange by BAT is defined in Act No.76/2002 Coll., on integrated prevention, as amended. The set of BAT is specified in reference documents (BREF). For permitting purposes, the most important information is provided in the so-called conclusions on BAT.

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: Since 2002

Implemented scenario: WEM

Mitigation impact: As this is a framework measure, its mitigation effect is accounted under other measures.

Sector: Industrial Processes

Greenhouse gas coverage: CO_2**,** CH_4**,** HFCs, PFCs, SF_6

b) Regulation (EU) No. 517/2014 on fluorinated greenhouse gases and repealing Regulation (EC) No. 842/2006

The F-Gas Regulation (EU) No 517/2014 retains many important and successful features of the previous F-Gas Regulation related to leak prevention, F-gas recovery and technical training. As its main measure is to reduce the use of HFCs, the new Regulation prescribes a cap and subsequent reduction of HFCs that can be placed on the EU market ("phase-down"). The new F-Gas Regulation also includes several bans. F-gases with high global warming potential (henceforth as "GWP") are restricted from use in new equipment in refrigeration, small air conditioners, fire protection, foams and technical aerosols. In addition, a "service ban" requires operators of existing equipment to start using more climate-friendly alternatives from 2020 onwards.

The main scope of the F-gas regulation:

- Prevention of emissions of fluorinated greenhouse gases – sets requirements for leak checks, servicing, training of the staff, record keeping, recovery of the gases at the end of the equipment's life;

- Reduction of the quantity of HFCs placed on the market - banning the use of F-gases in equipment where less harmful alternatives are available also the volume of HFCs placed on the EU market will be limited.

Producers/importers/exporters of more than 100t CO_2 eq. of F-gases must communicate information via obligatory reporting. Since 2015, a new system of quotas has been put in place.

Type of policy: Regulatory

Implementing entity: Ministry of the Environment (Government)

Period of implementation: 2015-2035

Implemented scenario: WEM

Mitigation impact: The main goal of the new F-Gas Regulation is to cut the EU's F-gas emissions by two-thirds compared with 2014 levels by 2030.

Sector: Industrial Processes

Greenhouse gas coverage: HFCs, PFCs, SF_6

c) Act No. 73/2012 Coll., on ozone depleting substances and fluorinated greenhouse gases, as amended

This Act regulates the rights and obligations of persons and competence of administrative bodies in the field of ozone layer protection and climate system protection against negative effects of regulated substances and fluorinated greenhouse gases. The implementing regulation to Act No. 73/2012 Coll., as amended, is regulation No. 257/2012 Coll., on emission prevention of substances damaging ozone layer and fluorinated greenhouse gases.

With regard to ozone layer protection, the fundamental regulation is Regulation (EC) No.1005/2009 of the European Parliament and of the Council of September 2009 on substances that deplete the ozone layer, as amended, and Regulation (EU) No. 517/2014 of the European Parliament and of the Council of April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No. 842/2006.

A process of amending this Act has been started recently, the main objective being the removal of non-refillable containers from the black market by means of banning their use and storage.

Type of Policy: Regulatory

Implementing entity: Ministry of the Environment (Government)

Period of Implementation: Since 2012

Implemented Scenario: WEM

Mitigation impact: The Act aims to remove substances that deplete the ozone layer.

Sector: Industrial Processes

Greenhouse gas coverage: HFCs, PFCs, SF_6

d) Directive 2006/40/EC (MAC Directive)

Directive 2006/40/EC regulates the use of F-gases with GWP higher than 150 in passenger cars (M1) and light commercial vehicles' (N1) air conditioning. The directive consists of 3 phases, from which the last one entered force on 1st January 2017. Since then, the use of HFCs with GWP higher than 150 is totally banned for new vehicles placed on the EU market.

Type of policy: Regulatory

Implementing entity: Ministry of Transport (Government)

Period of implementation: Since 2008

Implemented in scenario: WEM

Mitigation impact: Overall mitigation impact of the Directive 2006/40/EC on F-gases consumption in passenger cars (M1) and light commercial vehicles (N1) was calculated by using market information for year 2017. Car producers do not use F-gases (HFC-134a) for new cars intended for EU market but HFC-134a is used for filling of air conditioning of cars for non EU countries. If the situation on the market remains stable in future, it is expected that emissions from 1st fill will decrease by 82% in 2035 comparing to year 2015. If the car producers will switch to use of alternatives (HFO-1234yf) also for cars intended for non-EU countries the mitigation impact will be 100% in 2035 compared to 2015.

Sector: Industrial Processes

Greenhouse gas coverage: HFCs

e) The Kigali Amendment to the Montreal Protocol

The Kigali Amendment was agreed at the 28th Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer in October 2016. The Kigali Amendment adds to the Montreal Protocol the phase-down of the use of HFCs. The Amendment sets a different time schedules and methodology for baseline calculations for Article 5 and non-Article 5 Parties. Trade with Parties that have not ratified the Amendment ("non-Parties") will be banned from 1 January 2033.

Type of policy: Regulatory

Implementing entity: Ministry of the Environment (Government)

Period of implementation: 2019-2036

Implemented in scenario: WEM

Mitigation impact: The starting point for the phase down of the use of HFCs for non-article 5 parties will be year 2019. Non-article 5 Parties should reduce the production/consumption of HFCs by 85% relative to the baseline which is calculated as average production/consumption of HFCs in 2011-2013 plus 15% of HCFC baseline production/consumption.

Sector: Industrial Processes

Greenhouse gas coverage: HFCs

Financial Schemes and Programmes

An Eco tax on imports and the use of ODS has been introduced back in 2002 and it is still in place, even though it is applied on very rare occasions as ODS have been phased out completely apart from the critical use applications.

Finances that have been acquired by means of this eco tax are used (to this day) mostly for supporting the recovery and destruction of ODS. The dominant sector being the halon installations, the RAC were supported by these means as well. Domestic RAC is, however, a subject to a take-back scheme under the waste regulation (WEEE Directive), so the recovery and destruction costs are covered by the buyers of new equipment. The reason for the above-mentioned preference of halons is their very high ozone depleting potential and the fact that their release into atmosphere is technically identical with their intended use. The support continues to be provided to these days.

Type of policy: Regulatory

Implementing entity: Ministry of Finance (Government)

Period of implementation: Since 2002

Implemented in scenario: WEM

Mitigation impact: The Act aims to remove substances that deplete the ozone layer.

Sector: Industrial Processes

Greenhouse gas coverage: HFCs, PFCs, SF_6

4.4.3 Agriculture

The concept of sustainable and multifunctional agriculture in the Czech Republic takes into account the reduction of greenhouse gas emissions and possible needs for adaptation measures, along with other environmental and socio-economic considerations. These objectives can be achieved by the Common Agricultural Policy of the EU, as well as through national measures.

The implemented agrarian policies and measures should undoubtedly increase CO_2 fixation in the agriculture sector. The policies and measures in agriculture leading to greenhouse gas mitigation are based on prudent application of fertilizers, cultivation of cover crops, adoption of ecological and organic farming, implementation of modern and innovative technologies, monitoring fermentation of crop residues, etc. Recent agrarian policy has declared the goal of reducing nitrogen leaching and run-off.

Important measures to reduce emissions of GHGs in agriculture include optimal timing of fertilization, the exact amount of fertilizer application to crop use and optimal (covered) storage of manure.

The EU Common Agricultural Policy (henceforth "CAP") has a significant impact on the extent, orientation and profitability of agricultural activities. The CAP is based on three principles – a common market for agricultural products based on common prices, preferences for agricultural production in EU countries as opposed to external competition, and financial solidarity - financing from common contribution-based funds. The implementation of the CAP can affect the trend in GHG emissions from agriculture (methane and nitrous oxide emissions) in both directions (up or down) depending on the individual implemented measures, practices and policies in the Czech Republic.

In December 2013, the Council of EU Agriculture Ministers formally adopted four basic Regulations for the reformed CAP as well as the transitional Regulation for 2014. With these new rules, the majority of CAP legislation is defined under the four following consecutive Regulations covering rural development, "horizontal" issues, direct payments for farmers, and common organization of the markets. Specifically, these Regulations are:

- Regulation (EU) No 1307/2013 - Direct payments for farmers
- Regulation (EU) No 1308/2013 - Market Measures
- Regulation (EU) No 1305/2013 - Rural Development
- Regulation (EU) No 1306/2013 - "Horizontal" issues such as funding and control
- Supporting Regulation (EU) No 1310/2013 - Transitional provisions

Agricultural direct payments are part of the first pillar of the EU Common Agricultural Policy. This policy had undergone a reform, which resulted in new rules for the period 2015-2020.

In the period to 2020, EUR 8.3 billion will be invested from the EU budget into the Czech farming sector and rural areas. The total budget available for Czech farmers in the form of Direct Payments is EUR 6.01 billion while around EUR 2.31 billion has been allocated for measures benefiting its rural areas (including transfers from Direct Payments), which is then supplemented by further public and private funding.

Policies and Strategies

a) Action Plan for Biomass in the Czech Republic for the period 2012-2020

The main aim of the Action Plan for Biomass is to define appropriate measures and principles that will help use effectively and efficiently the energy potential of biomass in the Czech Republic. The main objectives include a determination of energy potential of agricultural and forest woody biomass and

quantifying the amount of energy that can be produced by biomass in the Czech Republic by the year 2020.

Type of policy: Fiscal

Implementing entity: Ministry of Agriculture (Government)

Period of implementation: 2012-2020

Implemented scenario: WEM

Mitigation Impact: It is expected that GHG emissions reduction for the year 2020 will be approximately 125 kt CO_2 eq. and 255 kt CO_2 eq. for the year 2035.

Sectors: Agriculture, Energy, LULUCF

Greenhouse gas coverage: CO_2

b) Czech Action Plan for Development of Organic Farming 2016-2020

The aim of Czech Action Plan for Development of Organic Farming 2016-2020 (henceforth "AP") is to support the development of organic farming in the Czech Republic until the year 2020, and it has been drawn up as the third AP in succession. Organic farming (henceforth "OF") has been developing in the Czech Republic for more than 25 years. Areas such as legislation or inspection and certification systems are agreed on at a high level, but other areas are not yet sufficiently developed (e.g. organic food processing and sale, domestic organic food market, use of OF potential in the area of nature protection, research and innovation in OF, consultancy and education) and require systematic support. The AP has been drawn up for this purpose. It includes priority areas and recommended measures and its implementation will contribute to the further development of OF.

The defined priority areas for OF development up to the year 2020 are based on an analysis of the current state of OF and an updated SWOT analysis. Specifically, the defined priority areas for OF including their strategic goals for the time period 2016-2020, as stated and further described together with priority measures in the Action Plan, are:

1. Organic Farms – Improve the economic viability of organic farms;
2. Organic Food Market – Increase the proportion of Czech organic foods on the market;
3. Consumption of organic foods – Increase the consumption of organic foods, especially of Czech origin;
4. Benefits to the environment and animal welfare – Raise awareness of the benefits of the OF to the environment and animal welfare;
5. Research – education – consultancy – Increase the use of research results and innovation.

Overall, the main aims of the Action Plan are the following:

- Organic farming will become an important part of Czech agriculture = the aim is to increase the viability of organic farms while concurrently retaining the benefits for the environment and animal welfare (fair prices along with effective and considerate methods of organic production);
- Build a stable market for organic foods with a significant proportion of foods of Czech origin (produced from domestic organic raw ingredients) = raise consumer confidence and consumption of organic foods;
- Functional cooperation within the entire supply chain (functional sales).

Type of policy: Fiscal

Implementing entity: Ministry of Agriculture (Government)

Period of implementation: 2016-2020

Implemented scenario: WEM

Mitigation impact: This is a framework measure and its mitigation effect is accounted together with other PaMs in the agriculture sector.

Sector: Agriculture

Greenhouse gases coverage: CH_4, N_2O

c) Strategy for Growth – Czech Agriculture and Food Sector within the Common Agricultural Policy of the EU after 2013

The Strategy for Growth lays down strategic development targets in the field of agriculture and food production for the Czech Republic. The long-term objective of the economically justified strategic level of production in the main agricultural commodities of the moderate belt (dairy products, meat, etc.) is taken into account, also ensuring adequate market share for the production of processed agricultural and food products, especially those for which there is a potential for competitive production.

The document presents prognosis of activity data and agricultural management targets in the context of agro-environmental measures and policies.

In the field of agriculture, the main objective is to contribute on a long-term and sustainable basis to the food security on the national and European level and to contribute to the energy self-sufficiency of the Czech Republic within the framework of the set energy mix and rural development, including the increase of its recreational potential. Out of the seven targets to this objective, several are closely linked to mitigation efforts – e.g., to develop the use of agricultural production and waste as renewable sources of energy, or to improve the impacts of agriculture on natural resources and, in times of climate change, to increase protection with regard to sustainable farming, comprehensive development, and landscape creation.

Type of policy: Fiscal

Implementing entity: Ministry of Agriculture (Government)

Period of implementation: 2013-2020

Implemented in scenario: WEM

Mitigation Impact: It is expected that GHG emissions reduction for the year 2020 will be approximately 250 kt CO_2 eq. and 300 kt CO_2 eq. for the year 2035.

Sector: Agriculture

Greenhouse gas coverage: CH_4, N_2O, CO_2

d) The Strategy of the Ministry of Agriculture of the Czech Republic with outlook up to 2030

The document is designed as an open living document and a fundamental basis for strategic management processes within the Ministry of Agriculture. Priorities, objectives and actions of the Strategy will be implemented via relevant programmes. The document was approved by the Government of the Czech Republic in May 2016.

Type of policy: Fiscal

Implementing entity: Ministry of Agriculture (Government)

Period of implementation: 2016-2030

Implemented in scenario: WEM

Mitigation impact: This is a framework measure and its mitigation effect is accounted together with other PaMs in the agriculture sector.

Sector: Agriculture

Greenhouse gas coverage: CH_4, N_2O

Legislative Instruments

a) Cross Compliance

Cross compliance has been employed in the Czech Republic since January 2009. Based on this mechanism, direct payments and other selected subsidies can be granted only on the condition that a beneficiary meets the statutory management requirements addressing environment, public health, the health of animals and plants, and animal welfare, the standards of Good Agricultural and Environmental Conditions (GAEC). In the following years, the cross compliance mechanism underwent a number of updates reflecting the EU legislation; the requirements and evaluated standards within Cross Compliance were updated in line with the Common Agricultural Policy.

Type of policy: Research, Education

Implementing entity: Ministry of Agriculture (Government)

Period of implementation: 2009-2035

Implemented in scenario: WEM

Mitigation impact: This is a framework measure and its mitigation effect is accounted together with other PaMs in the agriculture sector. The implementation of cross compliance should reduce direct emissions from fertilizers (N_2O) and emissions from enteric fermentation (CH_4) by improving breeding management and sustaining a healthier animal population.

Sector: Agriculture

Greenhouse gases coverage: CH_4, N_2O, CO_2

b) Nitrates Directive – Czech Republic's 4th Action Programme

The Nitrates Directive (91/676/EEC) generally requires EU Member States to:

- Monitor waters and identify waters which are polluted or are liable to be polluted by nitrates from agriculture;
- Establish a code of good agricultural practice to protect waters from this pollution;
- Promote the application by farmers of the code of good agricultural practice;
- Identify the area or areas to which an action programme should be applied to protect waters from pollution by nitrates from agricultural sources;
- Develop and implement action programmes to reduce and prevent this pollution in identified areas: action programmes are to be implemented and updated on a four-year cycle;
- Monitor the effectiveness of the action programmes and report to the EU Commission on progress.

The Directive specifies the maximum amount of livestock manure which may be applied (as the amount of fertilizers containing nitrogen per hectare per year, i.e. 170 kg N/ha).

The Czech Republic has drawn up action programmes to cut nitrate pollution, and since August 2016, the Fourth Action Programme for the period 2016-2020 is in force. In March 2018, a technical update of the Action Programme took place. Based on the update, changes have been made in respect to seasons and limits of fertilization use, agricultural activities in proximity to surface water, crop rotation,

storage of fertilizers, farming on slopes and farming near water. Altogether, the programme as such focuses on defining vulnerable areas, their revision and expansion.

It should be noted that the costs associated with the implementation of the above measures and policies are not possible to estimate at present. They represent an inherent part of the landscape (agricultural and forest) management practice applied in accordance with the local environmental and other specific conditions.

Type of policy: Information

Implementing entity: Ministry of Agriculture (Government)

Period of implementation: 2016-2035

Implemented in scenario: WEM

Mitigation impact: This is a framework measure and its mitigation effect is accounted together with other PaMs in the agriculture sector.

Sector: Agriculture

Greenhouse gas coverage: N_2O

Financial Schemes and Programmes

a) Czech Rural Development Programme for 2014-2020

The Rural Development Programme (RDP) for the Czech Republic was formally adopted by the European Commission in May 2015, outlining the Czech priorities for using the nearly EUR 3.1 billion of public money that is made available for the 7-year period 2014-2020. Of this budget, EUR 2.3 billion comes from the EU budget with EUR 135 million transferred from the envelope for CAP direct payments, and EUR 769 million of national co-funding. In June 2016, within the 2nd RDP amendment, the national contribution was increased with the total public contribution reaching more than EUR 3.5 billion.

The RDP focuses mainly on ensuring the sustainable management of natural resources and on encouraging climate friendly farming practices, with around 25% of agricultural land under contract to protect biodiversity, 11% to improve water management and 12% to protect soil. Secondly, its aim is to increase the competitiveness of agriculture and forestry as well as that of the food industry. The RDP also supports organic farming, increased use of renewables, and afforestation of agricultural land. The objective of the programme is thus to restore, preserve and improve the ecosystems dependent on agriculture by means of agri-environmental measures, to invest into the competitiveness and innovation of agricultural enterprises, to encourage young people into farming, and to improve landscape infrastructure.

The RDP funds actions under six Rural Development Priorities and in the Czech context, particular emphasis is placed on Priority 4: Restoring, preserving and enhancing ecosystems related to agriculture and forestry. Under this priority, among other activities, nearly 870 000 ha of farmland will be subject to voluntary agri-environmental and climate-related commitments by farmers, who will receive training on the better delivery of environmental and climate-related benefits. Priority 5: Resource efficiency and climate is further relevant as under this priority the RDP will support renewable energy

investment to produce wooden pellets and the afforestation of 1 000 ha of agricultural land to increase CO_2 sequestration.[21]

In general, 59,27% of public support is directed towards Priority 4 with 25,56% being used for agri-environment-climate measures in the context of water management. On the other hand, 0,41% of public support is spent on Priority 5 related to promoting resource efficiency and supporting the shift towards a low carbon and climate resilient economy in agriculture, food and forestry sector (0,12% supports measures in relation to renewable energy, 0,29% is spent on carbon conservation/sequestration).

Type of policy: Fiscal

Implementing entity: Ministry of Agriculture (Government)

Period of implementation: 2014-2020

Implemented in scenario: WEM

Mitigation impact: It is expected that GHG emissions reduction in 2020 will be approximately 200 kt CO_2 eq. and 357 kt CO_2 eq. in 2035.

Sectors: Agriculture, LULUCF

Greenhouse gas coverage: CO_2, CH_4, N_2O

[21] https://ec.europa.eu/agriculture/sites/agriculture/files/rural-development-2014-2020/country-files/cz/factsheet_en.pdf

4.4.4 LULUCF

The land use, land use change and forestry (LULUCF) sector is linked to agriculture and some of the policies listed above in the chapter on Policies and Measures in the Agriculture Sector are partly common for both sectors. Policies and measures in the LULUCF sector are generally focused on the sustainable use of natural resources, biodiversity preservation, and on securing all functions and services that these resources provide to society.

Despite numerous EU policy processes that are linked to LULUCF, such as the Ministerial Conference on the Protection of Forests in Europe (Forest Europe, http://www.foresteurope.org), Natura 2000 etc., none of those are prescriptive in terms of CO_2, CH_4 and N_2O, emissions and removals. Their effect on greenhouse gas balance of the LULUCF sector may be indirect, however, not practicably quantifiable. Similarly, the adopted EU Decision No 529/2013/EU (on accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities) is in principle not prescriptive with respect to concrete actions and targets in the LULUCF sector, but regulates accounting rules and providing information. On the other hand, the most recently adopted EU Regulation 2018/841 (on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework) may represent a stronger incentive for actions in the LULUCF sector. Specifically, it adopts a new accounting framework for forestry based on forest reference level (henceforth "FRL"). Setting FRL is mandatorily based on the continuation of forest management practices during the so-called Reference period of 2000-2009. These practices are projected to the period 2021-2030 with a limited possibility to exclude disturbances. Since the Czech forestry is currently experiencing an unpreceded large-scale decline of spruce-dominated stands (and also other species are endangered by recurrent drought), the adopted accounting framework becomes very unfavourable for the national circumstances. This issue is expected to fuel the national policymaking associated with efforts to reform and stabilize the forestry sector and management of forest resources.

It should be noted that the costs associated with the implementation of the below measures and policies are not possible to estimate at present. They represent an inherent part of the landscape (agricultural and forest) management practice applied in accordance with the local environmental and other specific conditions. Hence, the implemented measures carry over its spatial heterogeneity and discerning the particular costs is not feasible.

Policies and Strategies

a) National Forest Program II

The most important land category of the Czech LULUCF sector in terms of greenhouse gas emission balance is Forest Land. Forestry in the Czech Republic is regulated by the Forestry Act (Act no. 289/1995 Coll. on Forests and Amendments to some Acts), which is the principal legislative instrument in this regard. This instrument also does not specifically target carbon balance, but its provisions affect carbon budget and greenhouse gas emissions and removals in numerous ways indirectly.

Beyond the legislation above, the National Forest Program II for the period 2008 to 2013 (NFP II) is the basic national strategic document for forestry and forestry-related sectors. Implemented within the environmental pillar, specifically Key Action 6 lists the measures being or to be implemented to alleviate the impact of expected global climate change and extreme meteorological conditions. These measures generally focus on creating more resilient forest ecosystems by promoting diversified forest stand utilizing to the greatest possible extent natural processes, appropriate species composition and variability of silvicultural approaches, reflecting the current international treaties, agreements, conventions and EU legislation.

Type of policy: Economic

Implementing entity: Ministry of Agriculture (Government)

Period of implementation: 2008-2018

Implemented in scenario: WEM

Mitigation Impact: The policies and measures listed above are directly aimed at mitigation, although mitigation effect is expected in long-term perspective of several decades to a century. The key aim of the above policies is the adaptation of forest ecosystems to environmental change, including both climate and societal factors. Discerning mitigation effect is, due to numerous uncertainties involved, highly uncertain. In general, mitigation benefits of this program are expected to be minimal or even negative in the coming decades. However, it is expected to turn positive in the long-term perspective of functional ecosystems fulfilling the entire spectrum of expected functions, including mitigation.

Sector: LULUCF

Greenhouse gas coverage: CO_2

b) Updated Recommendations for implementing the proposed measures of NFP II

The Conclusions of the Coordinating Council for the implementation of the National Forestry Program II (2013) summarized the recommendations for implementing the proposed measures of NFP II after lengthy consultations by forestry experts. For the emission balance of the LULUCF sector, particularly important are the elaborated recommendations of Key Action 6 NFP II, which are directly aimed at reducing the impacts of global climate change and extreme weather events. These recommendations applicable to forestry are also reflected in the National Adaptation Strategy (Strategy on Adaptation to Climate Change in the Czech Republic) adopted in 2015 and further elaborated in the associated National Action Plan on Adaptation to Climate Change adopted in 2017.

Several of these recommendations were implemented by the Decree No 298/2018/ Coll., on elaborating regional plans of forest development and on specification of economic complexes. The Decree has increased the minimal share of improving and stabilizing tree species (newly including larch and Douglas fir) in the forest stands. It has also increased the financial support for improving and stabilizing species and introduced support for pioneering species to speed up forest regeneration.

Type of Policy: Economic

Implementing entity: Ministry of Agriculture (Government)

Period of Implementation: 2018-2035

Implemented in scenario: WAM

Mitigation Impact: The policies and measures listed above are directly aimed at mitigation, although mitigation effect is expected in long-term perspective of several decades to century. The key aim of the above policies is adaptation of forest ecosystems to environmental change, including both climate and societal factors. Discerning mitigation effect is, due to numerous uncertainties involved, highly uncertain. In general, mitigation benefits of this PaM are expected to be minimal or even negative in the coming decades. However, it is expected to turn positive in the long-term perspective of functional

ecosystems fulfilling the entire spectrum of expected functions, including mitigation. The model-assisted estimation of impacts to mitigation until 2040 is shown in chapter.

Sector: LULUCF

Greenhouse gas coverage: CO_2

Legislative Instruments

a) Regulation (EU) No. 2018/841 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry into the 2030 climate and energy framework

To ensure the contribution of the LULUCF sector to the achievement of the European Union's emission reduction target of at least 40% cuts in greenhouse gas emissions (from 1990 levels) and to the long-term goal of the Paris Agreement, the LULUCF Regulation has established a robust accounting system for the different LULUCF land accounting categories for the period 2021-2030 in accordance with the 2006 IPCC Guidelines. The Regulation sets a binding commitment for each Member State to ensure that accounted emissions from land use are entirely compensated by an equivalent removal in the LULUCF sector (so called "no debit" rule). For the key category of managed forest land, it has established accounting based on forest reference levels, which should not take into account any new forestry policies adopted after 2009.

Type of policy: Regulatory

Implementing entity: Ministry of Agriculture (Government)

Period of implementation: 2021-2030

Implemented in scenario: WEM

Mitigation impact: The LULUCF accounting framework has no direct mitigation impact. However, it should encourage Member States to maintain and enhance their carbon sink. The credits from LULUCF accounting could be to a limited degree used for Effort Sharing Regulation compliance and, on the other hand, the debits resulting from non-compliance with the "no debit" rule need to be compensated by Annual Emission Allocations (AEAs).

Sector: LULUCF

Greenhouse gas coverage: CO_2, CH_4, N_2O

4.4.5 Waste

Greenhouse gas emissions generated by the waste sector in the Czech Republic have been growing due to organic carbon that is accumulated in landfills, increasing amount of produced municipal solid waste (henceforth as "MSW") and unfavourable mix of MSW treatment options. Recently, this trend started to change and we observe mild stagnation of emissions from landfills, which is a key source of GHG emissions from this sector in the Czech Republic. The slowing of GHG production observed is mainly due to increased landfill gas (henceforth as "LFG") capturing.

There is a potential for emission reductions in fulfilling the EU obligations of the Circular Economy Package (henceforth as "CEP") (COM/2015/0614) and other national measures with emission reduction effects related to the national common waste policy. Waste-to-energy measures will also affect industrial waste generated by other industries. Policies and measures in the waste sector aim at reducing the amount of produced waste, significant reduction of landfilled waste, minimizing the delivery of biodegradable waste in landfills, establishing and expanding separate collection system for different waste streams (plastics, paper, glass, bio-waste, cardboard, metals, textile), promoting the energy recovery and digestion of non-recyclable waste, and increasing landfill gas recovery.

The Czech waste legislation is largely based on the EU legislation. The EU legislation with direct impact on GHG emissions from waste included the Landfill Directive (1999/31/EC) and the Waste Directive (2008/98/EU), these Directives have been modified by the CEP. The revised legislative framework on waste has entered force in July 2018. The EU Member states have 24 months to implement the CEP into national law.

There are several policies that are not part of the waste legislation that already have or will have impact on GHG emissions from waste. Most of them are mentioned in the cross sectoral section in this report, nevertheless, it is important to especially highlight the EU ETS, the Climate & Energy Package and the Energy Tax Directive which provide direct and indirect support on LFG recovery and therefore significantly influence landfill emissions.

The largest public financial support for the waste management infrastructure comes from the State Environmental Fund of the Czech Republic (SEF). The Operational Programme Environment (henceforth "OPE") also contributes significantly to the expansion of the facility network; it is financed from the EU Cohesion Fund.

Policies and Strategies

a) Waste Management Plan of the Czech Republic for the period 2003-2014

The most important instrument on the national level aimed at CH_4 emission reduction from waste was the Waste Management Plan (henceforth "WMP"). All of the targets and measures were in compliance with the obligatory EU legislation. Further, several programmes were set up to help reach the WMP goals. The main programme was the OPE 2007-2013 with its priority axis 4: Improvement of waste management and rehabilitation of old ecological burdens. This axis had a budget of EUR 713 million from the EU Cohesion Fund.

The increasing share of recovered waste to the waste disposed is the result of three factors: 1. A shift towards more efficient technology use in the manufacturing sector 2. Waste is perceived as a source of raw material 3. The financial support of EUR 713 million from the OPE 2007-2013 has helped implement the WMP as EUR 515 million was allocated to waste management alone. The total number of supported projects in this context reached 4227.

The tables below show the rates of municipal waste treatment and treatment with all waste in the Czech Republic for the time period 2009-2014. The time period begins from 2009 as the official database VISOH, operated by the Ministry of Environment, shows values from 2009.

Municipal waste treatment in the Czech Republic in 2009-2014

Municipal Waste	Recovery	Material recovery	Energy recovery	Landfilling	Other treatment
Year 2009	29%	23%	6%	64%	7%
Year 2010	33%	24%	9%	59%	8%
Year 2011	42%	31%	11%	55%	3%
Year 2012	42%	30%	12%	54%	4%
Year 2013	42%	30%	12%	52%	6%
Year 2014	47%	35%	12%	48%	5%

Treatment with all waste in the Czech Republic in the period 2009-2014

All waste	Recovery	Material recovery	Energy recovery	Landfilling	Other treatment
Year 2009	74.5%	72.5%	2%	15%	10.5%
Year 2010	73.5%	71%	2.5%	13.5%	13%
Year 2011	78%	75%	3%	13%	9%
Year 2012	79%	75.5%	3.5%	13%	8%
Year 2013	79.5%	76%	3.5%	11%	9.5%
Year 2014	83%	79.5%	3.5%	10%	7%

Source: MoE

Type of policy: Economic, Fiscal

Implementing entity: Ministry of the Environment (Government)

Period of implementation: 2003-2014

Implemented in scenario: WEM

Mitigation impact: The total emission reduction of this measure is 974 kt CO_2 eq. in 2035.

Sector: Waste

Greenhouse gas coverage: CH_4

b) Waste Management Plan of the Czech Republic for the period 2015-2024

Today's crucial instrument in the context of waste management on the national level is the Waste Management Plan (WMP) for the period 2015-2024 adopted by the Government in December 2014.

The WMP of the Czech Republic establishes in accordance with the principles of sustainable development the objectives, policies, and measures of waste management in the Czech Republic. The WMP is also the reference document for the development of regional Waste Management Plans. The binding part of WMP constitutes the mandatory basis for decision-making and other activities of the relevant administrative authorities, regions, and municipalities in the area of waste management. The WMP has been prepared for the period of 10 years, and will be changed immediately following any fundamental change in the conditions under which it had been developed (e.g. new legislation on waste management affecting the waste management strategy, including the establishment of new objectives or the redefinition of existing objectives, policies, and measures).

From 2024, certain waste categories (recyclable and recoverable wastes) will be prohibited from being deposited in landfills. For these categories, the landfilling fee will be gradually increased to achieve gradual decrease in the quantity of waste from the relevant categories deposited at landfills.

The defined objectives and targets set in the WMP 2015-2024 include, also in light of the European Directive 2008/98/EC on waste, the following:

- In relation to municipal waste, to introduce by the year 2015 separate collection at least for waste consisting of paper, plastic, glass, and metals; (from 2015 is obligatory separate collection of biodegradable municipal waste and from 2020 is obligatory separate collection of edible oils and fats);
- By 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50% by weight.
- To use mixed municipal waste (after sorting of materially recoverable components, hazardous substances and biodegradable waste) especially for energy recovery in facilities designed for this purpose in accordance with effective legislation;
- To reduce the maximum quantity of biodegradable municipal waste deposited at landfills in such a way, so that the share of this component would in 2020 account for maximum of 35% by weight of the total quantity of biodegradable municipal waste produced in 1995;
- To increase by the year 2020, to at least 70% by weight, the rate of preparing for re-use and the rate of recycling of construction and demolition waste and other types of their material recovery;

- Objectives are also set for packaging and packaging waste, separate collection of waste electrical and electronic equipment, waste batteries and accumulators, and for the processing of end-of-life vehicles and waste tyres.

The OPE 2014-2020 is a direct continuation of the above mentioned OPE 2007-2013 and it is also financed from the EU Cohesion Fund. The priorities of the project support in waste management are determined by the obligations set in the CEP (COM/2015/0614), the WMP and by the Programme of Waste Prevention of the Czech Republic. Waste management and material flows, environmental burdens and risks are covered by the OPE's Priority Axis 3. From the Priority Axis 3's overall budget of EUR 458.8 million, for example EUR 18.3 million is allocated for preventing municipal waste generation, EUR 42.7 million for preventing industrial waste generation, EUR 68 million for construction and modernization of waste collection, sorting and treatment facilities, EUR 103 million for material recovery of waste, EUR 53 million for energy recovery of waste and EUR 22.2 million for construction and modernization of hazardous waste management facilities.

The new WMP includes modelling of the proposed and implemented measures and their impact on activity data – waste quantity and waste management practices. The result of this modelling was used as a basis for the projections of GHG emissions in this document.

The tables below show the rates of municipal waste treatment and waste treatment in the Czech Republic for the period 2015-2016.

Municipal waste treatment in the Czech Republic in 2015-2016

Municipal waste	Recovery	Material recovery	Energy recovery	Landfilling	Other treatment
Year 2015	47%	36%	11%	47%	6%
Year 2016	50%	38%	12%	45%	5%

Source: MoE

Treatment with all waste in the Czech Republic in the period 2015-2016

All waste	Recovery	Material recovery	Energy recovery	Landfilling	Other treatment
Year 2015	86%	83%	3%	9%	5%
Year 2016	85%	82%	3%	9%	6%

Source: MoE

For treatment with all waste the material recovery of waste predominates, but the share of recovered wastes decreased slightly from 83.2% to 81.6% year-on-year. In regards to municipal waste management, landfilling prevails, the share of municipal waste disposed of by landfilling decreased, from 2015 to 2016, from 47.4% to 45%.

Type of policy: Economic, Fiscal

Implementing entity: Ministry of Environment (Government)

Period of implementation: 2015-2024

Implemented in scenario: WEM

Mitigation impact: The assumption for GHG emission reduction is 0.56 Mt CO_2 eq. or 10% over the period of 2015-2024

Sectors: Waste, Energy

Greenhouse gas coverage: CH_4

Legislative Instruments

a) Circular Economy Package

In 2015, the European Commission published an ambitious Circular Economy Action Plan (COM/2015/0614) which includes measures that will help stimulate Europe's transition towards a circular economy. In July 2018, the revised waste legislative framework has entered force setting clear targets for reduction of waste and the establishment of a long-term path for waste management and recycling.

Key elements of the revised waste proposal, the Circular Economy Package (CEP), include:

- A common EU target for recycling 65% of municipal waste by 2035;
- A common EU target for recycling 70 % of packaging waste by 2030;
- A binding landfill target to reduce landfill to maximum of 10% of municipal waste by 2035;
- Recycling targets for specific packaging materials;
- Strengthening and extension of separate collection obligations to hazardous household waste (by the end of 2024), bio-waste (by end of 2023), textiles (by the end of 2024), etc.
- Establishment of minimum requirements for extended producer responsibility schemes to improve their governance and cost efficiency;
- Promotion of economic instruments to reduce landfilling;
- Improved definitions and harmonised calculation methods for recycling rates throughout the EU;
- Specific measures to promote re-use and stimulate industrial symbiosis - turning one industry's by-product into another industry's raw material;
- Economic incentives for producers to put greener products on the market and support recovery and recycling schemes.

Time of policy: Economic, Fiscal

Implementing entity: Ministry of Environment (Government)

Period of implementation: 2018-2035

Implemented in scenario: WEM

Mitigation impact: The assumption is that obliging with the CEP 2030 targets will also significantly contribute to the achievement of GHG reduction target.

Sector: Waste

Greenhouse gas coverage: CH_4

4.4.6 Transport

Policies and Strategies

a) National Action Plan for Clean Mobility

The National Action Plan for Clean Mobility (henceforth "NAP CM") for the period 2015-2018 with the outlook until 2030 responds to the Directive 2014/94/EU on the deployment of alternative fuels infrastructure. The Directive requires the development of domestic policy framework to support the growth of the market with alternative fuels within the transport sector as well as the development of related infrastructure.

The NAP CM focuses on electromobility, CNG, LNG, and partly also hydrogen technology (or the technology of fuel cells). Due to the direct relation to the above-mentioned Directive, the NAP CM primarily aims at alternative fuels, which are underlined in the Directive as being crucial for EU Member States, as well as the need to define, within domestic policy frameworks, national targets for the development of related infrastructure of charging and filling stations. The NAP CM sets out requirements for the construction of filling and charging stations with a time horizon between 2020 and 2030. Specifically, based on the Directive, 1 300 charging stations have to be in use by the year 2020 as well as 3-5 hydrogen filling stations. Concerning strategic goals in relation to electromobility, they include the facilitation of infrastructure development in the field of electromobility, the stimulation of demand for electric vehicles, the creation of conditions for potential customers to perceive electric vehicles in a better light, and to improve conditions to conduct business in fields related to electromobility.

The emphasis of the NAP CM is in accordance with the effort to strive mainly for technologies close to commercial use. The document will be updated every three years as required by the Directive.

By creating the NAP CM, the Government of the Czech Republic declares its will to support the development of alternative fuels in transport and thus to help achieve goals in the area of energy, transport, and environment. Reflecting the Directive, a key principle of the NAP CM is technical neutrality, which means the public sector's untargeted preference towards only one type of alternative fuels. To achieve planned emission reduction in the transport sector, it is necessary to increase the share of alternative fuels. Based on predictions, the biggest impact on the reduction of GHG emissions by the year 2020 in the transport sector in the conditions of the Czech Republic will be reached predominantly via the use of CNG.

Concerning clean mobility as such, it is financed, as stated in the NAP CM, via several subsidy programmes:

- Operational Programme Transport – helps fund infrastructure for alternative fuels
- Operational Programme Enterprise and Innovation for Competitiveness – helps fund the purchase of electric cars for entrepreneurs
- Integrated Regional Development Programme – helps fund the purchase of buses using alternative fuels
- National Programme of the Ministry of Environment of the Czech Republic to help purchase municipalities vehicles using alternative fuels

These programmes are described in more detail in the relevant section (Programming Tools and Other Measures).

The NAP CM is currently being revised and new goals for 2025 and 2030 will be set.

Type of policy: Regulatory

Implementing entity: Ministry of Transport (Government)

Period of implementation: 2015-2018 with an outlook to 2030

Implemented in scenario: WEM

Sector: Transport

Mitigation impact: This is a policy framework, therefore its mitigation effect is accounted under other measures.

Greenhouse gases covered: CO_2

b) Czech National Cycling Development Strategy for 2013-2020

In May 2013, the Czech government approved the strategic document "Czech National Cycling Development Strategy for 2013-2020" aiming to increase urban cycling modal share to 10% by 2020 and up to 25% by 2025 as well as increase the efficiency of building cycling infrastructure. Further, the Strategy calls for cooperation among the state, the regional level, and the local level, as well as the private and voluntary sectors.

The main global objective of the Cycling Strategy is to popularize bicycle to become equal-valuable natural and integral part of the transport system in cities.

The Strategy sets four specific goals:

- To secure the financing of the cycling and cycle-tourism infrastructure;
- To increase safety of cycling;
- To provide methodological support to the development of cycling in cities and to the project "Cycling Academy";
- To implement the national product "Czechia Cycles", the popularization of cycle-tourism in the Czech Republic.

The Strategy and the implementation of relevant measures to secure above mentioned goals are financed by the State Fund for Transport Infrastructure.

Type of policy: Economic

Implementing entity: State Fund of Transport Infrastructure (Government)

Period of implementation: 2013-2030

Implemented in scenario: WEM

Sector: Transport

Mitigation impact: The annual energy savings were estimated to be 585 TJ/year from 2020 with the annual budget of 150 million CZK.

Greenhouse gases covered: CO_2

Legislative Instruments

EU Level Instruments

Aviation

a) EU Emissions Trading System

Under the EU Emission Trading System (EU ETS), all airlines operating in Europe, European and non-European alike, are required to monitor, report, and verify their emissions, and to surrender allowances against those emissions. The airlines receive tradeable allowances covering a certain level of emissions from their flights per year. As CO_2 emissions from aviation have been included in the wider EU ETS, the main carbon pricing instrument for aviation in Europe and the first large emissions trading scheme, this measure is described in detail as a cross-cutting measure in the relevant chapter.

b) ICAO Agreement

The International Civil Aviation Organization (ICAO) is a UN specialized agency to manage the administration and governance of the Convention on International Civil Aviation (Chicago Convention). ICAO cooperates with Member States and industry groups on international civil aviation Standards and Recommended Practices (SARPs) and policies in support of a safe, efficient, secure, economically sustainable and environmentally responsible civil aviation sector.

The measure 'ICAO Agreement' is related to the agreement among ICAO's 191 members in October 2016 to use an offsetting scheme called CORSIA. The scheme does not take effect until 2021 and will be voluntary until 2027. Under the agreement, the global aviation emissions target is a 50% reduction by 2050 relative to 2005.

Type of policy: Economic

Implementing entity: Ministry of Transport, Ministry of the Environment in relation to EU legislation (Government)

Period of implementation: Since 2021

Implemented in scenario: WAM

Mitigation impact: The emission reduction has been calculated by subtraction of supposed energy saving from air transport related total emissions. In the context of the Czech Republic, the total emission reduction of this measure is 5.9 kt. CO_2 eq. in 2035.

Sector: Transport

Greenhouse gas coverage: CO_2

Road Transport

a) EU Regulation 2019/1242 on setting CO_2 emission performance standards for new heavy-duty vehicles

The Regulation sets CO_2 emission performance requirements for new heavy-duty vehicles whereby the specific CO_2 emissions of the Union fleet of new heavy-duty vehicles shall be reduced compared to the reference CO_2 emissions as follows:

- for the reporting periods of the year 2025 onwards by 15%;
- for the reporting periods of the year 2030 onwards by 30%, unless decided otherwise pursuant to the review referred to in Article 15 in the Regulation.

The reference CO_2 emissions shall be based on the monitoring data reported pursuant to Regulation (EU) 2018/956 for the period from 1 July 2019 to 30 June 2020, excluding vocational vehicles.

Type of policy: Regulatory

Implementing entity: Ministry of Transport (Government)

Period of implementation: Since 2019

Implemented in scenario: Measure entered force only in 2019, therefore it is not implemented in scenarios.

Mitigation impact: As this is a framework measure, its mitigation impact is accounted under other measures.

Sector: Transport

Greenhouse gas coverage: CO_2

b) EU Regulation 2019/631 on setting CO_2 emission performance standards for new passenger cars and for new light commercial vehicles

The EU Regulation 2019/631 of the European Parliament and of the Council of April 2019 sets CO_2 emission performance standards for new passenger cars and for new light commercial vehicles, and repeals Regulations (EC) No 443/2009 and (EU) No 510/2011.

The Regulation sets cost-effective CO_2 emission reduction targets for new light-duty vehicles up to 2030 combined with a dedicated incentive mechanism to increase the share of zero/low-emission vehicles. The aim of the Regulation is to ensure that the EU automotive industry maintains its technological leadership also by strengthening its competitiveness and stimulating employment while ensuring a better functioning of the internal market and aiming to fulfil Paris Agreement on climate change's objective. Further, the Regulation will also reduce fuel consumption costs for consumers. The incentive mechanism to increase the share of zero/low-emission vehicles will in particular contribute to the reduction of air pollutants and in turn increase air quality with public health benefits.

From 1 January 2020, this Regulation sets an EU fleet-wide target of 95 g CO_2/km for the average emissions of new passenger cars and an EU fleet-wide target of 147 g CO_2/km for the average emissions of new light commercial vehicles registered in the Union. The Regulation will, until the end of the year 2024, be complemented by additional measures corresponding to a reduction of 10 g CO_2/km.

According to the Regulation, the following EU fleet-wide targets shall apply from January 1st, 2025:

a) For the average emissions of the new passenger car fleet, an EU fleet-wide target equal to a 15% reduction of the target in 2021;
b) For the average emissions of the new light commercial vehicles fleet, an EU fleet-wide target equal to a 15% reduction of the target in 2021.

From January 1st, 2030 the following EU fleet-wide targets shall apply:

a) For the average emissions of the new passenger car fleet, an EU fleet-wide target equal to a 37,5% reduction of the target in 2021;
b) For the average emissions of the new light commercial vehicles fleet, an EU fleet-wide target equal to a 31% reduction of the target in 2021.

From the beginning of 2025, a zero- and low-emission vehicles' benchmark equal to a 15% share of the respective fleets of new passenger cars and new light commercial vehicles shall apply (in accordance with points 6.3 of Parts A and B of Annex I, respectively). From 1 January 2030, the following zero- and low-emission vehicles' benchmarks shall apply, in accordance with points 6.3 of Parts A and B of Annex I, respectively:

a) A benchmark equal to a 35 % share of the fleet of new passenger cars;

b) A benchmark equal to a 30 % share of the fleet of new light commercial vehicles.

Type of policy: Regulatory

Implementing entity: Ministry of Transport, Ministry of Industry and Trade (Government)

Period of implementation: Since 2019

Implemented in scenario: Measure entered force only in 2019, therefore it is not implemented in scenarios.

Mitigation impact: As this is a framework measure, its mitigation impact is accounted under other measures.

Sector: Transport

Greenhouse gas coverage: CO_2

c) Directive 2009/33/EC on the promotion of clean and energy efficient road transport vehicles

The Directive 2009/33/EC, amended in July 2019, requires EU Member States to ensure that contracting authorities and contracting entities take into account lifetime energy and environmental impacts, including energy consumption and emissions of CO_2 and of certain pollutants, when procuring certain road transport vehicles with the objectives of promoting and stimulating the market for clean and energy-efficient vehicles and of improving the contribution of the transport sector to the environment, climate and energy policies of the Union. The amended Directive, the Clean Vehicles Directive, introduces exemptions for EU Member States and specifies its scope. The Directive applies to procurement through contracts for the purchase, lease, rent or hire-purchase of road transport vehicles awarded by contracting authorities or contracting entities or, for instance, through public

service contracts having as their subject matter the provision of passenger road transport services in excess of a further to be defined threshold.

This Directive shall only apply to such contracts for which the call for competition has been sent after 2 August 2021 or, in cases where a call for competition is not foreseen, where the contracting authority or contracting entity has commenced the procurement procedure after that date. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by August 2nd, 2021.

Type of policy: Regulatory

Implementing entity: Ministry of Regional Development (Government)

Period of implementation: Since 2019

Implemented in scenario: Measure entered force only in 2019, therefore it is not implemented in scenarios

Mitigation impact: As this is a framework measure, its mitigation impact is accounted under other measures.

Sector: Transport

Greenhouse gas coverage: CO_2

d) Support of biofuels on the EU level

The quality of fuels used in transport is regulated by the Directive 2009/30/EC amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions. By the end of 2020, suppliers should gradually reduce life cycle greenhouse gas emissions by up to 10% per unit of energy from fuel and energy supplied, this reduction amounting to at least 6 % by the end of 2020 compared to the EU-average life cycle greenhouse gas emissions per unit of energy from fossil fuels in 2010, obtained through the use of biofuels, alternative fuels and reductions in flaring and venting at production sites.

Also, the EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources was transposed by the Act on Air Protection 201/2012 Coll., which sets the minimal share of biofuels in gasoline and diesel. Further, on the national level, the Government Decree 351/2012 Coll. sets sustainability criteria of biofuels, and The Law on Consumption Tax 453/2016 Coll. levies biofuels with a lower tax rate. The Directive also sets rules for the sustainable use of biofuels – greenhouse gas emissions from biofuels must be at least 35% lower than a fuel they replace. From 2017, this figure rises to 50% and from 2018 to 60% for biofuels produced in facilities that started production on January 1, 2017 or later.

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade, Ministry of Transport

Period of implementation: Since 2009

Implemented in scenario: WEM

Mitigation impact: The mitigation impact of biofuels was calculated using modification of emission factors per a unit of energy. The resulted emission factor is a weighted average of emission factors of fossil part and bio part, where weights correspond to the percentage of these components blending, and to plans to increase bio components blending to petrol and diesel. The total emission reduction of this measure is 198 kt CO_2 eq. in 2035.

Sector: Transport

Greenhouse gas coverage: CO_2

e) Support of electromobility on the EU level

Concerning the regulatory framework for the development of electromobility within the EU legislation, the Directive 2014/94/EU on the deployment of alternative fuels infrastructure as transposed to the national level via Act No. 152/2017 Coll. on fuels is relevant. This Act sets requirements on operators of charging stations and by registering them, the Ministry of Transport is able to publish lists of charging stations open to public.

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: Since 2017

Implemented in scenario: WEM

Mitigation impact: Due to the nature of the framework measure, it is not possible to calculate its mitigation impact.

Sector: Transport

Greenhouse gas coverage: CO_2

National level

a) Promotion of biofuels and fuels quality on national level

The quality of fuels used in transport is regulated by the Directive 2009/30/EC amending Directive 98/70/EC. The Fuel Quality Directive 2009/30/EC has been implemented into the Czech legislation (with regards to GHG emissions) via the amendment to the Act on Air Protection No. 201/2012 Coll., which sets minimal shares of biofuels in gasoline and diesel in accordance with the EU Directive.

The Directive 2009/30/EC requires that the emission intensity of transport fuels falls to 10% by the end of the year 2020, at least 6% compared to the average emission levels. The Government Decree 189/2018 Coll. sets sustainability criteria for biofuels and methodology for calculation greenhouse gas emission production from fuels. The Law on Consumption Tax 453/2016 Coll. Levies biofuels with a lower tax rate. The baseline shall be based on EU average level life cycle GHG emissions per unit of energy from fossil fuel products in 2010. Reducing GHG emissions is likely to be achieved by harnessing biofuels and fuels with lower carbon content (e.g. natural gas).

The Directive also sets rules for the sustainable use of biofuels. GHG emissions from biofuels must be at least 50% lower than the level of GHG emissions of a fuel they replace. This figure rose to 60% from biofuels produced in installations starting operation from October 2015 until the end of the year 2020 and 65% for biofuels produced in installations starting operation from January 1st, 2021.

Type of policy: Regulatory

Implementing entity: Ministry of Industry and Trade (Government)

Period of implementation: since 2009

Implemented in scenario: WEM

Mitigation impact: The mitigation impact of biofuel was calculated by the modification of emission factors per a unit of energy. The resulted emission factor is a weighted average of emission factors of fossil part and bio part, where weights correspond to percentage of these components blending and to plans to increase bio components blending to petrol and diesel. The total emission reduction of this measure is 198kt CO_2 by 2035.

Sector: Transport, Energy

Greenhouse gas coverage: CO_2

b) Economic and tax tools for road vehicles on national level

The objective of these tools is to promote the use of less polluting vehicles. This group of measures covers the following rules:

- Road Traffic Law 13/1997 and its amendments on the charging of the use of transport infrastructure for freight vehicles
- Road Tax Law 190/1993 and its amendments on road tax
- Excise Law 353/2003 supporting alternative fuels with lower CO_2 emissions (e.g. compressed natural gas – CNG, bio fuels – tax free)

Further, the Transport Policy of the Czech Republic for 2014-2020 with the Prospect of 2050 contains the following aims:

- To apply measures minimizing negative impacts of traffic emissions and noise by appropriate transport infrastructure
- To promote low emission freight transport
- To gradually implement measures to decrease noise and vibrations in densely populated areas
- To minimize negative impacts of transport on public health and ecosystem stability
- The construction and reconstruction of traffic structures for functional permeability for animals
- To strengthen the capacity of existing transport corridors before building new communications with similar transport capacity serving the same territory
- To reduce the dependence of transport on fossil fuels
- To introduce speed limits on motorways and highways (higher speed causes more energy consumption and higher emissions).

Type of policy: Economic, Fiscal

Implementing entity: Ministry of Finance (Government)

Period of implementation: 2020-2030

Implemented in scenario: WAM

Mitigation Impact: The emission reduction will be achieved by the changed composition of fuel consumption, i.e. more alternative fuels and less petrol and diesel. Provided that no alternative fuels will be charged by excise tax, its consumption would increase while petrol and diesel consumption decreases equally. The total emission reduction of this measure is 38.4 kt. CO_2 eq. in 2035 year.

Sector: Transport

Greenhouse gas coverage: CO_2

c) Government Decree No. 173/2016 Coll. on determining binding criteria for awarding public contracts for the acquisition of road vehicles

The Decree reflects the Directive 2009/33/EC of the European Parliament and of the Council of April 2009 on the promotion of clean and energy-efficient road transport vehicles and determines binding award criteria of public contracts for the acquisition of road vehicles specifically in connection with the procurement of vehicles. The contracting authorities must define technical specification, including consumption, and emissions of CO_2, NOx, hydrocarbons, and other particles.

The possibility of contracting authorities to define their technical specifications is described in Act No. 134/2016 Coll. On Public Procurement which transposes the European Procurement Directive (Directive 2014/24/EU) as well as other Directives, such as the Directive 2014/25/EU on procurement by entities operating in the water, energy, transport and postal services sectors or the Directive 2014/23/EU on the award of concession contracts, into Czech law. Further, the Directive 2009/33/EC was amended by the Directive (EU) 2019/1161 of the European Parliament and of the Council of June 20 2019 and sets minimum procurement targets for the share of clean light-duty vehicles in the total number of light-duty vehicles covered by contracts at Member State level, etc. The share for Czechia is set to be 29.7% from August 2nd 2021 to December 31st 2025 as well as from January 1st 2026 to December 31st 2030. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by August 2nd, 2021.

Type of policy: Regulatory

Implementing entity: Ministry of Regional Development (Government)

Period of implementation: Since 2016

Implemented in scenario: WEM

Mitigation Impact: The emission reduction will be achieved by the changed composition of fuel consumption, i.e. more alternative fuels and less petrol and diesel. Provided that no alternative fuels will be charged by excise tax, its consumption would increase while petrol and diesel consumption decreases equally. The total emission reduction of this measure is 38.4 kt. CO_2 eq. in 2035.

Sector: Transport

Greenhouse gas coverage: CO_2

Financial Schemes and Programmes

a) Operational Programme Transport

The current Operational Programme Transport 2014-2020 (hereinafter OPT2) follows the Operational Programme Transport 2007-2013 (hereinafter OPT1) and represents the most important source of financing for the construction of transport infrastructure in the Czech Republic in the programming period 2014-2020. OPT2 is one of the largest operational programmes taking about 17%, cca EUR 4.56 billion, of all funds for the Czech Republic from the European Structural and Investment Funds in the programming period. Its aim is to fulfil strategic investment needs and help solve key problems in the Czech transport sector.

The main objective is to provide support to sustainable transport and to remove barriers in key network infrastructures. Specifically, the aim is to finalize the backbone infrastructure and help regions access the Trans-European Transport Network (TEN-T), improve its quality and functionality, remove narrow areas in key infrastructure, and support sustainable mobility focusing on cities mainly. The OPT implements the transport strategy and other transport-related aspects of the National Development Plan. Taking into account lessons learnt from the OPT1, the OPT2 targets its support at four priority axis:

Priority Axis 1: Infrastructure for Railways and other modes of sustainable transport

Priority Axis 2: Road infrastructure within the TEN-T, public infrastructure for clean mobility and traffic management

Priority Axis 3: Road infrastructure excluding the TEN-T

Priority Axis 4: Technical assistance

With the OPT2, there are overall 79 subsidy programmes, applications for support to certain calls can be received until June 2023.

All projects implemented within individual Priority Axes favour mass transportation, aim to increase flow of road transportation and support ecological alternatives to road automobile transportation (water-borne and railway transportation) and thus have indirect positive effect on CO_2, NO_x and solid particle emissions.

Concerning clean mobility, the subsidy scheme The Development of Infrastructure for alternative fuels in road transport, funded by the OPT2, is further divided into four sub-programmes. These sub-programmes help fund the network development of fast-charging stations and charging stations (sub-programme 1), CNG filling stations (sub-programme 2), LNG filling stations (sub-programme 3), and hydrogen filling stations (sub-programme 4).

Type of policy: Economic

Implementing entity: State Fund of Transport Infrastructure (Government)

Period of implementation: 2007-2023

Implemented in scenario: WEM

Mitigation Impact: The annual CO_2 emission drop was calculated from average emission coefficients of transport and annual energy savings estimated to 3 016 TJ/year from 2020.

Sector: Transport

Greenhouse gas covered: CO_2

b) Support of public transport and modal shift from road transport

- **Increasing the attractiveness of public transport**
  - Further development of the integrated transport system

    The integrated transport system provides public transport in a certain region and includes several means of transport which do not compete within the system. Individual carriers can participate in this system and their transportation services are usually harmonized. The ITS systems in Prague, South Moravia and Ostrava belong to the most efficient systems in the Czech Republic. As this measure is valid on urban and regional level, it is impossible to quantify its mitigation impact.

  - Increasing passengers' comfort
    The comfort of passengers is increased via different measures including air-conditioning, cleanliness and by the design of the internal environment of the means of transport itself. Travelling is also made more comfortable for disabled citizens or mothers with prams, for instance. Due to the character of this measure, it is not possible to determinate its contribution to GHG emission reduction.

  - Strengthening preferences for public transport vehicles
    In order to enable public transport vehicles to drive faster, extra lanes for buses or trolleybuses are designed. Also, urban public transport receives priority on intersections with light control systems.

  - Introducing the "Park and Ride" system
    Efforts to improve multi-modal passenger transport by "Park and Ride" (P&R) are made to encourage people to leave their cars at the outskirts of Prague and instead take public transport to the centre. In Prague, for instance, this system combines the increasing rates of parking fees in locations where quieter environments are preferred (so called "blue zones") with cheap fees at guarded parking places outside of the city centre.

- **Creating systems of combined freight transport**

The use of multimodal transport systems is preferred to reduce the performance of road transport in favour of those modes of transport that have less impact on the environment. Relevant measures, as described in the Transport Policy of the Czech Republic for 2014-2020 with the Prospect of 2050, seek to find effective and sustainable logistics solutions using the principle of co-modality with the view to support multimodal nature of transport, optimize the capacity of transport infrastructure and use of energy and make logistics services available to small and middle-sized businesses in industry, trade and agriculture. Further, competitive multimodal transport chains for companies, using the railway and possibly waterborne transport with the objective to improve capacity utilization of the means of transport and reducing empty rides, reduction of heavy road transport, better cooperation and

coordination among companies in the area of transport, support of small and middle-sized enterprises, and reduction of negative impacts on the environment, public health and transport safety.

Also, the support of railway transport shall be realized through investment programs for improvement of infrastructure, increasing of speed, promotion of intermodal (container) transport, construction of transship points and of logistic centers. The aim of the measure is to shift 30% of long distanced freight transport from roads to railways (in trips over 300 km).

In total, all fourteen regional authorities in the Czech Republic make effort to develop integrated transport systems (ITS) and are the implementing authorities of this measure. In some regions (Southern and Northern Moravian, Olomouc, Middle Bohemian) these systems already exist, in other regions they are being prepared**.**

Type of policy: Regulatory

Implementing entity: 14 regions/regional authorities

Period of implementation: There is no uniform period for all 14 regions. Each region has the plan of its development. The plans are partly coordinated by Ministry for Regional Development. Within the projections this measures is calculated until 2035.

Implemented in scenario: WEM

Mitigation Impact: The emission reduction will be achieved by the changed composition of fuel consumption, i.e. more alternative fuels and less petrol and diesel. Provided that no alternative fuels will be charged by excise tax, its consumption would increase while petrol and diesel consumption decreases equally. The total emission reduction of this measure is 38.4 kt. CO_2 eq. in 2035 year.

Sector: Transport

Greenhouse gas coverage: CO_2

- **Road toll**

Since 2010, certain vehicles are subject to toll payment including vehicles over 3.5 tons. The charge level is derived from the type of vehicle, number of axles, and the time when the road is used.

Type of policy: Fiscal

Implementing entity: Ministry of Transport (Government)

Period of implementation: 2020-2035

Implemented in scenario: WAM

Mitigation Impact: The emission reduction has been calculated with a help of demand elasticity. Elasticity expresses how travel demand responds to transport price increases. The elasticity values for road transport were obtained from scientific literature (Dunkerley et al., 2014). The total emission reduction of this measure is thus calculated to be 161.9 kt. CO_2 eq. by 2035.

Sector: Transport

Greenhouse gas coverage: CO_2

c) Clean Mobility

As mentioned above, there are several subsidy schemes funding clean mobility.

The Integrated Regional Development Programme helps fund the purchase of buses using alternative fuels. So far, there have been three calls: "Low-carbon and Zero-emission vehicles" (2016-2017, allocation: EUR 100 million, 211 vehicles were bought for public transportation), "Sustainable Transportation" (2017-2019, allocation: EUR 300 million, by the end of 2019 around 190 vehicles were bought for public transportation), and "Low-emission and Zero-emission vehicles for coal-mining regions, allocation: CZK 1 839 877 615 = EUR 71 148 067).

The Operational Programme Enterprise and Innovation for Competitiveness helps fund the purchase of electric cars for entrepreneurs. Within the programme to support low-emission technologies and via the sub-programme Electromobility, four calls were announced.

1st call (spring 2016) – allocation: CZK 80 million

2nd call (2017) – allocation: CZK 150 million

3rd call (2018) – allocation: CZK 60 million

4th call (2019) – allocation: CZK 200 million

In total (excluding the 4th call), 536 electronic cars were bought and 255 charging stations were built.

The **National Programme of the Ministry of Environment of the Czech Republic** helps purchase municipalities vehicles that use alternative fuels. The Programme is directed at applicants that are either regions or municipalities, region-owned or municipality-owned market economy operators, or contributory organisations set up by regions/municipalities and state-owned contributory organisations. So far, CZK 100 million was allocated to the first two calls (2016-2017), the third call has been launched in autumn 2018.

Further, e-vehicles are exempted from paying road tax and, in the context of adopting the NAP CM, e-vehicles are also exempted from paying motorway tolls. Vehicles using other alternative fuels pay less than conventional vehicles for motorway tolls, other discussions on further exemptions are undergoing.

Type of policy: Regulatory, Economic

Implementing entity: Ministry of the Environment, Ministry of Industry and Trade (Government)

Period of implementation: As described above for individual programmes.

Implemented in scenario: WEM

Mitigation Impact: The Programmes being in their rather initial phases, the mitigation impact of the programmes combined is not possible to calculate.

Sector: Transport

Greenhouse gas coverage: CO_2

5 Projections

5.1. Sectoral projections

5.1.1. Emission projection scenarios

The following projections have been prepared in line with methodological guidelines for projection compilation[22] and in line with Regulation (EU) No 525/2013. Projections contain two scenarios:

- With existing measures (WEM) - with measures implemented and effective as of the date when preparation of projections began (July, 2018);
- With additional measures (WAM) - with measures which are going to be implemented in near future or which are planned to be implemented in future.

Table below provides overview of projection results. All specific Policies and Measures (PaMs) included in WEM and WAM scenarios are presented in Chapter 4.

Table 5-1: Overview of projection results - emissions [Mt CO_2 eq., % reduction in comparison with 1990, with LULUCF]

Scenario	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990 - 2030 (%)	1990 - 2040 (%)
WEM	192.2	140.5	126.5	126.8	112.8	108.2	97.8	91.6	-34.0	-43.7	-52.3
WAM	192.2	140.5	126.5	127.2	113.1	108.7	97.8	92.3	-33.8	-43.4	-52.0

Source: CHMI

5.1.2. Projections in individual categories

The projections of greenhouse gas emissions are prepared for the following sectors (division to the sectors is in line with IPCC 2006 Guidelines (IPCC 2006)):

1. Energy (Sector 1) - greenhouse gas emissions from combustion processes and fugitive emissions
2. Industrial Processes and Product Use (IPPU) (Sector 2) - greenhouse gas emissions resulting from industrial activities and not from fuel combustions used to supply energy for carrying out these activities
3. Agriculture (Sector 3)
4. Land use, Land Use Change and Forestry (LULUCF) (Sector 4)
5. Waste (Sector 5)

Total greenhouse gas emissions are calculated as a sum of CO_2, N_2O, CH_4, HFCs, PCFs, SF_6 and NF_3 emissions expressed in CO_2 eq. Methodological operations and modelling tools used for projections of greenhouse gases are described in the text below for every sector.

[22] UNFCCC Reporting Guidelines on National Communication, FCCC/CP/1999/7, part II

5.1.3. Greenhouse gas emissions from Energy (Sector 1)

Projections of greenhouse gas emissions from Energy include the following activities:

CO_2 emissions

- Fuel combustion in fuel conversion processes (public and industrial energy sector),
- Fuel combustion in final consumption (industrial processes, transportation, households, agriculture and sector of public and commercial services),
- Fuel refinement processes (refineries, coal treatment and coking),
- Desulfurization processes using lime.

CH_4 emissions

- Mining and post-mining treatment of coal,
- Mining, storage, transit and distribution of natural gas,
- Mining, storage, transportation and refining of oil.

N_2O emissions

- Fuel combustion (in stationary or mobile sources).

The bottom-up MESSAGE (Model for Energy Supply Strategy Alternatives and their General Environmental Impacts) model was used for the projections of CO_2, CH_4 and N_2O emissions from categories related to the combustion of fossil fuels (Sector 1A), except of category 1A3 Transport for which methodology based on data from COPERT was used. The MESSAGE model was developed at IIASA (International Institute for Applied Systems Analysis) and designed for the optimization of energy system. The original purpose of MESSAGE was the modelling of energy systems for the International Atomic Energy Agency. Currently, MESSAGE is used also for projections of greenhouse gas emissions and basic pollutants. The model uses input data for individual emission sources from the EU ETS database (e.g. emissions, fuel consumption and fuel parameters). Electricity, heat production and financial support of renewable sources are provided by Energy regulatory office. Energy or industrial companies are directly contacted by the Ministry of Industry and Trade (MIT) and by the Czech Hydrometeorological Institute (CHMI) to get information about future plans (constructions of new sources or shutdowns), technical details, life expectancy, investment and operating costs. The Ministry of Industry and Trade (The State Energy Policy) and OTE, Inc. provide information regarding the development of energy production and consumption. Further data are obtained from the association for energy information and statistics (ENERGOSTAT).

Parameters of energy sector development presented below were calculated using the MESSAGE model. Balance is valid for scenario with existing measures (WEM).

Table 5-2: Domestic consumption of primary energy sources – WEM scenario

(PJ)	2017	2020	2025	2030	2035	2040
Coal	677	661	540	530	451	279
Oil	368	370	373	370	368	361
Gas	288	290	293	284	275	330
Nuclear	332	339	340	340	395	464
Other	-58	-43	-13	-13	-6	8
Renewable energy sources (RES)	188	200	218	239	246	254
Total	**1807**	**1817**	**1751**	**1750**	**1729**	**1696**

Source: CzSO, MIT

Table 5-3: Structure of electricity production – scenario WEM

(PJ)	2017	2020	2025	2030	2035	2040
Coal	150	148	117	117	93	50
Liquid fuels	0.4	0.3	0.3	0.3	0.3	0.3
Natural gas	13	14	15	14	14	31
Renewables	39	40	44	50	52	56
Nuclear energy	110	112	112	112	130	153
Other fuels	10	11	11	11	11	4
TOTAL	**323**	**325**	**299**	**305**	**301**	**294**

Source: CzSO, MIT

Table 5-4: Final consumption of fuel and energy – scenario WEM

(PJ)	2017	2020	2025	2030	2035	2040
Coal	61	59	46	37	30	28
Manufactured gases	12	12	12	11	11	11

(PJ)	2017	2020	2025	2030	2035	2040
Oil and petroleum products	267	269	271	268	266	260
Natural gas	222	219	215	206	205	203
Renewables and biofuels	119	129	141	153	155	149
Non-renewable waste	10	10	10	10	10	10
Derived heat	91	89	85	81	78	75
Electricity	209	214	219	224	229	237
Total	**992**	**1002**	**999**	**990**	**983**	**972**

Source: CzSO, MIT

Table 5-5: Final consumption of electricity – scenario WEM

(PJ)	2017	2020	2025	2030	2035	2040
Households	0.1	0.1	0.1	0.1	0.1	0.1
Transport	6	7	8	10	14	20
Industry	88	27	26	23	22	22
Commercial and Other	57	61	60	59	58	56
TOTAL	**151**	**95**	**94**	**92**	**94**	**98**

Source: CzSO, MIT

Projections from category 1A3 Transport are based mainly on the new road transport data, which were obtained from COPERT. COPERT is the EU standard vehicle emissions calculator which uses a detailed methodology for EMEP/CORINAIR transport emissions calculations (EEA 2016). The overall transport performance forecast and the division of transport work are based on the Transport Sector Strategy (MT 2013). Transportation performances in the transportation sector are shown in Table 5.6.

Table 5-6: Expected transport performances for personal and freight transportation

	2017	2020	2025	2030	2035	2040
Personal transportation (million person-km)	124	105	109	109	105	96
Freight transportation (million t-km)	64	77	80	79	75	69

Source: MIT, Transport Research Centre (CDV)

The following projections of final consumption of energy in transportation sector for the WEM scenario are expected (Table 5.7). Table 5.7. is following the reporting of projections and PAMs under the Reg. EU No 525/2013 submitted in 2019 (CHMI 2019), however the year 2017 was updated with latest available data.

Table 5-7: Projections of final fuel and energy consumption in transportation – scenario WEM (PJ)

	2017	2020	2025	2030	2035	2040
Brown coal	0.1	0.0	0.0	0.0	0.0	0.0
Liquid biofuels	13.1	29.1	29.1	28.1	28.1	28.1
Electricity	6.6	9.7	12.1	15.6	20.4	22.6
Gasoline	67.7	53.9	50.2	50.5	46.7	42.4
Diesel fuel	169.6	119.5	99.6	92.4	95.7	90.4
Aviation fuels	15.1	15.6	16.4	16.7	17.2	17.2
Liquefied petroleum gas	4.4	2.6	2.7	3.8	3.6	3.6
Natural gas	3.4	23.8	35.1	44.1	48.1	48.1
Hydrogen	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	258.5	254.1	245.2	251.1	259.8	252.4

Source: CzSO and MIT

Emission projections for residential houses are based on the final energy consumption in residential sector (Table 5.10). Projections are prepared by using MESSAGE.

Table 5-8: Projections of final energy consumption in residential sector

Final energy consumption in residential sector (PJ)	2017	2020	2025	2030	2035	2040
Coal	0.03	0.03	0.02	0.02	0.01	0.01
Liquid fuels	0.00	0.00	0.00	0.00	0.00	0.00
Natural gas	0.08	0.08	0.07	0.07	0.06	0.06
Renewables	0.08	0.08	0.09	0.09	0.10	0.09
Heat	0.04	0.04	0.04	0.03	0.04	0.04
Electricity	0.05	0.06	0.06	0.06	0.06	0.06

Final energy consumption in residential sector (PJ)	2017	2020	2025	2030	2035	2040
TOTAL	**0.29**	**0.29**	**0.28**	**0.28**	**0.28**	**0.27**

Source: CzSO, MIT

For the commercial sector, the final energy consumption is shown in Table 5.9.

Table 5-9: Projections of final energy consumption of commercial sector and agriculture/fisheries and other

Final energy consumption in commercial sector (PJ)	2017	2020	2025	2030	2035	2040
Coal	1	1	1	0	0	0
Technological gases	0	0	0	0	0	0
Liquid fuels	16	16	16	16	16	16
Natural gas	50	49	46	43	40	36
Renewables	9	9	9	9	9	9
Industrial waste	1	1	1	1	1	1
Municipal waste	1	1	1	1	1	1
Heat	19	19	18	17	17	16
Electricity	60	61	60	59	58	56
TOTAL	**156**	**154**	**150**	**144**	**140**	**133**

Source: CzSO, MIT

Projection results – WEM and WAM scenario

According to the projections of greenhouse gas emissions in Energy sector it is expected that emissions are going to decrease for both scenarios. Decrease of emissions is more visible for WAM scenario which includes additional measures for category 1A3 Transport but difference between WEM and WAM scenario is not very distinctive.

Table 5-10: Projections of total greenhouse gas emissions from the Energy sector [Mt CO_2 eq., respectively % reduction in comparison with 1990]

Scenario	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990 - 2030 (%)	1990 - 2040 (%)
WEM	161.3	120.6	98.9	96.5	85.7	82.1	73.0	67.6	-40.2	-49.1	-58.1
WAM	161.3	120.6	98.9	96.1	85.3	81.8	72.7	67.3	-40.4	-49.3	-58.3

Source: CHMI

Table 5-11: Breakdown of reported and projected emissions of GHG by categories in Energy - WEM scenario

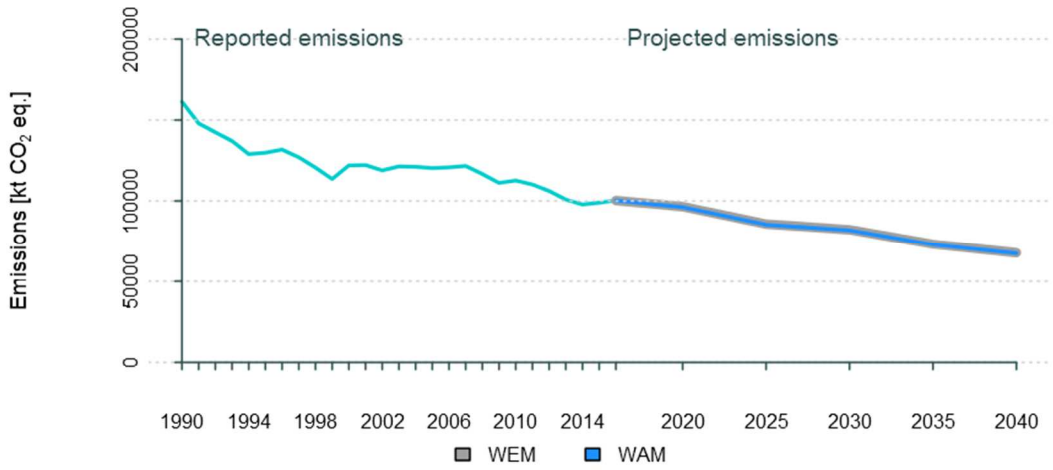
Category	1990	2005	2017	2020	2025	2030	2035	2040	1990 – 2020 (%)	1990 – 2030 (%)	1990 – 2040 (%)
A. Fuel combustion (sectoral approach)	**149.5**	**114.2**	**95.3**	**92.5**	**81.8**	**78.8**	**69.8**	**64.9**	**-38.1**	**-47.2**	**-56.6**
1. Energy industries	56.9	63.2	51.8	51.5	42.5	42.2	36.3	34.0	-9.4	-25.7	-40.2
2. Manufacturing industries and construction	47.1	18.8	10.4	9.9	9.8	9.7	9.6	9.5	-79.1	-79.5	-79.8
3. Transport	11.5	17.4	18.7	17.9	17.4	16.1	14.3	12.2	56.3	40.2	6.4
4. Other sectors	33.8	14.5	14.0	12.9	11.8	10.6	9.4	8.9	-61.7	-68.7	-73.7
5. Other	0.2	0.3	0.5	0.2	0.2	0.2	0.2	0.2	17.9	17.9	17.9
B. Fugitive emissions from fuels	**11.9**	**6.4**	**3.6**	**4.0**	**3.9**	**3.3**	**3.2**	**2.7**	**-66.1**	**-72.1**	**-77.2**
1. Solid fuels	10.8	5.5	3.0	3.4	3.1	2.7	2.6	2.0	-68.7	-75.2	-81.3
2. Oil and natural gas and other emissions from energy production	1.1	0.9	0.6	0.6	0.8	0.6	0.7	0.7	-40.1	-41.5	-36.7

C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA
Total	**161.3**	**120.6**	**98.9**	**96.5**	**85.7**	**82.1**	**73.0**	**67.6**	**-40.2**	**-49.1**	**-58.1**

Table 5-12: Breakdown of reported and projected emissions of GHG by categories in Energy - WAM scenario

Category	1990	2005	2017	2020	2025	2030	2035	2040	1990 – 2020 (%)	1990 – 2030(%)	1990 – 2040 (%)
A. Fuel combustion (sectoral approach)	**149.5**	**114.2**	**95.3**	**92.1**	**81.4**	**78.5**	**69.5**	**64.6**	**-38.4**	**-47.5**	**-56.8**
1. Energy industries	56.9	63.2	51.8	51.5	42.5	42.2	36.3	34.0	-9.4	-25.7	-40.2
2. Manufacturing industries and construction	47.1	18.8	10.4	9.9	9.8	9.7	9.6	9.5	-79.1	-79.5	-79.8
3. Transport	11.5	17.4	18.7	17.6	17.0	15.7	13.9	11.9	56.3	37.0	3.8
4. Other sectors	33.8	14.5	14.0	12.9	11.8	10.6	9.4	8.9	-61.7	-68.7	-73.7
5. Other	0.2	0.3	0.5	0.2	0.2	0.2	0.2	0.2	17.9	17.9	17.9
B. Fugitive emissions from fuels	**11.9**	**6.4**	**3.6**	**4.0**	**3.9**	**3.3**	**3.2**	**2.7**	**-66.1**	**-72.1**	**-77.2**
1. Solid fuels	10.8	5.5	3.0	3.4	3.1	2.7	2.6	2.0	-68.7	-75.2	-81.3
2. Oil and natural gas and other emissions from energy production	1.1	0.9	0.6	0.6	0.8	0.6	0.7	0.7	-40.1	-41.5	-36.7
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA
Total	**161.3**	**120.6**	**98.9**	**96.1**	**85.3**	**81.8**	**72.7**	**67.3**	**-40.4**	**-49.3**	**-58.3**

Figure 5-1: Historic and projected greenhouse gas emissions (kt CO_2 eq.) in Energy according to scenario with existing measures (WEM) and with additional measures (WAM)



Source: CHMI

Table 5.13 shows projections of greenhouse gas emissions related to fuel sold to aircraft in international transport. The Czech Republic doesn´t have emission related to fuel sold to ships for international transport. These emissions are not included in totals. Emissions from international aviation strongly increased in 2005 in comparison to 1990. In 2017 in comparison to 2016 a strong increase in emissions was estimated (about 127 kt CO2 eq.), main reason for this change is the fast growth of the share of low cost flights in 2017. However, after 2017 a decline in emissions is expected due to rise in flight prices and do to the gradual implementation of abatement measures (e.g. technological and logistic improvements).

Table 5-13: Projections of greenhouse gas emissions related to fuel sold to aircraft [kt CO_2 eq.; only WEM scenario]

Scenario	1990	2005	2017	2020	2025	2030	2035	2040
WEM	528.2	978.9	1082.89	893.2	901.5	910.0	918.5	925.5

Source: CHMI

Sensitivity analysis

Regarding the dominant share of combustion processes on total greenhouse gas emission levels in the Czech Republic, the sensitivity analyses focused on this decisive portion of projections. The sensitivity analysis was conducted for CO_2 emissions from fuel combustion in energy sector (1.A). Dependency on economic development was tested (+/- 5% GDP difference) with the MESSAGE model. The following table shows the results.

Table 5-14: Sensitivity analysis of combustion processes (1A) on GDP (WEM scenario)

	CO_2 (Mt)	CO_2 in Mt (GDP +5%)	CO_2 in Mt (GDP -5%)	Emission difference in % (GDP +5%)	Emission difference in % (GDP -5%)
2020	92.5	98.0	88.6	9.0	-7.4
2025	81.8	89.4	78.9	8.2	-7.1
2030	78.8	83.3	75.6	8.3	-7.6
2035	69.8	76.7	66.9	8.7	-8.0
2040	64.9	64.9	64.9	0.0	0.0

Source: CHMI

Differences between high (GDP +5%) and basic scenarios are mostly higher than variations between basic and low scenario (GDP -5%). That means that higher growth of emissions with high scenario, that is contingent of fast economic growth, is partially compensated by improved energy efficiency. Improved energy efficiency in the high scenario may be explained by growth in investment in more favourable economic conditions.

5.1.4. Greenhouse gas emissions from Industrial Processes and Product Use (Sector 2)

Sector IPPU includes emissions from technological processes and not from fuel combustions used to supply energy for carrying out these processes. Projections of greenhouse gas emissions include the following activities:

CO_2 emissions

- Mineral industry,
- Chemical industry,
- Metal industry,
- Non energy products from fuels and solvent use.

CH_4 emissions

- Chemical industry,
- Metal industry.

N_2O emissions

- Chemical industry,
- Other product manufacture and use.

HFCs emissions

- Product uses as substitutes for ODS.

PFCs emissions

- Electronics industry,
- Product uses as substitutes for ODS.

SF_6 emissions

- Electronics industry,
- Other product manufacture and use.

NF_3 emissions

- Electronics industry.

The projections of greenhouse gas emissions in IPPU are based on data and methodology used for emission estimates reported in National Inventory Report (CHMI 2019). The projections are estimated separately for each subcategory under IPPU sector and also for each gas. In the Czech Republic, there is no additional measure for IPPU sector and thus only WEM scenario is calculated.

For most of the categories under 2.A Mineral Production, 2.B Chemical Production and 2.C.1 Iron and Steel Production, the activity data are forecasted by the Ministry of Industry and Trade (MIT). The forecasts of the activity data are available for 2017 - 2030, after 2030 data are forecasted by experts at CHMI. For 2.C.2 - 2.C.7 the data were forecasted using statistical methods by the experts from CHMI. However, the emissions are under the threshold of the significance. For 2.D the data about non-energy use of fuels were forecasted by the experts from CHMI.

Table 5.15 contains activity data obtained from MIT used for projections of greenhouse gas emissions from sector IPPU.

Table 5-15: Projections of activity data for industrial processes (kt)

Activity data [kt]	2020	2025	2030
A. Mineral industry			
Cement production	4050	4100	4150
Lime production	964	1013	1065
Glass production	1268	1312	1357
Bricks production	894	808	666
B. Chemical industry			
Ammonia production (5)	193	171	150
Nitric acid production	620	620	620
Ethylene	500	500	500
Polyvinyl chloride (PVC)	100	100	100
Styrene	179	194	220
C. Metal industry			
Iron and steel production	4181	4182	4184

Source: MIT

Projection results – WEM scenario

According to the WEM scenario, total emissions from IPPU will be slightly increasing and then stagnant in the next few years. It is not expected that the production capacity for main products in the Czech Republic as lime, cement, ammonia, iron and steel is going to decrease rapidly. It is expected that the decrease of GHG emissions till 2040 will be very slight and it will be mainly influenced by the ban on F-gases use.

Table 5-16: Projections of total greenhouse gas emissions from Industrial Processes [Mt CO_2 eq., respectively % reduction in comparison with 1990; only WEM scenario]

Scenario	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990 - 2030 (%)	1999 - 2040 (%)
WEM	17.1	14.8	15.7	16.0	15.3	14.4	13.8	13.6	-6.2	-15.7	-20.5

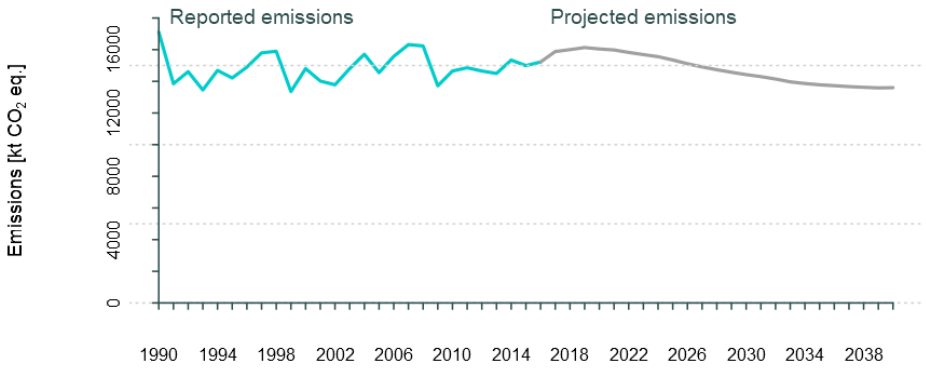
Source: CHMI

Table 5-17: Breakdown of reported and projected emissions of GHG by categories in IPPU - WEM scenario [Mt CO_2 eq.]

Category	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990 - 2030 (%)	1999 - 2040 (%)
2.A Mineral industry	4.1	3.3	2.9	2.9	3.0	3.0	3.1	3.2	-29.0	-25.9	-22.8
2.B Chemical industry	2.9	2.8	2.2	2.4	2.4	2.3	2.2	2.2	-18.4	-22.0	-26.7
2.C Metal industry	9.7	7.1	6.5	6.9	6.8	6.8	6.7	6.7	-28.8	-30.2	-30.4
2.D Non-energy products from fuels and solvent use	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.9	1.5	1.5
2.E Electronic industry	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA
2.F Product uses as ODS substitutes	NO	1.0	3.6	3.4	2.8	1.9	1.3	1.1	NA	NA	NA
2.G Other product manufacture and use	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	NA	NA	NA
Total	**17.1**	**14.8**	**15.7**	**16.0**	**15.3**	**14.4**	**13.8**	**13.6**	**-6.2**	**-15.7**	**-20.5**

Source: CHMI

Figure 5-2: Historic and projected greenhouse gas emissions (kt CO_2 eq.) in IPPU according to scenario with existing measures (WEM)



Source: CHMI

The sector IPPU is only sector under which emissions of fluorinated gases (HFCs, PFCs, SF_6 and NF_3) are reported. There is no production of fluorinated gases in the Czech Republic and thus only emissions resulting from the use of fluorinated gases are estimated. There is no official forecast of the consumption of fluorinated greenhouse gases in categories 2.E Electronics Industry, 2.F Substitutes for Ozone Depleting Substances and 2.G Other Product Manufacture and Use and thus the forecast of consumption is based on expert judgement at CHMI. Forecasting of F-gases consumption strictly follows Regulation No 517/2014, Directive 2006/40/EC and Kigali Amendment of the Montreal Protocol. Projections for category 2.F.1 which has the highest share on total fluorinated greenhouse gas emissions are calculated by model Phoenix, which is used for emission estimates reported in National Inventory Report (Ondrusova, Krtkova 2018, CHMI 2019). Methodology used for emission estimates is Tier 2a (CHMI 2019, IPCC 2006); methodology used for emission projections from 2.F.1 is also Tier 2a (IPCC 2006).

Table 5.18 gives projections of fluorinated greenhouse gas emissions and the percentage differences compared to level of emissions in 1990. Decrease of HFCs, PFCs and NF_3 emissions compared to 1990 cannot be calculated because at that time F-gases were not used in the Czech Republic and thus emissions are reported as not occurring (NO). It is expected that HFCs emissions will start to decrease around the year 2020. The decrease of F-gas emissions will not be rapid as someone could expected because it is important to take into account that emissions are releasing during equipment lifetime and for some cases lifetime of equipment can be more than a decade.

Table 5-18: Breakdown of reported and projected emissions of fluorinated GHG in IPPU - WEM scenario [Mt CO_2 eq.]

Scenario	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990 - 2030 (%)	1990 - 2040 (%)
HFCs	NO	1.0	3.6	3.4	2.8	1.9	1.3	1.1	NA	NA	NA
PFCs	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA
SF_6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-15.6	-25.6	-31.0
NF_3	NO	NO	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA

Source: CHMI

Sensitivity analysis

Projections of greenhouse gas emissions from the IPPU sector are based on calculation sheets used for emission estimates in the National Inventory Report (CHMI 2019). Activity data is the only variable which changes during the projected period. Emission factors are constant during projected period and thus sensitivity analysis would not bring any interesting outcomes for categories under IPPU sector (except category 2.F.1). If activity data will change by ±5% then emissions will change by ±5%, because emission factors used for emission estimates are constant during the projected period.

The only category for which the sensitivity analysis could bring interesting output is category 2.F.1 Refrigeration and Air Conditioning, which is also a key category (CHMI 2019). Emission estimates and projections are prepared by using national model Phoenix, which take into account specific approach for calculating the amount of chemical remaining in the equipment at decommissioning. The amount of chemical remaining in the equipment at decommissioning is calculated using the Gaussian distribution model with mean at the lifetime expectancy for newly filled equipment and only half lifetime expectancy is assumed for serviced equipment (Ondrusova, Krtkova 2018). Sensitivity analysis for category 2.F.1 is implemented for the WEM scenario using increased/decreased consumption of F-gases by ±5% (respecting the emission trend from National Inventory Report (CHMI 2019)).

Table 5-19: Sensitivity analysis using variable consumption of F-gases in category 2. F.1 under IPPU sector

Emission difference [%]	2020	2025	2030	2035	2040
WEM and WEM +5%	2.12	3.16	4.23	4.93	4.91
WEM and WEM -5%	-2.12	-3.16	-4.23	-4.93	-4.91

Source: CHMI

5.1.5. Emissions from Agriculture (Sector 3)

Projections of greenhouse gas emissions include the following activities:

CH_4 emissions

- Enteric fermentation,
- Manure management.

N_2O emissions

- Manure management,
- Agricultural soils.

CO_2 emissions

- Liming,
- Urea application.

The projections of greenhouse gases from Agriculture are based strictly on the methodology used in the National Inventory Report (CHMI 2019) in the Agriculture sector. It means that projected emissions are estimated by the same processes as it is used in National Inventory Report (CHMI 2019) (Tier 2 and Tier 1 methodology). There are three important sources of data sets used for estimation:

- Animal populations (number of heads per animal categories),
- Amount of nitrogen from fertilizers applied to agricultural soils,
- Annual harvest production.

Trends in activity data and the emission factors used in calculation were derived from two official documents of the Ministry of Agriculture (MA 2016, MA 2018). Lack of some activity data (body weight of cattle, yield of crop within 2030-2040) was substituted by values derived by standard statistical approaches (regression based on historical data, long term average in case of data without regression trend etc.). In some cases, if it is very difficult to forecast the future development (e.g. content of the fat in milk in 2030-2040, the amount of sewage sludge applied to soils etc.), the constant values were used in estimation.

Methane emissions

Enteric fermentation and manure management are the main sources of methane emissions in agriculture. The cattle population rapidly declined during 1990-2011 (cattle by more than 60%). From 2012 the population is slowly growing (about 0.5-2% per year) and the similar trend is predicted for the period 2020-2040. The more intensive growth is predicted for pig population, specifically a rise to 40% within 2017-2040, and for poultry population with growth up to 20% from 2017 to 2040. The emission coefficients used to estimate methane emissions are taken from the National Inventory Report (CHMI 2019). The methodology of emission estimation is linked to the IPCC 2006 Guidelines (IPCC 2006).

Table 5-20: Historic and projected activity data for animal population (thousands of heads)

	2017	2020	2025	2030	2035	2040
Cattle	**1 421**	**1 430**	**1 500**	**1 555**	**1 570**	**1 580**
Swine	**1 491**	**1 600**	**1 900**	**2 100**	**2 200**	**2 200**
Sheep	**217**	**235**	**240**	**250**	**250**	**250**
Goats	**28**	**30**	**35**	**40**	**40**	**40**
Horses	**35**	**35**	**35**	**35**	**35**	**35**
Poultry	**21 494**	**23 780**	**24 180**	**26695**	**26695**	**26 695**

Source: CzSO, MA

Nitrous oxide emissions

Manure management and managed soils are the main sources of N_2O emissions in the Agriculture sector. The constant amount of N applied to the soil is projected for the period 2020-2040.

A prognosis of the total agricultural plant production is very uncertain. Crop harvest depends on climatic factors and trading preferences. The projections are based on strategical forecast of the Ministry of Agriculture (MA 2016) on development of sowing areas for agricultural crops and also on some observed trends in demands of the Czech food consumers. According to the strategical expectations of the Ministry, the total crop area used for cereals production decreases to 1 300 000 ha in 2025 and the grassland category relevantly increases. The total area of agricultural land stays almost the same. The total arable land is slowly decreasing to the benefit of grassland area. Harvest prediction is based on statistical analysis of yields trends.

The emission coefficients used to estimate the nitrous oxide emissions were taken from the National Inventory Report (CHMI 2019). The methodology of emission estimation corresponds to the IPCC 2006 Guidelines (IPCC 2006).

Table 5-21: Historic and projected activity data for application of mineral fertilizers and annual harvests (kt)

Input data	2017	2020	2025	2030	2035	2040
Mineral fertiliser	285 739	280 739	280 739	280 739	280 739	280 739
Crops (cereals)	7 457	6 978	6 865	6 978	7 053	7 051
Pulses	100	70	80	93	93	94
Potatoes	689	622	662	722	724	726
Sugar beet	4 400	3 728	3 760	3 804	3 843	3 866
Fodder	4 616	3 003	2 997	3 012	3 047	3 083
Soya	37	25	29	33	38	42

Source: CzSO, IFER, Ltd.

Carbon oxide emissions

There are two main sources of CO_2 emissions reported in the National Inventory Report (CHMI 2019):

1. Liming (3.G)

2. Urea application (3.H)

Prediction of activity data developments is based on the fact that the consumption of inorganic fertilizers was growing until 2017. The Ministry of Agriculture (Budnakova 2018) forecasts a slow decrease of its consumption in the future. The tier 1 methods are used for the estimation of CO_2 emissions from both sources (CHMI 2019).

Projection results – WEM scenario

A relatively moderate increasing trend in the production of greenhouse gases in Agriculture is expected, according to the WEM scenario. The current economic and financial situation entails

considerable uncertainties in predicting the long-term emission trends in the Agriculture sector. Due to the relatively small contribution of Agriculture (6%) to total GHG emissions in the Czech Republic, the impact of emission changes is not significant for the total emission trend. The noted emission changes are caused by changes in activity data. Specifically, the predicted growth of animal production has a strong effect on the GHG emissions in the Agriculture sector.

Table 5-22: Historic and projected emissions from Agriculture (in Gg CO_2 eq.)

Scenario	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990-2030 (%)	1990-2040 (%)
WEM	15.8	7.9	8.4	8.4	8.8	9.1	9.1	9.2	-47.2	-42.8	-42.1

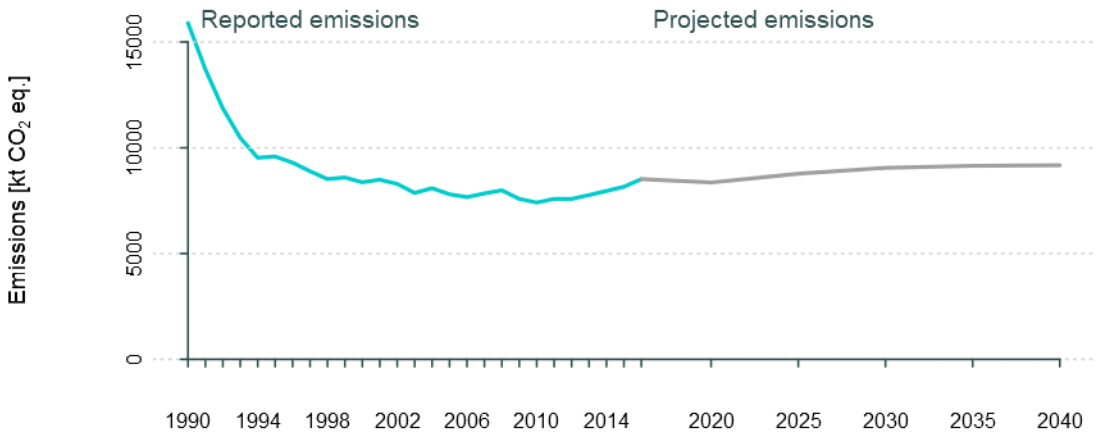
Source: IFER, Ltd.

Table 5-23: Breakdown of the reported and projected emissions of GHG by categories in agriculture - WEM scenario

Category	1990	2005	2017	2020	2025	2030	2035	2040	1990 – 2020 (%)	1990 – 2030 (%)	1990 – 2040 (%)
3.A Enteric fermentation	5.6	2.9	2.9	2.9	3.1	3.2	3.3	3.3	-47.6	-42.1	-41.2
3.B Manure management	3.3	2.0	1.6	1.6	1.8	1.9	1.9	1.9	-51.0	-43.2	-41.9
3.D Agricultural soils	5.6	2.8	3.6	3.4	3.5	3.6	3.6	3.6	-38.9	-36.7	-36.1
3.G Liming	1.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	-86.6	-86.6	-86.6
3.H Urea application	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	88.2	88.2	88.2
Total	**15.8**	**7.9**	**8.4**	**8.4**	**8.8**	**9.1**	**9.1**	**9.2**	**-47.2**	**-42.8**	**-42.1**

Source: IFER, Ltd

Figure 5-3: Historic and projected greenhouse gas emissions (kt CO_2 eq.) in Agriculture according to scenario with existing measures (WEM)



Source: CHMI

Sensitivity analysis

Projections of greenhouse gas emissions from Agriculture sector are based on calculation sheets used for emission estimates in National Inventory Report (CHMI 2019). Activity data is only variable which changes during the projected period. Emission factors are constant during projected period and thus sensitivity analysis would not bring any interesting outcomes. If activity data will change by ±5% then emissions will change by ±5% because emission factors used for emission estimates are constant during the projected period.

5.1.6. Land Use, Land-Use Change and Forestry (Sector 4)

Land use, land-use change and forestry (LULUCF) is a specific sector within the emission inventory framework, as it is the only one able to directly offset CO_2 emissions due to photosynthetic fixation of carbon in plants and increasing individual ecosystem carbon pools. Projections for LULUCF include the following activities:

CO_2 emissions

- Cropland,
- Wetlands,
- Settlements,
- Other land.

CO_2 removals

- Forest land,
- Grassland,
- Harvested wood products.

CH_4 emissions

- Forest land.

N_2O emissions

- Forest land.

The emission estimates in the LULUCF sector are to a large degree determined by development of land areas categorized by their use. Therefore, the LULUCF emission estimates and their projections must primarily methodologically solve the issue of land areas. The data on areas used in National Inventory Reporting (CHMI 2019) are exclusively based on the cadastral land use information of the Czech Office for Surveying, Mapping and Cadastre (COSMC; www.cuzk.cz). The land-use representation and the land-use change identification system of the LULUCF emission inventory use annually updated COSMC data, elaborated at the level of about 13 thousand individual cadastral units. The observed development of the major IPCC land use categories (IPCC 2006) is reported in the National Inventory Report (CHMI 2019).

The projections beyond 2017 are based on the observed trends and anticipation of gradually diminishing category-specific land use changes until 2040. Specifically, for land use categories Forest land and Grassland, a half-declining trend with respect to the changes since 1990 is foreseen for the period until 2040. For Wetlands and Settlements, a continuation of the trend since 1990 is foreseen. The trend projections of land areas are constructed based on either nonlinear fit using a sigmoid function (Forest land, Settlement), parabolic function (Grassland), or linear fit (Wetlands). For Cropland, the estimate is given by balancing total land area with the other projected land use categories.

Table 5-24: Historic and projected areas of land use (*areas of Other land are included within Settlements)

Land use categories (thousand ha)	2017	2020	2025	2030	2035	2040
Forest land	2669	2676	2681	2684	2685	2686
Cropland	3198	3153	3125	3105	3090	3078
Grassland	1002	1034	1049	1061	1072	1081
Wetlands	166	166	168	170	171	173
Settlements	840	857	865	868	869	869
Other land *	IE	IE	IE	IE	IE	IE

Source: IFER, Ltd.

Following the setup of land use areas, the projections of emission estimates are prepared. The specific attention is given to forest land, which always represents the key emission category of the LULUCF sector as well as within the entire Czech National Inventory. For this reason, the projections related to forestry are elaborated on the basis of the scenario modelling using EFISCEN – the European Forest Information Scenario Model. EFISCEN is a large-scale model that assesses the supply of wood and biomass from forests and projects forest resource development on regional to European scale, based

on forest inventory data. EFISCEN provides projections on basic forest inventory data (stem wood volume, increment, age-structure), as well as carbon in forest biomass and soil. EFISCEN is one of the most commonly used models applied for various tasks associated with forest resource projections in European conditions.

The projections of greenhouse gas emissions related to other land use categories besides Forest land are based on simple correlations of the estimated emissions for the reference year linked exclusively to the corresponding land areas for the predicted years. The exception is the emission contribution of harvested wood products (HWP). The contribution of HWP was projected using the harvest activity data as reported in National Inventory Report (CHMI 2019). For the period to 2040, harvest volumes (logs) as adopted for the EFISCEN-assisted estimates, were used as input and proxy for estimation of HWP contribution following the identical methodology for HWP as described in National Inventory Report (CHMI 2019).

Projection results – WEM and WAM scenario

The WEM (With Existing Measures) scenario includes the development of land areas of individual land use categories. Land area is used as a proxy for the projected emissions. Hence, development of land areas and land use changes drive the projected emissions relative to the reference year for the individual land use categories with exception of CO_2 emissions from Forest Land and HPW emission contribution.

The WAM scenario is similar to WEM. However, it differs in the applied EFISCEN model scenario for Forest Land and CO_2 emissions, the key category of the LULUCF emission inventory. Specifically, it includes the proposed tree species change of dominantly spruce even-aged forests stand to more diverse stands with higher share of broadleaved tree species such as beech and oak.

The historical data and projections using the WEM and WAM scenarios are shown in Tab. 5-25. It can be observed that for the nearest decades, the LULUCF sector is projected significantly loose its emission sink strength. This is largely due to the development on Forest land under the assumed harvest demand for both WEM and WAM scenario.

Table 5-25: Historic and projected emissions from LULUCF (in Mt CO_2 eq.)

Scenario	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020(%)	1990-2030(%)	1990-2040(%)
WEM	-5.2	-7.0	-2.1	0.6	-1.7	-1.6	-1.7	-1.8	-110.6	-68.9	-65.4
WAM	-5.2	-7.0	-2.1	1.2	-1.1	-0.5	-0.6	-0.1	-123.8	-90.6	-98.1

Source: IFER, Ltd.

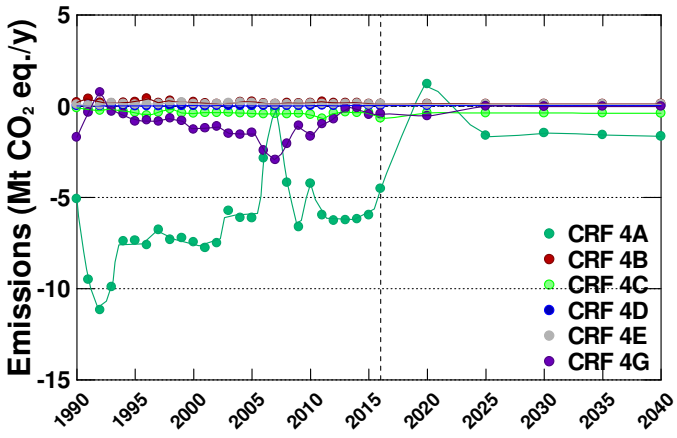
Table 5-26: Breakdown of reported and projected emissions of GHG by categories in LULUCF sector - WEM scenario

Category	1990	2005	2017	2020	2025	2030	2035	2040	1990 – 2020 (%)	1990 – 2030 (%)	1990 – 2040 (%)
4.A Forest Land	-4.6	-5.9	-1.6	1.2	-1.6	-1.5	-1.6	-1.7	-126.3	-68.0	-64.1
4.B Cropland	0.2	0.2	0.0	0.1	0.1	0.1	0.1	0.1	-30.5	-31.6	-32.2
4.C Grassland	-0.1	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	164.3	171.2	176.5
4.D Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1	18.3	20.6
4.E Settlements	1.0	0.6	0.6	0.1	0.1	0.1	0.1	0.1	-90.6	-90.5	-90.4
4.G HWP	-1.7	-1.4	-0.8	-0.5	0.0	0.0	0.0	0.0	-68.4	-98.7	-99.0
Total	**-5.2**	**-7.0**	**-2.1**	**0.6**	**-1.7**	**-1.6**	**-1.7**	**-1.8**	**-110.6**	**-68.9**	**-65.4**

Table 5-27: Breakdown of reported and projected emissions of GHG by categories in LULUCF sector - WAM scenario

Category	1990	2005	2017	2020	2025	2030	2035	2040	1990 – 2020 (%)	1990 – 2030 (%)	1990 – 2040 (%)
4.A Forest Land	-4.6	-5.9	-1.6	1.9	-1.0	-0.3	-0.5	0.1	-141.3	-92.6	-101.1
4.B Cropland	0.2	0.2	0.0	0.1	0.1	0.1	0.1	0.1	-30.5	-31.6	-32.2
4.C Grassland	-0.1	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	164.3	171.2	176.5
4.D Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1	18.3	20.6
4.E Settlements	1.0	0.6	0.6	0.1	0.1	0.1	0.1	0.1	-90.6	-90.5	-90.4
4.G HWP	-1.7	-1.4	-0.8	-0.5	0.0	0.0	0.0	0.0	-68.4	-98.7	-99.0
Total	**-5.2**	**-7.0**	**-2.1**	**1.2**	**-1.1**	**-0.5**	**-0.6**	**-0.1**	**-123.8**	**-90.6**	**-98.1**

Figure 5-4: Reported and projected emissions of GHG in LULUCF sector for WEM (red) and WAM (green) scenarios, respectively. The historical data (blue) and the WEM scenarios are accompanied by a least square smooth lines using different tension values that determine the local flex.



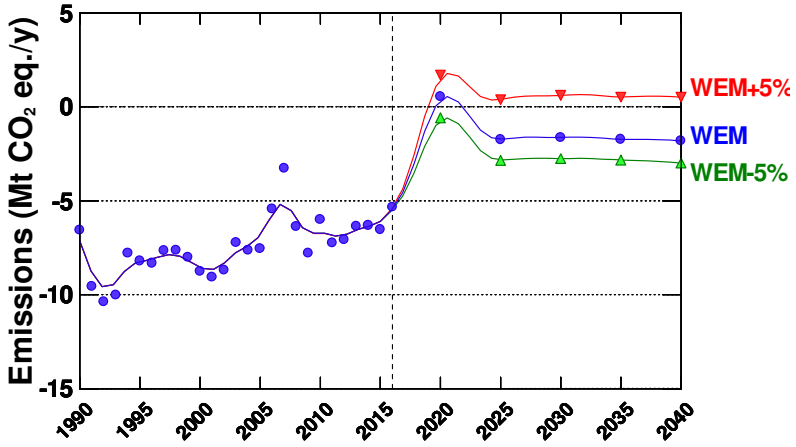
Source: CHMI

Sensitivity analysis

Sensitivity analysis is solely based on analysing the category 4.A Forest land. This is the key category of the Czech emission inventory, determined by biomass carbon stock changes in the emission sub-category 4.A.1 Land remaining Forest Land. This basically represents the entire forest management in the country and its effect on forest growing stock volume and ecosystem carbon stock. Here, the loss is determined by harvest removals including thinning and final felling. This is to be offset by annual biomass increment. Therefore, harvest regime is the most prominent factor affecting carbon balance in the sector.

The role of harvest quantity is demonstrated on the sensitivity analysis using smaller or larger overall harvest demand by 5% with respect to the selected baseline (harvest as in WEM/WAM scenarios) using the EFISCEN model. The model outcome as implemented for the WEM scenario and its two variants is shown in Figure 5.5. It is apparent that a relatively small change in harvest demand would indeed have a significant effect on emissions from the LULUCF sector. Harvest removals smaller than 5% relative to WEM would result in a continuous carbon sink in forestry. Contrarily, increased harvest removals by 5% relative to WEM would already change the LULUCF sector from sink into a source category for the projected period until 2040. It should also be noted that harvest demand is a more powerful short-term factor affecting emissions as compared to gradual tree species change that distinguish WEM and WAM scenarios and affect carbon balance more on long-term basis at a country-level scale.

Figure 5-5: Sensitivity analysis using variable harvest demand and its effect on emissions in LULUCF under WEM scenario



Source: CHMI

5.1.7. Emissions generated from waste (Sector 5)

The waste sector comprises emissions from human activities associated with general waste management. Projections include the following activities:

CO_2 emissions

- Waste incineration.

CH_4 emissions

- Solid waste disposal,
- Biological treatment of solid waste,
- Incineration and open burning of waste,
- Waste water treatment and discharged.

N_2O emissions

- Biological treatment of solid waste,
- Incineration and open burning of waste,
- Waste water treatment and discharged.

The overall development of the waste sector in the past decades is dominated by the landfilling (Solid Waste Disposal Sites – SWDS) of waste. Landfilling is still the dominant type of waste management nowadays, but its importance is decreasing due to the rise of waste recycling; collection of separated waste parts, composting, and energy recovery. In a not so far future, landfilling, mainly landfilling of municipal and organic waste, might disappear as the capacity of landfills is decreasing and other options are preferred by national legislation and by obligations of the Circular Economy Package (EC 2018).

The projections of greenhouse gas emissions in waste sector are based on data and methodology used for emission estimates reported in the National Inventory Report (CHMI 2019). Activity data reported in the National Inventory Report (CHMI 2019) are obtained from the database VISOH ("Veřejné informace o produkci a nakládání s odpady") which contains information about production and management of waste in the Czech Republic. The spreadsheets used for the National Inventory Report (CHMI 2019) have been adapted for the all sectors except 5.D – Wastewater treatment and discharge which has timelines for CH_4 and N_2O emissions extended straight from the recent year emission values.

Emissions estimated up to the year 2024 are based on assumptions and forecasted scenario in the Waste Management Plan 2014 (WMP) (MoE 2014). The timeline has been prolonged up to 2040 by building upon the scenarios in WMP (MoE 2014) and by the new obligations of the Circular Economy Package (EC 2018).

Table 5-28: Forecast of total mixed municipal waste production by all subjects in the Czech Republic (Mt)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Municipalities	2.22	2.30	2.20	2.18	2.16	2.15	2.13	2.12	2.10	2.09	2.07	2.05
Non-municipal entities	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Total	**3.12**	**3.20**	**3.10**	**3.08**	**3.06**	**3.05**	**3.03**	**3.02**	**3.00**	**2.99**	**2.97**	**2.95**

Source: MoE 2014

Table 5-29: Forecast of municipal waste management (Mt)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Material recovery	1.6	1.9	1.9	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.4
Composting	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8
Energy recovery	0.6	0.6	0.6	0.7	0.7	0.8	0.9	0.9	1.0	1.0	1.1	1.2

Landfilling	3.0	2.8	2.8	2.8	2.5	2.4	2.2	1.9	1.6	1.4	1.1	0.9
Incineration	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Source: MoE 2014, CHMI

Projection results –WEM and WAM scenario

Scenario in WMP (MoE 2014) fulfils description of WEM, the document is taking into account all measures that are already in power, though some measures will be implemented in the future, based on the proposed roadmap. For both WEM and WAM scenarios, it is expected that emissions will be decreasing during 2017-2040 compared to the year 2017. A decrease of emissions is more obvious for WAM scenario which takes into account stricter landfill gas (LFG) recovery coefficients after the year 2025.

Table 5-30: Historic and projected emissions from Waste (in Gg CO_2 eq.)

Scenario	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990-2030 (%)	1990-2040 (%)
WEM	3.1	4.3	5.6	5.4	4.8	4.2	3.6	3.0	72.2	35.0	-2.9
WAM	3.1	4.3	5.6	5.4	4.8	3.9	2.8	2.3	72.2	26.4	-25.8

Source: CHMI

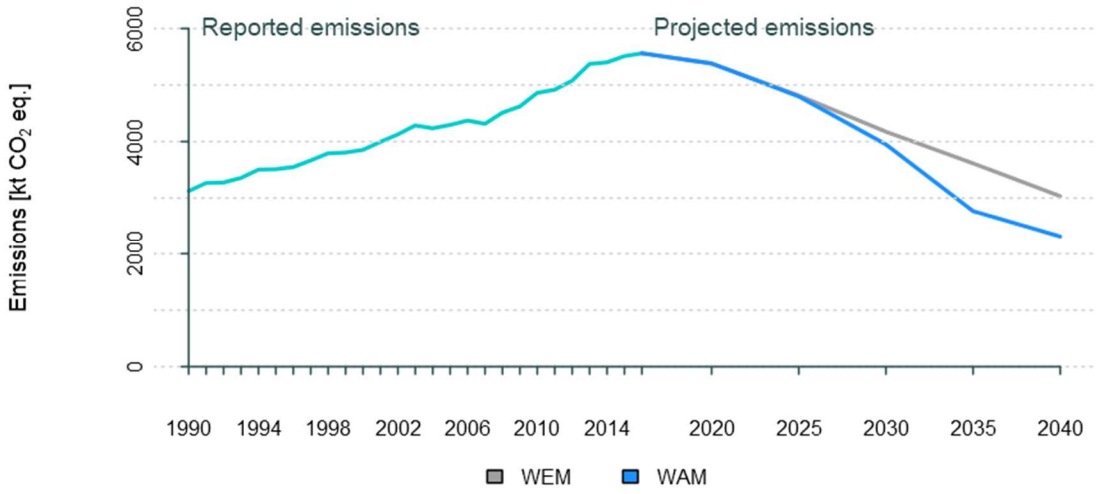
Table 5-31: Breakdown of reported and projected emissions of GHG by categories in Waste - WEM scenario

	1990	2005	2017	2020	2025	2030	2035	2040	1990 – 2020(%)	1990 – 2030 (%)	1990 – 2040 (%)
5. A Solid waste disposal	2.0	3.1	3.7	3.4	2.8	2.1	1.4	0.7	72.6	4.8	-63.9
5.B Biological treatment of solid waste	NO/IE	0.1	0.7	0.8	0.9	0.9	1.0	1.1	NA	NA	NA
5.C Incineration and open burning of waste	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	509.8	581.1	652.5
5.D Waste water treatment and discharge	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	-5.8	-5.6	-5.4
Total	3.1	4.3	5.6	5.4	4.8	4.2	3.6	3.0	72.2	35.0	-2.9

Table 5-32: Breakdown of reported and projected emissions of GHG by categories in Waste - WAM scenario

	1990	2005	2017	2020	2025	2030	2035	2040	1990 – 2020 (%)	1990 – 2030 (%)	1990 – 2040 (%)
5. A Solid waste disposal	2.0	3.1	3.7	3.4	2.7	1.8	0.5	0.0	72.6	-8.8	-100.0
5.B Biological treatment of solid waste	NO/IE	0.1	0.7	0.8	0.9	0.9	1.0	1.1	NA	NA	NA
5.C Incineration and open burning of waste	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	509.8	581.1	652.5
5.D Waste water treatment and discharge	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	-5.8	-5.6	-5.4
Total	3.1	4.3	5.6	5.4	4.8	3.9	2.8	2.3	72.2	26.4	-25.8

Figure 5-6: Historic and projected greenhouse gas emissions (kt CO_2 eq.) in Waste sector according to scenario with existing measures (WEM) and scenario with additional measures (WAM)



Source: CHMI

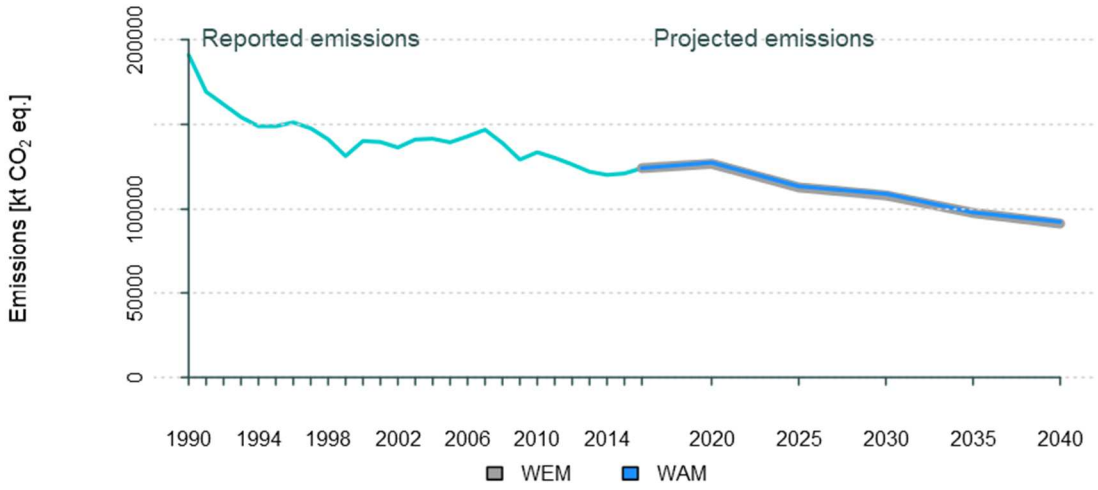
Sensitivity analysis

Projections of greenhouse gas emissions from the Waste sector are based on calculation sheets used for emission estimates in the National Inventory Report (CHMI 2019). The emission factors are constant during the projected period and thus the sensitivity analysis would not bring any interesting outcomes. If activity data will change by ±5% then emissions will change by ±5% because emission factors used for emission estimates are constant during the projected period.

5.1.8. Total projections

According to the current projections, it is expected that total greenhouse gas emissions are going to slightly increase in next few years for both scenarios. Around the year 2025, it is forecasted that emissions will start to decrease and the decrease of emissions will continue to year 2040. Slight difference between WEM and WAM scenario is caused by additional measures in Energy, LULUCF and Waste. The WAM scenario in Energy includes additional measures in transport. The WAM scenario in LULUCF includes the proposed change of dominantly spruce even-aged forests stand to more diverse stands with a notably higher share of broadleaved tree species such as beech and oak, applicable to period until 2040. The WAM scenario in Waste involves increased recovery of landfill gas.

Figure 5-7: Historic emissions and projections of greenhouse gas emissions in kt CO_2 eq. for WEM and WAM scenarios (incl. LULUCF)



Source: CHMI

Tables 5.33 and Table 5.34 show more detailed results for calculations of the two different projection scenarios.

Table 5.33: Calculation of projections of greenhouse gas emissions (incl. sector LULUCF) – projections with existing measures

Gas (Mt CO_2 eq.)	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990-2030 (%)	1990-2040 (%)
CO_2	158.9	118.5	103.4	103.8	90.8	87.9	78.8	73.9	-34.7	-44.7	-53.5
CH_4	23.5	14.7	13.5	13.6	13.1	12.1	11.4	10.2	-42.2	-48.7	-56.5
N_2O	9.7	6.0	5.9	5.9	6.1	6.2	6.2	6.2	-38.9	-35.6	-35.3
HFCs	NO	1.0	3.6	3.4	2.8	1.9	1.3	1.1	NA	NA	NA
PFCs	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA

Gas (Mt CO_2 eq.)	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990-2030 (%)	1990-2040 (%)
SF_6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-15.6	-25.6	-31.0
NF_3	NO	NO	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA
Total (CO_2 eq.)	**192.2**	**140.5**	**126.5**	**126.8**	**112.8**	**108.2**	**97.8**	**91.6**	**-34.0**	**-43.7**	**-52.3**

Source: CHMI

Table 5-34: Calculation of projections of greenhouse gas emissions (incl. sector LULUCF) – projections with additional measures

Gas (Mt CO_2 eq.)	1990	2005	2017	2020	2025	2030	2035	2040	1990 - 2020 (%)	1990-2030 (%)	1990-2040 (%)
CO_2	158.9	118.5	103.4	104.2	91.1	88.7	79.6	75.3	-34.4	-44.2	-52.6
CH_4	23.5	14.7	13.5	13.6	13.1	11.8	10.5	9.5	-42.2	-49.9	-59.6
N_2O	9.7	6.0	5.9	5.9	6.1	6.2	6.2	6.2	-39.0	-35.7	-35.4
HFCs	NO	1.0	3.6	3.4	2.8	1.9	1.3	1.1	NA	NA	NA
PFCs	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA
SF_6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-15.6	-25.6	-31.0
NF_3	NO	NO	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA
Total (CO_2 eq.)	**192.2**	**140.5**	**126.5**	**127.2**	**113.1**	**108.7**	**97.8**	**92.3**	**-33.8**	**-43.4**	**-52.0**

Source: CHMI

The total effects of policies and measures for the WEM scenario, aggregated and for each sector, are given in Table 5-35. The total effect especially in 2020 is lower than in previous NC and BR reporting. This is due to calculated lower effects mainly in the energy sector. The update of the National Energy Efficiency Action Plan of the Czech Republic (activity data) and also the updating of emission factors are the main reasons for these changes.

Table 5-35: Total effect of policies and measures in 2020 and 2030

Total Effect of Policies and Measures	Expected benefit in reducing greenhouse gas emissions (in kt CO_2 eq./year)	
	2020	**2030**
WEM Scenario		
Energy supply	5983	5942
Transport	1289	2386
Industrial Processes	552	3903
Agriculture	575	912
Waste	854	1304
LULUCF	458	395
Cross-cutting	5340	9370
Total Effect WEM	**15051**	**28280**

Source: CHMI, ENVIROS, Ltd.

5.1.9. Methodology used

The methodology used for the preparation of emission projections is in line with the methodology used for compilation of the Third, Fourth, Fifth and the Sixth National Communication, which enables their mutual comparability. The methodology includes a set of the following actions:

1. Inventory of greenhouse gases,
2. Selection of the starting and the end year and cross-sectional years for projection,
3. Selection of own methodology and modelling tools for projections,
4. Collection and analysis of input data,
5. Determination of initial assumptions,
6. Definition of scenarios,
7. Calculation of scenarios and results presentation,
8. Sensitivity analysis of selected assumptions.

Results of these actions are described below.

Inventory of greenhouse gas emissions

The latest National Inventory Report available during the preparation of projections was published in 2019 (CHMI 2019) and contains emission estimates for 1990-2017. Summary data from this inventory are given in Chapter 3.

Starting year and cross-section periods

The year 2017 was selected as a base year for projections of greenhouse gas emissions. Year 2017 is the latest year with available information on macroeconomic development, energy balances and emission estimates. The year 2040 was selected as a final year. The years 2020, 2025, 2030, 2035 and 2040 were selected as cross-cutting years.

Modelling tools and methods

For projections of CO_2, CH_4 and N_2O emissions from fuel combustion processes (sector Energy) the MESSAGE model was used. The strength of the model is its flexibility regarding all input data and the possibility to calculate not only activity data and emissions, but also to estimate the influence of various PaMs. Projections of CO_2, CH_4 and N_2O emissions from category 1A3 Transport were performed by using methodology linked to data from COPERT.

Projections of CO_2, CH_4, N_2O, SF_6 and NF_3 emissions from sector industrial processes and product use are directly linked to the calculation sheets for emission estimates. In the case of projections of fluorinated greenhouse gases used as substitutes for ODS national model Phoenix was used.

Projections of CO_2, CH_4, and N_2O emissions from sector agriculture are directly linked to the calculation sheets for emission estimates.

Projections related to Forest Land are elaborated on the basis of the scenario modelling using EFISCEN – the European Forest Information Scenario Model. The projections of greenhouse gas emissions related to other land use categories besides Forest land are based on simple correlations of the estimated emissions for the reference year linked exclusively to the corresponding land areas for the predicted years.

Projections of CO_2, CH_4, and N_2O emissions from sector waste are directly linked to the calculation sheets for emission estimates.

Few methodology, assumptions and changes occurred compared to BR3, mainly for sector IPPU for which projections are now directly linked to the calculation sheets used for emission estimates as it is described in National Inventory Report (CHMI 2019). Table below contains information about methodology changes compared to BR3.

Table 5-36: Methodology, assumptions and changes since the previous submission

Sector	Methodology changes compared to BR3
Energy	There are no significant changes in projections of greenhouse gas emissions from the Energy sector compared to the previous projections. The same model (MESSAGE) was used (except the 1A3 transport sector). Projections for category 1A3 Transport were calculated in R-project unlike previous projections (CHMI 2017). This is related to the fact that COPERT data was available for this reporting for the first time. COPERT data are very detailed and needs to be aggregated and processed in various ways. Also, the projections are more closely related to the prediction of energy consumption in the fleet area, with the newly registered vehicles being assigned categories respecting the expected development of fuel consumption. Emission factors used for projections are available from the COPERT database, which is generally recognized as very reliable data source.
IPPU	Unlike previous projections (CHMI 2017), current projections are based on the methodology used in the National Inventory Report (CHMI 2018) in the IPPU sector. Further, previous projections (CHMI 2017) were concerned only on activities with a major contribution to total GHG emissions, current projections take into account all source categories under IPPU. Due to major changes in the preparation of projections in IPPU, overall result of previous projections (CHMI 2017) and current projections is different. It was expected, that total emissions from IPPU should decrease more rapidly (CHMI 2017) than it is expected now. The most visible difference is for F-gases projections. The decrease of F-gases emissions should be quicker and more rapid according previous projections (CHMI 2017) than it is expected now. It should be noted, that current projections use national model Phoenix for F-gas emission estimates in 2.F.1 and the model was not introduced during preparation of previous projection (Ondrusova, Krtkova 2018, CHMI 2018).
Agriculture	Methodology used in the current report is the same that it was used in previous report. The current projection estimates are lower than those of the earlier projections. The less ambition forecast of animal population growth produces a lower level of GHG emissions in the projected period.
LULUCF	There has been no fundamental methodological difference in the concept of the LULUCF projections apart from treating the projections for the category 4.A Forest land and related aspects of the WEM and WAM scenarios. Specifically, the harvest demand that dominantly drives carbon budget on Forest land has been altered based on new available information from the Czech Statistical Office and elsewhere. In

	contrast to the constant harvest level of 17.29 Mm3/year adopted for earlier projection estimates, the current harvest scenario (identical for WEM and WAM) was defined more truly following the available updated information.
Waste	Few methodological changes were implemented in current projections compared to previous projections (CHMI 2017). For category 5.A – Solid waste disposal, industrial correction factor of 0.26 Mt was added to landfilling data. A default 5% leakage from the anaerobic digestion processes and the subcategory 5.B.1.b – Other have been included in the category 5.B – Biological treatment of solid waste. The category 5.C – Incineration and open burning of waste has the forecast based on its incinerated I/HW tonnes which are applied to the spreadsheet with an extended timeline to 2040.

Source: CHMI

Collection and analysis of input data

The basic sources of data for compilation of greenhouse gases projections were the following documents:

Statistical data:

1. Greenhouse gas emissions inventory of the Czech Republic 2017, CHMI, Prague, April 2019
2. Energy Balance of the Czech Republic 2010-2017, CzSO, Prague, 2019
3. National Action Plan for Energy Efficiency for the Czech Republic (NEEAP), Ministry of Industry and Trade, February 2017.
4. MIT 2019: The draft of the energy-climate plan of the Czech Republic, Ministry of Industry and Trade, 2019.
5. Documents provided by the Ministry of Industry and Trade, Ministry of the Environment, Ministry of Transport, Ministry of Agriculture, Ministry of Education Youth and Sports, Ministry of Culture, Czech Energy Agency, State Environmental Fund, Czech Statistical Office and CzechInvest.

Prognostic data:

1. Ministry of Industry and Trade, 2015. State Energy Policy of the Czech Republic
2. Ministry of Agriculture (2016). Ministry of Agriculture strategy with a view until 2030, no. 66699/2015-MZE-10051, 136 pp. (in Czech)
3. National Renewable Energy Action Plan of the Czech Republic. Ministry of Industry and Trade, December 2015
4. The draft of the energy-climate plan of the Czech Republic, Ministry of Industry and Trade, 2019.
5. Documents provided by Ministry of Industry and Trade, Ministry of the Environment, Ministry of Transport, Ministry of Agriculture, Ministry of Education Youth and Sports, Ministry of Culture, Czech Energy Agency, State Environmental Fund.

The above-mentioned sources were used in creating databases for prognoses input data.

5.1.10. Initial assumptions and scenarios

Political and legal environment

From a political and legal perspective, these following conditions have been taken into consideration with regard to the development of energy sector and industrial processes emitting GHGs:

- By acceding to the EU, the Czech Republic committed itself in terms of protection of the environment and climate, which form a part of the Acquis communautaire, such as Directive No. 80/2001/EC, Directive No. 96/61/EC (to be replaced by Directive 2010/75/EU in 2014), Directive No. 81/2001/EC (replaced by Directive 2016/2284/EU), Directive No. 96/2003/EC (replaced by Directive 2003/27/EC and Regulation (EC) No 1882/2003) and Directive No. 2003/30/EC (replaced by Directive 2009/28/EC).
- The ETS system is in operation in the Czech Republic as a part of the EU ETS. This system is developing especially in terms of allowance allocations, when the so-called grandfathering is being gradually abandoned and auctions are the main source of allowances (since 2013).
- The Czech Republic is bound by a number of international climate and environmental protection treaties (Kyoto Protocol, Second Sulphur Protocol, Gothenburg Protocol).
- Energy market is open to all comers pursuant to Act No. 458/2000 Coll. amended by Act No. 670/2004 Coll. (electricity from 1. 1. 2006, gas 1. 1. 2007) and by Act No. 158/2009. Coal, gas and electricity prices are converging with European market prices.
- Act No. 165 of 31 January 2012 on promoted energy sources and on amendment to some laws governs the support of renewable energy sources and of combined and heat power.

Technological development

In the period between 2017 and 2040, there are anticipated significant developments in technologies for acquisition, conversion, transportation and use of energy sources. In the area of solid fuels used in electricity generation, the use will lead to sources with supercritical steam parameters and fluid technologies, which will considerably increase efficiency; in the area of combined electricity and heat production, the improvement of technologies will allow construction of sources as close as possible to its consumers. Later, we anticipate the possible introduction and usage of small sources based on micro turbine and fuel cell technologies.

In the nuclear sector, the construction of two new nuclear blocks is anticipated around 2035.

In terms of motor fuel, besides further decreasing consumption, a higher use of alternative fuels, which will be possible also by use of renewable energy sources (biofuel) is anticipated. The main trend will be not only further decreased in measurable investment costs, but also due to criteria affecting protection of soil and biodiversity, respectively, demonstrable contributions to reducing greenhouse gas emissions.

Demographic development scenario

Population growth prognosis is based on the Czech Statistical Office (CzSO) data[23]; numbers of households, which are also necessary to calculate energy-related demand, were estimated. The CzSO prepared three separate population projections; the middle projection was used.

[23] Population prognosis up to 2050, CzSO, Prague 2017 (https://www.czso.cz/csu/czso/populacni-prognoza-cr-do-r2050-n-g9kah2fe2x)

Table 5-37: Demographic prognosis (thousand)

	2017	2020	2025	2030	2035	2040
Population	10590	10662	10712	10692	10608	10549
Households	4470	4552	4663	4744	4805	4877

Source: CzSO, MIT

Economic development scenario

The scenarios of trends in the GDP used in this projection are based on predictions made by the company EGÚ Brno, a. s., for the Electricity Market Operator (OTE). These projections are made every year and approved by a group of experts organized by the OTE.

Table 5-38: Gross added value development prognosis (2016 constant prices[24]) in billion EUR

Sector	2017	2020	2025	2030	2035	2040
Industry	35	36	38	40	42	44
Construction	9	10	11	13	14	15
Agriculture	3	4	4	4	4	5
Transport	8	9	10	12	13	14
Services	93	103	121	139	158	179
Total	**149**	**161**	**184**	**208**	**232**	**258**

Source: ENVIROS, Ltd.

Development of global fuel and energy prices

Petroleum, natural gas and black coal are commonly traded energy commodities on the global market. Price trend scenarios are also regularly prepared for these three basic energy commodities. Recently, electrical energy has been increasingly traded; however, because of the regional character of trade, no scenarios have been published for price trends. The prices of fuels on the global market were taken from the European Commission document "Recommendations parameters for reporting o GHG projections in 2019, Final 15/06/2018".

[24] Exchange rate 27 CZK/€ – average for 2016

Table 5-39: Global prices of fuels (€/GJ, constant prices of 2016)

€ (2016)/GJ	2017	2020	2025	2030	2035	2040
Oil	8.2	11.9	15.7	17.3	18.1	19.1
Natural gas	4.7	7.6	9.6	10.5	11.2	11.6
Coal	3.0	2.2	3.2	3.8	4.0	4.2

Source: Recommended parameters for reporting on GHG projections in 2019, Final, 15/06/2018

Development of domestic prices and fuel and energy availability

Prices of imported primary energy sources are based on the above-listed average import prices into the EU. The prices of domestic energy sources are based on the costs of their acquisition and will also be affected by the position of the given fuel on the market compared to competitive energy sources. Solid fuels, especially brown coal, will continue to be a decisive domestic primary energy source by 2020.

Purchase prices of electricity from renewable energy sources and from sources with combined heat and electricity production were stipulated by a Decree of the Energy Regulation Authority. The legislation guaranteed favourable purchase prices for a period of 15 years from bringing the source into operation. The Energy Regulatory Office could reduce these prices by up to 5% annually compared to the previous year. The projections assumed maintenance of current purchase prices for the entire period.

During 2010 investment costs of photovoltaic panels decreased dramatically and an extreme boom of new solar installations occurred. The installed capacity of photovoltaic power plants tripled and reached 1800 MW by the end of 2010. Because this sharp increase would have led to a substantial increase of electricity prices, a new law was adopted which enabled to decrease the feed-in tariff by 50% and a new tax of 26%, applicable for 3 years for solar power plants built in 2009 and 2010, was introduced. Since 2015, the operational RES support for new installations is only granted to the CHP plants and partially biogas and hydro installations.

Availability of domestic coal

Solid fuels, especially brown coal, will continue to be a decisive domestic primary energy source in the near future. These sources will depend on the binding nature of administrative territorial environmental limits on brown coal mining. Tab. 5.31 shows the updated trends in the capacities of mining. The update respects the Governmental decision 827/2015, which partially releases territorial environmental limits at the Bílina mine and keeps them at the ČSA mine. As regards brown coal prices, they are moving from the costs-based price to a price derived from hard coal prices. It is expected that the brown coal price will reach about 75% of hard coal price.

Quite a dramatic development is observed in hard coal mining. Hard coal mining is becoming cost ineffective and the mining company OKD shortened economically exploitable reserves. Moreover, in 2016, the company OKD filed bankruptcy. The insolvency proceedings were kept off after all but the future of domestic hard coal mining is not very clear.

Table 5-40: Projections of domestic coal mining (thousand tons)

Brown coal	**2017**	**2020**	**2025**	**2030**	**2035**	**2040**
Libouš	12000	12000	9500	9500	5000	0
Bílina	9710	9600	8500	7500	7000	4500
ČSA	3213	3600	0	0	0	0
Vršany	7505	7500	6140	6140	6140	6140
Jiří+Družba	6905	6000	6000	6000	6000	0
Centrum	0	0	0	0	0	0
Celkem	**39334**	**38700**	**30140**	**29140**	**24140**	**10640**
Hard coal	**2017**	**2020**	**2025**	**2030**	**2035**	**2040**
ČSM	2700	2650	0			
Karviná - ČSA	1000	1600	0			
Karviná - Lazy	500	0	0			
Darkov	1000	0	0			
Paskov	0	0	0			
Celkem	**5200**	**4250**	**0**	**0**	**0**	**0**

Source: MIT

Energy scenarios

Model calculation of greenhouse gas emissions from energy processes is based on the following assumptions:

1. Temelín nuclear power plant will operate over the entire monitored period (2000-2035);
2. The operation license for the Dukovany nuclear power plant will be prolonged and the power plant decommissioned gradually in the period 2035-2037;
3. The tender for new nuclear units in the nuclear power plant Temelín was cancelled and possible introduction of new nuclear units was postponed to and after the year 2030;
4. The territorial environmental limits on mining of brown coal will be retained at the ČSA mine and partly relaxed at the Bílina mine;
5. There will be no limits in place for oil, gas and black coal imports;

6. Import and export of electricity will be limited by technical capacity of the transmission network.

6 Provisions of financial, technological and capacity-building support to developing country Parties

The Czech Republic, as non-Annex II Party to the Convention, is not obliged to adopt the measures in line with Article 12.3 of the Convention and, therefore, it is not obliged to fulfil the commitments pursuant to Articles 4.3, 4.4 and 4.5 of the Convention and to provide additional financial sources. However, the Czech Republic provides information on the financial support provided to developing countries on the voluntary basis. The Czech Republic, as a European Union member state, along with other developed countries, is committed to the goal of jointly mobilizing USD 100 billion annually by 2020 and through to 2025 to address the needs of developing countries in the context of meaningful mitigation and adaptation actions and transparency on its implementation. Regarding the technology development and transfer and capacity building projects, the Czech Republic has implemented several bilateral projects within its Official Development Assistance (henceforth "ODA") that contributed to the technology development and transfer to developing countries and capacity building in these countries.

6.1 Provision of financial support

The Czech Republic provided climate financial support to developing countries in 2017 and 2018 through both multilateral and bilateral channels. The key strategic document setting the Czech sectoral and territorial priorities is the Development Cooperation Strategy of the Czech Republic. The Czech development activities in 2017 were in accordance with the Development Cooperation Strategy of the Czech Republic for the period 2010-2017. In August 2017, the new Development Cooperation Strategy of the Czech Republic for the period 2018-2030 was endorsed by the Government and it has thus become a key strategic document for development cooperation in 2018[25]. The Czech bilateral and multilateral climate finance flows were partially or fully counted towards ODA and were identified in accordance with the OECD-DAC methodology. The Czech climate-specific funding in the years 2017 and 2018 consisted of contributions to the multilateral climate change funds and specialized United Nation bodies, and bilateral projects that have been marked with the Rio Marker for adaptation and/or mitigation. Other financial support provided to developing countries, which is also accountable for ODA, but where the exact climate related component could not be quantified, has been reported as the core/general funding in the BR4 CTF tables.

All the funds were reported in the Czech Koruna (CZK) and recalculated to USD according to the annual average exchange rate announced by the Czech National Bank[26].

The Czech Republic provides its support to three main international climate change funds: the Global Environment Facility, the Green Climate Fund (GCF), and the Multilateral Fund for the Implementation of the Montreal Protocol. In 2017, the Czech Republic also provided approximately USD 855 thousand (CZK 20,000 thousand) to UN Environment Programme (UNEP) to the Programme for facilitating

[25] For more information see: https://www.mzv.cz/file/2710363/CZ_Development_Cooperation_Strategy_2018_2030.pdf

[26] 2017: 23.382 CZK/USD; 2018: 21.735 CZK/USD

the engagement with and access to the Green Climate Fund for Western Balkan countries. The total climate-specific multilateral financial flows for 2017 and 2018 amounted USD 2,070 thousand and USD 1,190 thousand, respectively. Detailed overview of the Czech climate-specific contributions through multilateral channels is captured in CTF Table 7a in Annex I.

The bilateral financial flows to developing countries for climate action in 2017 and 2018 reached USD 5,886 thousand and USD 7,306 thousand, respectively. The financial support was mainly provided to the priority countries according to the Czech Bilateral Development cooperation, such as Bosnia and Herzegovina, Cambodia, Ethiopia, Georgia, Moldova, Mongolia and Zambia. For detailed overview of the climate-specific bilateral projects supported by the Czech Republic, see CTF Table 7b in Annex I.

6.2 Technology development and transfer

In the years 2017 and 2018, the Czech Republic carried out the technology development and transfer to developing countries mainly through its bilateral development cooperation and some of the projects listed in CTF Table 7b in Annex I feature the technology development and transfer element. Projects focused exclusively on technology development and transfer have not been implemented during the given period.

6.3 Capacity building

The capacity building activities have been also identified across a number of bilateral projects carried out in the years 2017 and 2018 (see CTF Table 7b in Annex I). The projects specifically aimed at capacity building are listed in the CTF Table 9 in Annex I. These projects were mainly focused on education, training and transfer of know-how. In addition to the bilateral projects, the support to capacity building in developing countries was also channeled through multilateral channels. For instance, the contribution to the UNEP provided in 2017 to facilitate the engagement with and access to the GCF for the Western Balkans aimed to build capacitates in the given region.

7 Other reporting matters

No other reporting matters supplied in this submission.

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List of Abbreviations

AAUs	Assigned amount unit
AEAs	Annual Emission Allocations
AOs	Aircraft Operators
AR4	Fourth Assessment Report
BAT	Best available techniques
BREF	Best Available Techniques Reference Document
CAP	Common Agricultural Policy
CDM	Clean Development Mechanism
CEP	Circular Economy Package
CER	Certified Emission Reductions
CF	Cohesion Fund
CFC	Chlorofluorocarbons
CH_4	Methane
CHMI	Czech Hydrometeorological Institute
CMP	Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol
CNG	Compressed natural gas
COSMC	Czech Office for Surveying, Mapping and Cadestre
CRF	Common Reporting Format
CTF	Common Tabular Format
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2 eq.	Carbon dioxide equivalent
CZK	Czech Koruna

CzSO	Czech Statistical Office
EC	European Commission
EFISCEN	European Forest Information Scenario Model
ENERGOSTAT	Association for Energy Information and Statistics
ESD	Effort Sharing Decision
ESR	Effort Sharing Regulation
ERDF	European Regional Development Fund
ERU	Emission reduction unit
EU	European Union
EUA	European Union Allowances
EUAA	European Aviation Allowances
EUR	EURO currency
EU ETS	European Union Emission Trading System
F-gases	fluorinated greenhouse gases
FRL	Forest Reference Level
GAEC	Good Agricultural and Environmental Conditions
GCF	Green Climate Fund
Gg	Gigagram
GHG	Greenhouse gas
GWP	Global Warming Potential
HCFC	Hydrochlorofluorocarbons
HFC, HFCs	Hydrofluorocarbons
HWP	harvested wood products
ICAO	International Civil Aviation Organisation
IED	Industrial Emissions Directive

IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
IPPU	Industrial Processes and Product Use
IROP	Integrated Regional Operational Programme
JI	Joint Implementation
Km	kilometre
kt	Kiloton
KP	Kyoto Protocol
kW	Kilowatt
LA	Level assessment
LCD	Liquid Crystal Display
LDCs	Least Developed Countries
LFG	landfill gas
LNG	Liquefied natural gas
LULUCF	Land Use, Land Use Change and Forestry
MESSAGE	Model for Energy Supply Strategy Alternatives and their General Environmental Impacts
MIT	Ministry of Industry and Trade
MoE	Ministry of the Environment
MS	Member States
MSW	municipal solid waste
Mt	megaton
MW	megawatt
MWh	megawatt hour
N	Nitrogen
N_2O	Nitrous oxide, Dinitrogen oxide

NAP	National Allocation Plan
NAP CM	National Action Plan for Clean Mobility
NF_3	Nitrogen trifluorid
NECP	National Energy Climate Plan
NEEAP	National Energy Efficiency Action Plan
NERP	National Emissions Reduction Programme
NFP	National Forest Programme
NGO	non-governmental non-profit organisation
NIR	National Inventory Report
NIS	National Inventory System (greenhouse gases)
NMVOC	Non-methane volatile organic compounds
NO	Nitrogen oxide
NOx	Nitrogen oxides
NREAP	National Renewable Energy Action Plan
ODA	Official Development Assistance
ODS	ozone depleting substances
OECD-DAC	The Organization for Economic Co-operation and Development's Development Assistance Committee
OF	organic farming
OP EIC	Operational Programme Enterprise and Innovations for Competitiveness
OPE	Operational Programme Environment
OPEI	Operational Programme Enterprise and Innovation
OPT	Operational Programme Transport
PaMs	Policies and measures
PFC, PFCs	Perfluorocarbons

PJ	Petajoule
QA	Quality Assessment
QC	Quality Control
RAC	Refrigeration and Air Conditioning
RES	renewable energy sources
SARP	Standards and Recommended Practices
SEF	Standard Electronic Format
SEP	State Energy Policy
SES	supported energy sources
SF_6	Sulphur hexafluoride
SHMI	Slovak Hydrometeorological Institute
SIDS	Small Island Developing States
SMEs	Small and Medium-Sized Enterprises
SO_2	Sulphur dioxide
SWDS	Solid Waste Disposal Sites
TA	Trend assessment
Tg	Teragram
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	US dollar
WAM	With additional measures
WEM	With existing measures
WMP	Waste Management Plan

Annex I - Common Tabular Format workbook for the 4th Biennial Report of the Czech Republic

Overview of CTF tables provided with the 4th Biennial Report:

CTF Table 1: Emission trends

CTF Table 2: Description of quantified economy-wide emission reduction target

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

CTF Table 4: Reporting on progress

CTF Table 4(a)I: Progress in achieving the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the contribution of the land use, land-use change and forestry sector

CTF Table 4(a)II: Progress in achievement of the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the counting of emissions and removals from the land use, land-use change and forestry sector in relation to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

CTF Table 4(b): Reporting on progress

CTF Table 5: Summary of key variables and assumptions used in the projections analysis

CTF Table 6(a)/(c): Information on updated greenhouse gas projections under a 'with measures' scenario and under a 'with additional measures' scenario

CTF Table 7: Provision of public financial support: summary information

CTF Table 7(a) Provision of public financial support: contribution through multilateral channels

CTF Table 7(b) Provision of public financial support: contribution through bilateral, regional and other channels

CTF Table 1 - Emission trends

(Sheet 1 of 3)

GREENHOUSE GAS EMISSIONS	Base year[a]	1990	1991	1992	1993	1994	1995	1996	1997	1998
	kt CO_2 eq									
CO_2 emissions without net CO_2 from LULUCF	164,203.58	164,203.58	148,893.58	144,618.05	138,636.10	132,374.36	131,605.98	134,959.57	130,729.08	125,313.44
CO_2 emissions with net CO_2 from LULUCF	158,893.50	158,893.50	140,404.84	135,278.21	129,690.55	125,766.84	124,537.11	127,685.03	124,100.57	118,620.63
CH_4 emissions without CH_4 from LULUCF	23,492.14	23,492.14	21,925.81	20,588.63	19,681.23	18,567.79	18,145.42	17,995.55	17,587.53	16,902.54
CH_4 emissions with CH_4 from LULUCF	23,536.29	23,536.29	21,958.59	20,626.39	19,723.93	18,610.78	18,184.77	18,051.69	17,651.91	16,953.34
N_2O emissions without N_2O from LULUCF	9,612.74	9,612.74	8,278.40	7,394.85	6,614.29	6,487.85	6,850.31	6,628.46	6,552.05	6,420.81
N_2O emissions with N_2O from LULUCF	9,652.77	9,652.77	8,310.67	7,429.86	6,651.99	6,524.97	6,884.19	6,672.05	6,600.01	6,461.40
HFCs	NO	NO	NO	NO	NO	NO	27.14	87.51	193.55	264.81
PFCs	NO	NO	NO	NO	NO	NO	0.01	0.68	1.73	1.66
Unspecified mix of HFCs and PFCs	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
SF_6	84.24	84.24	84.08	85.41	86.56	87.66	88.68	98.31	96.10	94.98
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (without LULUCF)	197,392.70	197,392.70	179,181.86	172,686.94	165,018.18	157,517.67	156,717.54	159,770.07	155,160.05	148,998.24
Total (with LULUCF)	192,166.80	192,166.80	170,758.17	163,419.86	156,153.04	150,990.25	149,721.89	152,595.26	148,643.87	142,396.81
Total (without LULUCF, with indirect)	199,242.03	199,242.03	180,813.24	174,226.57	166,528.47	158,971.61	158,129.08	161,150.01	156,515.32	150,311.11
Total (with LULUCF, with indirect)	194,016.12	194,016.12	172,389.55	164,959.49	157,663.33	152,444.19	151,133.43	153,975.21	149,999.15	143,709.68

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[a]	1990	1991	1992	1993	1994	1995	1996	1997	1998
	kt CO_2 eq									
1. Energy	161,315.59	161,315.59	148,334.86	142,963.34	137,686.90	129,784.15	129,387.75	131,980.34	126,749.69	120,701.98
2. Industrial processes and product use	17,113.01	17,113.01	13,847.99	14,609.67	13,451.41	14,690.24	14,202.28	14,903.04	15,822.55	15,949.40
3. Agriculture	15,839.59	15,839.59	13,732.22	11,838.17	10,523.14	9,539.83	9,616.63	9,337.48	8,921.83	8,554.82
4. Land Use, Land-Use Change and Forestry[b]	-5,225.91	-5,225.91	-8,423.69	-9,267.08	-8,865.14	-6,527.42	-6,995.65	-7,174.80	-6,516.18	-6,601.43
5. Waste	3,124.51	3,124.51	3,266.79	3,275.76	3,356.73	3,503.45	3,510.88	3,549.21	3,665.98	3,792.03
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)	192,166.80	192,166.80	170,758.17	163,419.86	156,153.04	150,990.25	149,721.89	152,595.26	148,643.87	142,396.81

Notes:

All footnotes for this table are given on sheet 3 of table 1.

(Sheet 2 of 3)

GREENHOUSE GAS EMISSIONS	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CO_2 emissions without net CO_2 from LULUCF	116,618.38	127,059.68	126,952.46	123,888.60	127,376.02	128,110.18	125,671.32	126,447.34	128,260.88	122,973.82	115,223.65
CO_2 emissions with net CO_2 from LULUCF	109,499.41	119,097.12	118,648.38	115,947.07	120,923.76	121,495.98	118,545.66	121,511.03	125,558.11	117,030.14	108,222.28
CH_4 emissions without CH_4 from LULUCF	16,173.39	15,351.20	15,109.74	14,689.13	14,701.53	14,282.25	14,656.44	14,889.52	14,454.41	14,578.90	14,232.44
CH_4 emissions with CH_4 from LULUCF	16,218.18	15,392.53	15,151.82	14,734.68	14,761.72	14,334.89	14,706.39	14,951.78	14,534.67	14,641.79	14,285.90
N_2O emissions without N_2O from LULUCF	6,234.91	6,365.04	6,364.69	6,107.76	5,707.99	6,176.90	6,002.61	5,817.28	5,782.17	5,923.20	5,533.45
N_2O emissions with N_2O from LULUCF	6,270.97	6,398.81	6,398.66	6,143.80	5,753.65	6,217.51	6,041.45	5,864.27	5,841.03	5,970.61	5,574.71
HFCs	324.77	444.51	561.53	682.36	820.07	921.91	1,037.04	1,308.41	1,716.51	2,009.94	2,090.49
PFCs	1.10	4.69	9.75	16.39	8.55	12.81	14.89	31.09	29.00	39.76	45.44
Unspecified mix of HFCs and PFCs	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
SF_6	95.94	108.40	98.82	121.28	144.69	120.61	111.84	105.12	93.79	88.67	89.05
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (without LULUCF)	139,448.48	149,333.52	149,096.97	145,505.52	148,758.85	149,624.67	147,494.14	148,598.76	150,336.76	145,614.29	137,214.52
Total (with LULUCF)	132,410.36	141,446.06	140,868.95	137,645.58	142,412.44	143,103.71	140,457.28	143,771.70	147,773.11	139,780.91	130,307.87
Total (without LULUCF, with indirect)	140,672.38	150,494.63	150,215.36	146,571.01	149,809.57	150,633.08	148,549.40	149,698.81	151,389.49	146,644.93	138,175.33
Total (with LULUCF, with indirect)	133,634.26	142,607.16	141,987.33	138,711.07	143,463.16	144,112.12	141,512.53	144,871.75	148,825.84	140,811.55	131,268.68

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1. Energy	113,611.61	122,170.35	122,455.72	119,132.82	121,633.74	121,399.88	120,608.01	120,719.51	121,583.10	116,565.26	110,966.55
2. Industrial processes and product use	13,431.38	14,916.43	14,153.58	13,939.64	14,989.07	15,925.09	14,790.38	15,828.73	16,604.19	16,565.03	14,054.54
3. Agriculture	8,599.40	8,393.28	8,494.36	8,306.07	7,850.92	8,064.87	7,801.18	7,679.47	7,835.16	7,972.44	7,572.38
4. Land Use, Land-Use Change and Forestry[b]	-7,038.12	-7,887.46	-8,228.03	-7,859.94	-6,346.41	-6,520.96	-7,036.87	-4,827.06	-2,563.65	-5,833.38	-6,906.65
5. Waste	3,806.09	3,853.46	3,993.32	4,126.98	4,285.11	4,234.83	4,294.58	4,371.05	4,314.32	4,511.55	4,621.05
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)	132,410.36	141,446.06	140,868.95	137,645.58	142,412.44	143,103.71	140,457.28	143,771.70	147,773.11	139,780.91	130,307.87

Notes:

All footnotes for this table are given on sheet 3 of table 1.

(Sheet 3 of 3)

GREENHOUSE GAS EMISSIONS	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
									(%)
CO_2 emissions without net CO_2 from LULUCF	117,459.82	115,005.47	110,904.82	106,376.58	104,014.52	104,786.44	106,599.14	105,607.27	-35.69
CO_2 emissions with net CO_2 from LULUCF	111,821.11	108,104.91	104,160.52	100,353.77	98,040.05	99,645.47	101,380.83	103,403.77	-34.92
CH_4 emissions without CH_4 from LULUCF	14,432.86	14,466.20	14,449.53	13,868.73	13,865.79	13,926.62	13,701.16	13,510.83	-42.49
CH_4 emissions with CH_4 from LULUCF	14,489.36	14,492.03	14,478.16	13,893.61	13,894.91	13,958.29	13,734.03	13,548.91	-42.43
N_2O emissions without N_2O from LULUCF	5,328.99	5,544.80	5,486.19	5,450.67	5,688.08	5,664.58	5,911.59	5,837.72	-39.27
N_2O emissions with N_2O from LULUCF	5,372.34	5,568.04	5,511.41	5,473.34	5,713.45	5,691.57	5,939.00	5,868.20	-39.21
HFCs	2,381.07	2,639.20	2,757.66	2,906.60	3,104.77	3,317.83	3,462.58	3,640.80	100.00
PFCs	48.04	8.24	6.19	4.08	3.02	1.93	1.44	1.37	100.00
Unspecified mix of HFCs and PFCs	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NO, NE	NO, NE	0.00
SF_6	82.76	88.64	92.44	83.04	79.90	78.27	78.63	74.31	-11.79
NF3	0.15	0.59	0.89	1.41	2.37	2.15	2.15	2.75	100.00
Total (without LULUCF)	139,733.69	137,753.14	133,697.71	128,691.10	126,758.46	127,777.83	129,756.68	128,675.05	-34.81
Total (with LULUCF)	134,194.82	130,901.65	127,007.26	122,715.84	120,838.48	122,695.51	124,598.65	126,540.11	-34.15
Total (without LULUCF, with indirect)	140,702.10	138,701.26	134,603.55	129,496.54	127,560.13	128,564.93	130,508.90	129,383.52	-35.06
Total (with LULUCF, with indirect)	135,163.23	131,849.77	127,913.10	123,521.28	121,640.15	123,482.61	125,350.87	127,248.59	-34.41

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
									(%)
1. Energy	112,462.86	110,014.66	106,004.88	100,676.98	97,662.04	98,771.14	100,133.52	98,936.38	-38.67
2. Industrial processes and product use	15,022.88	15,253.97	15,029.48	14,896.85	15,752.16	15,402.41	15,573.79	15,656.35	-8.51
3. Agriculture	7,386.47	7,567.38	7,585.97	7,744.22	7,940.86	8,092.55	8,482.36	8,432.99	-46.76
4. Land Use, Land-Use Change and Forestry[b]	-5,538.87	-6,851.49	-6,690.45	-5,975.26	-5,919.98	-5,082.32	-5,158.03	-2,134.94	-59.15
5. Waste	4,861.48	4,917.13	5,077.39	5,373.05	5,403.39	5,511.73	5,567.01	5,649.33	80.81
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total (including LULUCF)	134,194.82	130,901.65	127,007.26	122,715.84	120,838.48	122,695.51	124,598.65	126,540.11	-34.15

Notes:

Further detailed information could be found in the common reporting format tables of the Party's greenhouse gas inventory, namely "Emission trends (CO2)", "Emission trends (CH_4)", "Emission trends (N_2O)" and "Emission trends (HFCs, PFCs and SF_6)", which is included in an annex to this biennial report.

1 kt CO2 eq equals 1 Gg CO2 eq.

Abbreviation: LULUCF = land use, land-use change and forestry.

[a] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

[b] Includes net CO_2, CH_4 and N_2O from LULUCF.

CTF Table 1a - Emission trends (CO_2)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year[a]*	1990	1991	1992	1993	1994	1995	1996	1997	1998
	kt									
1. Energy	147,240.01	147,240.01	135,652.62	131,019.37	125,998.03	118,686.52	118,536.71	121,226.86	116,263.27	110,794.39
A. Fuel combustion (sectoral approach)	146,781.57	146,781.57	135,254.56	130,623.07	125,619.94	118,318.59	118,174.44	120,876.89	115,918.72	110,454.44
1. Energy industries	56,593.87	56,593.87	55,221.69	54,398.45	54,068.98	54,586.67	61,473.21	66,212.78	62,519.86	60,395.04
2. Manufacturing industries and construction	46,823.53	46,823.53	39,612.35	43,631.25	36,531.67	28,999.11	24,326.06	24,113.08	23,921.49	21,581.41
3. Transport	11,218.46	11,218.46	10,071.57	10,470.52	10,018.73	10,901.57	10,196.94	10,377.84	10,254.07	11,398.88
4. Other sectors	31,953.66	31,953.66	30,194.74	21,924.50	24,814.74	23,620.15	21,964.05	19,965.21	19,027.80	16,909.29
5. Other	192.04	192.04	154.22	198.36	185.81	211.08	214.18	207.99	195.49	169.82
B. Fugitive emissions from fuels	458.44	458.44	398.05	396.30	378.09	367.93	362.27	349.97	344.55	339.95
1. Solid fuels	456.24	456.24	395.10	392.83	373.45	362.60	356.21	343.65	337.79	332.53
2. Oil and natural gas and other emissions from energy production	2.20	2.20	2.95	3.47	4.64	5.33	6.06	6.32	6.76	7.41
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes	15,646.57	15,646.57	12,768.09	13,351.68	12,401.19	13,436.01	12,785.11	13,454.90	14,238.11	14,217.89
A. Mineral industry	4,082.45	4,082.45	3,365.96	3,506.00	3,195.85	3,249.88	3,019.09	3,247.34	3,435.56	3,599.41
B. Chemical industry	1,783.27	1,783.27	1,533.29	1,664.92	1,626.13	1,923.09	1,725.67	1,854.99	1,814.00	1,861.45
C. Metal industry	9,655.30	9,655.30	7,759.19	8,054.60	7,486.07	8,149.26	7,936.61	8,262.38	8,911.92	8,631.30
D. Non-energy products from fuels and solvent use	125.56	125.56	109.65	126.15	93.14	113.77	103.75	90.19	76.63	125.73
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
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	1,296.16	1,296.16	447.93	217.74	196.91	195.16	220.53	213.84	160.66	233.80
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	1,187.63	1,187.63	315.93	109.21	103.78	104.23	111.26	113.37	93.19	90.80
H. Urea application	108.53	108.53	132.00	108.53	93.13	90.93	109.27	100.47	67.47	143.00
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land Use, Land-Use Change and Forestry	-5,310.08	-5,310.08	-8,488.74	-9,339.85	-8,945.55	-6,607.52	-7,068.87	-7,274.54	-6,628.51	-6,692.82
A. Forest land	-4,690.91	-4,690.91	-9,264.45	-10,978.02	-9,656.94	-7,047.58	-7,002.41	-7,301.45	-6,475.45	-7,015.22
B. Cropland	177.35	177.35	373.35	170.64	117.23	174.08	206.21	394.35	149.48	247.13
C. Grassland	-140.23	-140.23	-229.48	-254.58	-180.09	-302.82	-364.05	-529.74	-378.16	-200.20
D. Wetlands	21.73	21.73	28.38	10.11	9.22	6.35	9.34	11.85	14.37	25.19
E. Settlements	1,034.95	1,034.95	943.51	953.03	1,051.27	987.48	915.57	922.27	902.04	918.19
F. Other land	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
G. Harvested wood products	-1,712.98	-1,712.98	-340.06	758.97	-286.25	-425.03	-833.54	-771.82	-840.79	-667.91
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

5. Waste	20.83	20.83	24.94	29.27	39.97	56.67	63.63	63.96	67.04	67.36
A. Solid waste disposal	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
B. Biological treatment of solid waste										
C. Incineration and open burning of waste	20.83	20.83	24.94	29.27	39.97	56.67	63.63	63.96	67.04	67.36
D. Waste water treatment and discharge										
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:										
International bunkers	523.72	523.72	430.45	498.13	414.11	515.34	558.03	419.43	483.25	571.33
Aviation	523.72	523.72	430.45	498.13	414.11	515.34	558.03	419.43	483.25	571.33
Navigation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass	6,445.39	6,445.39	6,547.99	7,286.46	7,040.23	6,710.66	5,790.70	5,826.89	6,455.06	6,724.11
CO2 captured	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE
Long-term storage of C in waste disposal sites	15,558.30	15,558.30	16,328.31	17,129.27	17,949.26	18,775.06	19,691.70	20,641.81	21,624.82	22,645.27
Indirect N2O										
Indirect CO2 (3)	1,849.32	1,849.32	1,631.38	1,539.62	1,510.29	1,453.94	1,411.54	1,379.95	1,355.27	1,312.88
Total CO2 equivalent emissions without land use, land-use change and forestry	164,203.58	164,203.58	148,893.58	144,618.05	138,636.10	132,374.36	131,605.98	134,959.57	130,729.08	125,313.44
Total CO2 equivalent emissions with land use, land-use change and forestry	158,893.50	158,893.50	140,404.84	135,278.21	129,690.55	125,766.84	124,537.11	127,685.03	124,100.57	118,620.63
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	166,052.91	166,052.91	150,524.95	146,157.68	140,146.39	133,828.30	133,017.52	136,339.51	132,084.36	126,626.32
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	160,742.82	160,742.82	142,036.21	136,817.83	131,200.85	127,220.78	125,948.65	129,064.98	125,455.85	119,933.50

Notes:

All footnotes for this table are given on sheet 3 of table 1(a).

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1. Energy	104,545.46	113,785.13	114,501.25	111,651.49	114,201.14	114,218.85	113,016.61	112,883.32	114,169.97	109,199.79	103,949.00
A. Fuel combustion (sectoral approach)	104,231.50	113,462.70	114,169.61	111,317.52	113,878.40	113,904.37	112,702.84	112,547.53	113,866.64	108,901.75	103,689.56
1. Energy industries	57,952.81	61,773.05	63,944.85	62,506.09	62,149.16	62,262.54	62,870.76	62,320.71	65,948.99	61,235.83	57,178.08
2. Manufacturing industries and construction	18,400.29	23,293.03	20,761.56	19,874.66	19,822.32	19,453.41	18,715.29	18,412.67	16,537.32	16,075.29	15,819.06
3. Transport	11,690.80	11,814.94	12,655.85	13,230.93	15,005.68	15,769.05	17,100.86	17,439.17	18,358.98	18,190.40	17,587.05
4. Other sectors	16,023.61	16,405.01	16,649.25	15,471.36	16,663.46	16,153.91	13,750.83	14,123.41	12,685.46	13,034.86	12,752.08
5. Other	163.99	176.66	158.10	234.48	237.78	265.44	265.10	251.57	335.89	365.37	353.28
B. Fugitive emissions from fuels	313.96	322.44	331.64	333.97	322.74	314.48	313.77	335.79	303.33	298.04	259.45
1. Solid fuels	306.33	315.13	324.03	322.98	309.65	301.87	300.85	324.80	293.09	288.00	250.22
2. Oil and natural gas and other emissions from energy production	7.63	7.30	7.62	10.99	13.09	12.61	12.92	10.99	10.24	10.04	9.23
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes	11,828.56	13,057.00	12,190.79	11,961.81	12,861.69	13,582.10	12,394.36	13,249.70	13,780.14	13,465.32	11,023.13
A. Mineral industry	3,553.49	3,633.37	3,322.41	3,064.16	3,165.55	3,330.41	3,345.75	3,445.51	3,826.59	3,674.72	3,075.56
B. Chemical industry	1,802.28	1,852.80	1,726.91	1,536.03	1,731.30	1,941.46	1,823.60	1,705.77	1,537.29	1,951.12	1,814.26
C. Metal industry	6,352.47	7,424.08	7,023.21	7,257.25	7,852.32	8,181.93	7,091.36	7,961.08	8,266.35	7,724.53	6,030.54
D. Non-energy products from fuels and solvent use	120.32	146.75	118.26	104.37	112.52	128.29	133.66	137.34	149.91	114.96	102.77

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
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	175.55	160.82	182.90	163.66	140.32	146.82	138.68	161.03	202.50	195.75	150.00
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	87.55	113.21	105.43	99.70	79.19	76.73	64.51	78.39	80.47	95.59	64.50
H. Urea application	88.00	47.61	77.47	63.96	61.13	70.09	74.17	82.64	122.03	100.16	85.50
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land Use, Land-Use Change and Forestry	-7,118.97	-7,962.57	-8,304.08	-7,941.53	-6,452.26	-6,614.20	-7,125.66	-4,936.30	-2,702.77	-5,943.68	-7,001.37
A. Forest land	-6,904.70	-7,144.08	-7,465.28	-7,209.77	-5,407.80	-5,553.23	-6,024.68	-2,658.92	97.01	-4,037.95	-6,075.57
B. Cropland	121.99	168.85	89.37	70.37	88.75	172.93	187.15	87.61	67.52	110.90	90.41
C. Grassland	-439.61	-464.14	-425.75	-430.73	-420.81	-452.98	-476.37	-516.44	-488.04	-501.66	-470.17
D. Wetlands	26.09	27.39	12.92	33.67	23.27	19.47	21.75	19.36	19.61	20.28	18.77
E. Settlements	880.43	727.14	695.86	703.05	759.34	759.39	612.64	562.76	537.99	521.62	501.29
F. Other land	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
G. Harvested wood products	-803.18	-1,277.73	-1,211.20	-1,108.13	-1,495.00	-1,559.77	-1,446.15	-2,430.67	-2,936.86	-2,056.88	-1,066.10
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	68.81	56.73	77.52	111.64	172.87	162.42	121.67	153.29	108.27	112.96	101.52
A. Solid waste disposal	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
B. Biological treatment of solid waste											
C. Incineration and open burning of waste	68.81	56.73	77.52	111.64	172.87	162.42	121.67	153.29	108.27	112.96	101.52
D. Waste water treatment and discharge											
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	537.68	588.73	625.64	540.31	726.67	933.91	970.47	1,005.99	1,055.53	1,118.52	1,021.56
Aviation	537.68	588.73	625.64	540.31	726.67	933.91	970.47	1,005.99	1,055.53	1,118.52	1,021.56
Navigation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass	7,018.88	6,666.40	7,158.55	7,965.76	7,803.53	8,440.86	8,667.97	9,137.40	9,746.28	10,493.77	11,558.56
CO2 captured	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE		NO, NE	NO, NE	NO, NE	NO, NE
Long-term storage of C in waste disposal sites	23,623.25	24,677.97	25,759.93	26,870.29	27,986.40	29,113.53	30,258.81	31,436.72	32,684.87	33,937.89	35,219.60
Indirect N2O											
Indirect CO2 (3)	1,223.90	1,161.11	1,118.39	1,065.50	1,050.72	1,008.41	1,055.26	1,100.05	1,052.72	1,030.64	960.81
Total CO2 equivalent emissions without land use, land-use change and forestry	116,618.38	127,059.68	126,952.46	123,888.60	127,376.02	128,110.18	125,671.32	126,447.34	128,260.88	122,973.82	115,223.65
Total CO2 equivalent emissions with land use, land-use change and forestry	109,499.41	119,097.12	118,648.38	115,947.07	120,923.76	121,495.98	118,545.66	121,511.03	125,558.11	117,030.14	108,222.28
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	117,842.29	128,220.79	128,070.84	124,954.10	128,426.74	129,118.59	126,726.57	127,547.39	129,313.60	124,004.46	116,184.47
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	110,723.31	120,258.22	119,766.76	117,012.57	121,974.48	122,504.39	119,600.92	122,611.08	126,610.84	118,060.78	109,183.09

Notes:

All footnotes for this table are given on sheet 3 of table 1(a).

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
									%
1. Energy	105,334.39	102,907.44	99,104.61	94,665.00	91,740.02	92,941.13	94,614.95	93,746.13	-36.33
A. Fuel combustion (sectoral approach)	105,067.67	102,645.04	98,838.63	94,463.66	91,536.89	92,747.21	94,453.55	93,619.11	-36.22
1. Energy industries	61,812.21	61,574.33	58,456.55	54,885.97	53,510.67	53,407.12	54,168.51	51,487.34	-9.02
2. Manufacturing industries and construction	12,021.16	11,048.31	10,722.00	9,998.44	9,470.96	9,657.57	9,389.49	10,325.74	-77.95
3. Transport	16,570.54	16,386.85	16,119.80	15,992.40	16,493.55	17,256.93	17,924.63	18,418.22	64.18
4. Other sectors	14,344.39	13,260.44	13,233.80	13,286.51	11,752.26	12,056.73	12,576.96	12,938.31	-59.51
5. Other	319.37	375.11	306.49	300.33	309.44	368.85	393.95	449.50	134.07
B. Fugitive emissions from fuels	266.72	262.40	265.97	201.35	203.13	193.92	161.40	127.02	-72.29
1. Solid fuels	259.30	255.45	259.41	194.88	196.83	188.53	156.46	122.45	-73.16
2. Oil and natural gas and other emissions from energy production	7.42	6.96	6.56	6.47	6.30	5.39	4.94	4.56	107.29
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	0.00
2. Industrial processes	11,827.42	11,793.50	11,435.09	11,332.18	11,947.36	11,374.62	11,485.98	11,444.43	-26.86
A. Mineral industry	3,048.42	3,356.80	3,092.40	2,404.70	2,569.79	2,594.89	2,834.25	2,855.54	-30.05
B. Chemical industry	1,921.18	1,766.52	1,855.41	1,760.93	1,989.50	1,679.88	1,222.12	1,980.74	11.07
C. Metal industry	6,742.56	6,544.67	6,379.10	7,051.56	7,273.43	6,962.44	7,292.19	6,465.45	-33.04
D. Non-energy products from fuels and solvent use	115.27	125.51	108.17	115.00	114.64	137.40	137.42	142.70	13.65
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	0.00
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Agriculture	173.24	191.26	252.43	262.32	208.57	351.51	378.86	283.32	-78.14
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	61.97	80.68	116.54	136.63	151.54	164.41	168.10	159.04	-86.61
H. Urea application	111.27	110.58	135.89	125.69	57.03	187.10	210.76	124.28	14.52
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	0.00
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land Use, Land-Use Change and Forestry	-5,638.72	-6,900.56	-6,744.30	-6,022.81	-5,974.48	-5,140.97	-5,218.31	-2,203.50	-58.50
A. Forest land	-4,094.03	-5,857.47	-6,182.66	-6,144.01	-6,106.97	-4,805.73	-4,167.31	-1,682.17	-64.14
B. Cropland	107.44	178.23	100.35	98.06	112.93	65.21	62.38	31.27	-82.37
C. Grassland	-537.56	-767.54	-462.23	-400.80	-446.76	-436.70	-733.89	-378.79	170.13
D. Wetlands	35.09	38.45	25.13	32.20	27.28	25.59	25.53	20.89	-3.84
E. Settlements	497.91	492.25	485.58	518.64	535.20	500.80	535.82	583.80	-43.59
F. Other land	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.00
G. Harvested wood products	-1,647.57	-984.48	-710.48	-126.90	-96.16	-490.14	-940.84	-778.50	-54.55
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Waste	124.77	113.26	112.70	117.07	118.56	119.19	119.35	133.39	540.27
A. Solid waste disposal	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NO, NE	NO, NE	0.00

B. Biological treatment of solid waste									
C. Incineration and open burning of waste	124.77	113.26	112.70	117.07	118.56	119.19	119.35	133.39	540.27
D. Waste water treatment and discharge									
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Memo items:									
International bunkers	957.18	948.88	884.22	853.05	875.75	887.47	947.37	1,073.65	105.00
Aviation	957.18	948.88	884.22	853.05	875.75	887.47	947.37	1,073.65	105.00
Navigation	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 emissions from biomass	12,379.65	13,205.48	14,040.05	15,024.16	15,795.52	16,258.72	16,403.24	16,718.07	159.38
CO2 captured	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	0.00
Long-term storage of C in waste disposal sites	36,422.71	37,553.31	38,614.57	39,642.47	40,627.13	41,586.48	42,554.38	43,541.66	179.86
Indirect N2O									
Indirect CO2 (3)	968.41	948.12	905.83	805.44	801.67	787.10	752.22	708.48	-61.69
Total CO2 equivalent emissions without land use, land-use change and forestry	117,459.82	115,005.47	110,904.82	106,376.58	104,014.52	104,786.44	106,599.14	105,607.27	-35.69
Total CO2 equivalent emissions with land use, land-use change and forestry	111,821.11	108,104.91	104,160.52	100,353.77	98,040.05	99,645.47	101,380.83	103,403.77	-34.92
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	118,428.23	115,953.59	111,810.66	107,182.02	104,816.19	105,573.54	107,351.35	106,315.75	-35.97
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	112,789.52	109,053.03	105,066.35	101,159.21	98,841.72	100,432.57	102,133.05	104,112.25	-35.23

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

[b] Fill in net emissions/removals as reported in CRF table Summary 1.A of the latest reported inventory year. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

CTF Table 1b - Emission trends (CH_4)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year[a]*	1990	1991	1992	1993	1994	1995	1996	1997	1998
	kt									
1. Energy	531.02	531.02	477.92	449.17	440.06	416.92	406.85	402.61	392.51	369.83
A. Fuel combustion (sectoral approach)	74.90	74.90	68.70	61.42	57.86	53.88	49.14	50.43	46.64	37.99
1. Energy industries	0.66	0.66	0.64	0.65	0.66	0.69	0.77	0.86	0.85	0.88
2. Manufacturing industries and construction	4.17	4.17	3.57	3.85	3.20	2.73	2.07	2.05	2.04	1.80
3. Transport	3.03	3.03	2.79	3.36	3.07	3.37	3.23	3.38	3.14	3.05
4. Other sectors	67.03	67.03	61.68	53.55	50.92	47.09	43.05	44.13	40.60	32.24
5. Other	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
B. Fugitive emissions from fuels	456.12	456.12	409.22	387.75	382.20	363.04	357.71	352.18	345.87	331.84
1. Solid fuels	412.93	412.93	372.10	353.38	348.58	329.97	324.47	316.24	310.45	294.53
2. Oil and natural gas and other emissions from energy production	43.20	43.20	37.11	34.37	33.62	33.07	33.23	35.94	35.42	37.31
C. CO2 transport and storage										
2. Industrial processes	2.05	2.05	1.68	1.52	1.52	1.73	1.91	1.95	1.95	2.11
A. Mineral industry										
B. Chemical industry	1.45	1.45	1.14	1.26	1.28	1.45	1.40	1.46	1.48	1.63
C. Metal industry	0.60	0.60	0.54	0.26	0.24	0.28	0.50	0.50	0.47	0.48
D. Non-energy products from fuels and solvent use	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, 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
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	291.85	291.85	275.97	250.73	221.22	194.04	187.45	184.32	173.35	163.76
A. Enteric fermentation	224.02	224.02	211.38	189.61	164.45	144.13	140.24	138.85	129.86	121.63
B. Manure management	67.83	67.83	64.59	61.11	56.76	49.91	47.21	45.47	43.49	42.13
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Liming										
H. Urea application										
I. Other carbon-containing fertilizers										
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	1.77	1.77	1.31	1.51	1.71	1.72	1.57	2.25	2.58	2.03
A. Forest land	1.77	1.77	1.31	1.51	1.71	1.72	1.57	2.25	2.58	2.03
B. Cropland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Grassland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
F. Other land	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	114.76	114.76	121.46	122.13	124.45	130.02	129.62	130.93	135.69	140.41

A. Solid waste disposal	79.17	79.17	82.79	85.97	89.48	92.95	96.20	98.23	102.01	105.69
B. Biological treatment of solid waste	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	35.59	35.59	38.67	36.16	34.97	37.07	33.42	32.70	33.68	34.71
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH4 emissions without CH4 from LULUCF	939.69	939.69	877.03	823.55	787.25	742.71	725.82	719.82	703.50	676.10
Total CH4 emissions with CH4 from LULUCF	941.45	941.45	878.34	825.06	788.96	744.43	727.39	722.07	706.08	678.13
Memo items:										
International bunkers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Navigation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass										
CO2 captured										
Long-term storage of C in waste disposal sites										
Indirect N2O										
Indirect CO2 (3)										

Notes:

All footnotes for this table are given on sheet 3 of table 1(b).

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1. Energy	336.33	307.23	292.71	273.73	271.04	260.55	276.86	286.12	268.69	267.17	254.42
A. Fuel combustion (sectoral approach)	33.66	35.08	35.88	34.90	35.36	35.23	33.05	34.15	33.49	33.64	35.65
1. Energy industries	0.86	0.86	0.90	0.90	1.03	1.11	0.91	0.92	1.01	1.03	1.06
2. Manufacturing industries and construction	1.56	1.93	1.72	1.83	1.68	1.70	1.92	1.95	1.81	1.82	1.87
3. Transport	2.98	2.81	2.77	2.74	2.80	2.65	2.55	2.33	2.24	2.09	2.00
4. Other sectors	28.25	29.46	30.46	29.41	29.82	29.74	27.64	28.92	28.40	28.66	30.69
5. Other	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04
B. Fugitive emissions from fuels	302.67	272.14	256.83	238.83	235.68	225.32	243.81	251.97	235.20	233.53	218.77
1. Solid fuels	266.11	237.38	224.04	204.34	203.56	195.36	208.50	216.40	199.75	200.95	184.42
2. Oil and natural gas and other emissions from energy production	36.56	34.76	32.80	34.49	32.12	29.95	35.31	35.57	35.45	32.59	34.35
C. CO2 transport and storage											
2. Industrial processes	2.15	2.13	2.23	2.15	2.10	2.59	2.59	2.53	2.31	2.40	2.19
A. Mineral industry											
B. Chemical industry	1.72	1.68	1.76	1.68	1.63	2.08	2.12	1.99	1.83	2.00	1.85
C. Metal industry	0.43	0.45	0.47	0.47	0.47	0.51	0.47	0.54	0.48	0.40	0.34
D. Non-energy products from fuels and solvent use	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, 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
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	167.05	160.79	161.00	159.26	158.67	153.77	149.65	147.52	148.49	147.65	141.30
A. Enteric fermentation	124.47	119.56	120.51	118.02	116.79	114.25	111.95	110.28	111.48	112.77	109.95

B. Manure management	42.58	41.23	40.49	41.24	41.88	39.52	37.70	37.23	37.01	34.88	31.35
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Liming											
H. Urea application											
I. Other carbon-containing fertilizers											
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	1.79	1.65	1.68	1.82	2.41	2.11	2.00	2.49	3.21	2.52	2.14
A. Forest land	1.79	1.65	1.68	1.82	2.41	2.11	2.00	2.49	3.21	2.52	2.14
B. Cropland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Grassland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
F. Other land	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
G. Harvested wood products											
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	141.40	143.90	148.46	152.42	156.24	154.38	157.16	159.42	158.69	165.94	171.38
A. Solid waste disposal	109.37	111.94	115.15	118.27	121.75	120.55	122.32	124.04	123.35	129.26	133.68
B. Biological treatment of solid waste	NE, IE	NE, IE	NE, IE	NE, IE	0.14	0.12	1.47	1.46	2.09	3.30	4.23
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	32.04	31.96	33.30	34.14	34.35	33.72	33.37	33.92	33.25	33.37	33.47
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH4 emissions without CH4 from LULUCF	646.94	614.05	604.39	587.57	588.06	571.29	586.26	595.58	578.18	583.16	569.30
Total CH4 emissions with CH4 from LULUCF	648.73	615.70	606.07	589.39	590.47	573.40	588.26	598.07	581.39	585.67	571.44
Memo items:											
International bunkers	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Aviation	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Navigation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass											
CO2 captured											
Long-term storage of C in waste disposal sites											
Indirect N2O											
Indirect CO2 (3)											

Notes:

All footnotes for this table are given on sheet 3 of table 1(b).

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
									%
1. Energy	258.82	257.78	249.95	214.87	211.08	206.90	194.04	180.86	-65.94
A. Fuel combustion (sectoral approach)	37.83	38.02	38.99	40.08	38.65	39.15	39.26	40.53	-45.89
1. Energy industries	1.19	1.24	1.26	1.22	1.25	1.31	1.35	1.38	108.27
2. Manufacturing industries and construction	1.38	1.36	1.34	1.33	1.37	1.43	1.42	1.49	-64.21
3. Transport	1.75	1.63	1.43	1.26	1.16	1.08	1.05	1.00	-66.87
4. Other sectors	33.48	33.75	34.93	36.24	34.84	35.29	35.39	36.60	-45.40
5. Other	0.03	0.04	0.03	0.03	0.03	0.04	0.04	0.05	303.26
B. Fugitive emissions from fuels	220.99	219.76	210.96	174.79	172.43	167.75	154.78	140.34	-69.23
1. Solid fuels	185.40	186.48	183.85	149.68	147.41	143.43	130.57	116.02	-71.90
2. Oil and natural gas and other emissions from energy production	35.59	33.28	27.11	25.12	25.02	24.32	24.21	24.31	-43.72
C. CO2 transport and storage									
2. Industrial processes	2.37	2.25	2.45	2.38	2.67	2.01	1.46	2.60	27.22
A. Mineral industry									
B. Chemical industry	1.97	1.81	1.97	1.85	2.13	1.47	0.88	2.05	41.39
C. Metal industry	0.40	0.45	0.49	0.53	0.54	0.54	0.58	0.56	-6.88
D. Non-energy products from fuels and solvent use	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NO, NA	NO, NA	NO, NA	0.00
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	0.00
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Agriculture	136.53	135.76	135.97	136.50	138.94	142.22	145.18	146.92	-49.66
A. Enteric fermentation	106.28	106.56	107.83	107.84	110.07	113.13	115.52	117.58	-47.52
B. Manure management	30.26	29.20	28.14	28.66	28.87	29.09	29.65	29.34	-56.74
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	0.00
D. Agricultural soils	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	0.00
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Liming									
H. Urea application									
I. Other carbon-containing fertilizers									
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry	2.26	1.03	1.15	1.00	1.16	1.27	1.31	1.52	-13.75
A. Forest land	2.26	1.03	1.15	1.00	1.16	1.27	1.31	1.52	-13.75
B. Cropland	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C. Grassland	NO	NO	NO	NO	NO	NO	NO	NO	0.00
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	0.00
E. Settlements	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.00
F. Other land	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.00
G. Harvested wood products									
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Waste	179.59	182.85	189.60	201.00	201.94	205.93	207.37	210.04	83.02
A. Solid waste disposal	138.50	140.04	141.99	144.88	143.77	146.15	146.84	148.81	87.96
B. Biological treatment of solid waste	6.67	9.03	14.25	22.84	24.55	25.36	25.91	25.99	100.00

C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540.27
D. Waste water treatment and discharge	34.42	33.78	33.37	33.29	33.62	34.42	34.61	35.25	-0.97
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total CH4 emissions without CH4 from LULUCF	577.31	578.65	577.98	554.75	554.63	557.06	548.05	540.43	-42.49
Total CH4 emissions with CH4 from LULUCF	579.57	579.68	579.13	555.74	555.80	558.33	549.36	541.96	-42.43
Memo items:									
International bunkers	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	105.00
Aviation	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	105.00
Navigation	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 emissions from biomass									
CO2 captured									
Long-term storage of C in waste disposal sites									
Indirect N2O									
Indirect CO2 (3)									

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

CTF Table 1c - Emission trends (N_2O)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year[a]*	1990	1991	1992	1993	1994	1995	1996	1997	1998
	kt									
1. Energy	2.68	2.68	2.46	2.40	2.31	2.26	2.28	2.31	2.26	2.22
A. Fuel combustion (sectoral approach)	2.68	2.68	2.46	2.40	2.31	2.26	2.28	2.31	2.26	2.22
1. Energy industries	0.82	0.82	0.80	0.79	0.79	0.80	0.91	0.95	0.90	0.88
2. Manufacturing industries and construction	0.62	0.62	0.53	0.57	0.47	0.40	0.30	0.30	0.30	0.26
3. Transport	0.64	0.64	0.55	0.56	0.53	0.60	0.65	0.67	0.68	0.73
4. Other sectors	0.60	0.60	0.58	0.48	0.51	0.46	0.41	0.38	0.37	0.34
5. Other	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
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
1. Solid fuels	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
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
C. CO2 transport and storage										
2. Industrial processes	4.47	4.47	3.20	3.81	3.11	3.77	4.21	4.07	4.18	4.42
A. Mineral industry										
B. Chemical industry	3.77	3.77	2.51	3.12	2.41	3.08	3.51	3.38	3.48	3.73
C. Metal industry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D. Non-energy products from fuels and solvent use	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	24.32	24.32	21.43	17.96	16.09	15.08	15.81	15.15	14.86	14.18
A. Enteric fermentation										
B. Manure management	5.44	5.44	5.22	4.80	4.28	3.74	3.77	3.78	3.63	3.46
C. Rice cultivation										
D. Agricultural soils	18.88	18.88	16.21	13.17	11.82	11.34	12.03	11.37	11.22	10.72
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Liming										
H. Urea application										
I. Other carbon containing fertlizers										
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	0.13	0.13	0.11	0.12	0.13	0.12	0.11	0.15	0.16	0.14
A. Forest land	0.10	0.10	0.07	0.08	0.09	0.10	0.09	0.12	0.14	0.11
B. Cropland	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02
C. Grassland	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.79	0.79	0.69	0.65	0.69	0.66	0.69	0.71	0.69	0.72
A. Solid waste disposal										

B. Biological treatment of solid waste	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE	NE, IE
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	0.79	0.79	0.69	0.65	0.69	0.65	0.69	0.71	0.69	0.72
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N2O emissions without N2O from LULUCF	32.26	32.26	27.78	24.81	22.20	21.77	22.99	22.24	21.99	21.55
Total direct N2O emissions with N2O from LULUCF	32.39	32.39	27.89	24.93	22.32	21.90	23.10	22.39	22.15	21.68
Memo items:										
International bunkers	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02
Aviation	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02
Navigation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass										
CO2 captured										
Long-term storage of C in waste disposal sites										
Indirect N2O	3.57	3.57	3.39	3.25	2.66	2.21	1.85	1.74	1.60	1.52
Indirect CO2 (3)										

Notes:

All footnotes for this table are given on sheet 3 of table 1(c).

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1. Energy	2.21	2.36	2.14	2.14	2.20	2.24	2.25	2.29	2.34	2.30	2.20
A. Fuel combustion (sectoral approach)	2.21	2.36	2.14	2.14	2.20	2.24	2.25	2.29	2.33	2.30	2.20
1. Energy industries	0.84	0.90	0.93	0.91	0.92	0.93	0.91	0.91	0.97	0.91	0.86
2. Manufacturing industries and construction	0.23	0.28	0.25	0.26	0.24	0.25	0.27	0.28	0.26	0.26	0.26
3. Transport	0.80	0.82	0.59	0.60	0.65	0.66	0.68	0.72	0.71	0.72	0.65
4. Other sectors	0.33	0.36	0.36	0.35	0.37	0.38	0.35	0.37	0.36	0.38	0.39
5. Other	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03
B. Fugitive emissions from fuels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1. Solid fuels	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
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
C. CO2 transport and storage											
2. Industrial processes	3.78	4.19	4.15	3.70	3.70	4.10	3.92	3.59	3.11	3.02	2.52
A. Mineral industry											
B. Chemical industry	3.09	3.50	3.46	3.01	3.00	3.41	3.23	2.90	2.42	2.27	1.77
C. Metal industry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D. Non-energy products from fuels and solvent use	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
E. Electronic industry											
F. Product uses as ODS substitutes											
G. Other product manufacture and use	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.75	0.75
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	14.25	14.14	14.38	13.96	12.56	13.67	13.16	12.85	13.16	13.71	13.05
A. Enteric fermentation											

B. Manure management	3.53	3.39	3.33	3.29	3.19	3.07	3.00	2.95	2.98	2.99	2.86
C. Rice cultivation											
D. Agricultural soils	10.72	10.74	11.06	10.67	9.38	10.60	10.16	9.91	10.18	10.72	10.20
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Liming											
H. Urea application											
I. Other carbon containing fertlizers											
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	0.12	0.11	0.11	0.12	0.15	0.14	0.13	0.16	0.20	0.16	0.14
A. Forest land	0.10	0.09	0.09	0.10	0.13	0.12	0.11	0.14	0.18	0.14	0.12
B. Cropland	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
C. Grassland	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
G. Harvested wood products											
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.68	0.67	0.69	0.69	0.69	0.71	0.82	0.78	0.80	0.84	0.79
A. Solid waste disposal											
B. Biological treatment of solid waste	NE, IE	NE, IE	NE, IE	NE, IE	NE, NO, IE	NE, NO, IE	0.08	0.07	0.09	0.13	0.09
C. Incineration and open burning of waste	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
D. Waste water treatment and discharge	0.67	0.66	0.68	0.68	0.68	0.70	0.73	0.70	0.70	0.70	0.70
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N2O emissions without N2O from LULUCF	20.92	21.36	21.36	20.50	19.15	20.73	20.14	19.52	19.40	19.88	18.57
Total direct N2O emissions with N2O from LULUCF	21.04	21.47	21.47	20.62	19.31	20.86	20.27	19.68	19.60	20.04	18.71
Memo items:											
International bunkers	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Aviation	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Navigation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass											
CO2 captured											
Long-term storage of C in waste disposal sites											
Indirect N2O	1.40	1.41	1.42	1.40	1.41	1.41	1.39	1.37	1.36	1.29	1.22
Indirect CO2 (3)											

Notes:

All footnotes for this table are given on sheet 3 of table 1(c).

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
									%
1. Energy	2.21	2.22	2.19	2.15	2.16	2.21	2.24	2.24	-16.42
A. Fuel combustion (sectoral approach)	2.21	2.22	2.19	2.15	2.16	2.21	2.24	2.24	-16.42
1. Energy industries	0.94	0.94	0.90	0.84	0.83	0.84	0.85	0.81	-0.83
2. Manufacturing industries and construction	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.20	-67.61
3. Transport	0.63	0.64	0.64	0.65	0.67	0.69	0.71	0.72	13.32
4. Other sectors	0.41	0.42	0.43	0.45	0.44	0.45	0.45	0.46	-23.24
5. Other	0.03	0.04	0.03	0.03	0.03	0.04	0.04	0.05	640.20
B. Fugitive emissions from fuels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119.90
1. Solid fuels	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NO, NA	NO, NA	NO, NA	0.00
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	119.90
C. CO2 transport and storage									
2. Industrial processes	2.09	2.24	2.27	1.71	1.84	1.94	1.70	1.43	-67.88
A. Mineral industry									
B. Chemical industry	1.34	1.49	1.52	0.96	1.09	1.19	0.95	0.68	-81.86
C. Metal industry	NA	NA	NA	NA	NA	NA	NA	NA	0.00
D. Non-energy products from fuels and solvent use	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NO, NA	NO, NA	NO, NA	0.00
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	8.38
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Agriculture	12.75	13.36	13.20	13.66	14.29	14.05	15.01	15.02	-38.23
A. Enteric fermentation									
B. Manure management	2.77	2.69	2.67	2.71	2.72	2.77	2.82	2.78	-48.84
C. Rice cultivation									
D. Agricultural soils	9.98	10.67	10.53	10.95	11.57	11.28	12.20	12.24	-35.17
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Liming									
H. Urea application									
I. Other carbon containing fertlizers									
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry	0.15	0.08	0.08	0.08	0.09	0.09	0.09	0.10	-23.85
A. Forest land	0.13	0.06	0.06	0.06	0.06	0.07	0.07	0.08	-13.75
B. Cropland	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	-50.81
C. Grassland	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NO, NA	NO, NA	0.00
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	0.00
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Other land	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.00
G. Harvested wood products									
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Waste	0.83	0.78	0.75	0.78	0.79	0.82	0.88	0.89	12.89
A. Solid waste disposal									
B. Biological treatment of solid waste	0.12	0.09	0.09	0.11	0.12	0.15	0.21	0.22	100.00

C. Incineration and open burning of waste	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	540.27
D. Waste water treatment and discharge	0.70	0.68	0.65	0.66	0.66	0.66	0.66	0.66	-15.49
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total direct N2O emissions without N2O from LULUCF	17.88	18.61	18.41	18.29	19.09	19.01	19.84	19.59	-39.27
Total direct N2O emissions with N2O from LULUCF	18.03	18.68	18.49	18.37	19.17	19.10	19.93	19.69	-39.21
Memo items:									
International bunkers	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	105.52
Aviation	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	105.52
Navigation	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 emissions from biomass									
CO2 captured									
Long-term storage of C in waste disposal sites									
Indirect N2O	1.19	1.13	1.07	1.00	0.97	0.93	0.88	0.87	-75.66
Indirect CO2 (3)									

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

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

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year[a]*	1990	1991	1992	1993	1994	1995	1996	1997	1998
	kt									
Emissions of HFCs and PFCs - (kt CO2 equivalent)	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	27.15	88.19	195.28	266.46
Emissions of HFCs - (kt CO2 equivalent)	NO	NO	NO	NO	NO	NO	27.14	87.51	193.55	264.81
HFC-23	NO	NO	NO	NO	NO	NO	NO	NO	0.00	0.00
HFC-32	NO	NO	NO	NO	NO	NO	NO	NO	0.00	0.00
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-43-10mee	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-125	NO	NO	NO	NO	NO	NO	NO	0.00	0.00	0.01
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-134a	NO	NO	NO	NO	NO	NO	0.02	0.06	0.11	0.15
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-143a	NO	NO	NO	NO	NO	NO	NO	0.00	0.00	0.01
HFC-152	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-152a	NO	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00
HFC-161	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-227ea	NO	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00
HFC-236cb	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-236ea	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-236fa	NO	NO	NO	NO	NO	NO	NO	NO	0.00	0.00
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-245fa	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-365mfc	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Emissions of PFCs - (kt CO2 equivalent)	NO	NO	NO	NO	NO	NO	0.01	0.68	1.73	1.66
CF_4	NO	NO	NO	NO	NO	NO	NO	NO	0.00	0.00
C_2F_6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_3F_8	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00	0.00
C_4F_{10}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C_4F_8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_5F_{12}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_6F_{14}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C10F18	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C3F6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of PFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs - (kt CO2 equivalent)	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
Emissions of SF6 - (kt CO2 equivalent)	84.24	84.24	84.08	85.41	86.56	87.66	88.68	98.31	96.10	94.98
SF_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions of NF3 - (kt CO2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Notes:

All footnotes for this table are given on sheet 3 of table 1(d).

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Emissions of HFCs and PFCs - (kt CO2 equivalent)	325.86	449.20	571.27	698.74	828.62	934.72	1,051.93	1,339.50	1,745.51	2,049.70	2,135.93
Emissions of HFCs - (kt CO2 equivalent)	324.77	444.51	561.53	682.36	820.07	921.91	1,037.04	1,308.41	1,716.51	2,009.94	2,090.49
HFC-23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-32	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.09	0.12	0.12
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-43-10mee	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-125	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.08	0.14	0.17	0.19
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-134a	0.17	0.23	0.28	0.33	0.39	0.44	0.49	0.54	0.63	0.72	0.72
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-143a	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.06	0.06	0.07
HFC-152	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-152a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-161	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-227ea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-236cb	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-236ea	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-236fa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-245fa	NO	NO	NO	NO	NO	0.00	0.00	0.00	0.00	0.00	0.00
HFC-365mfc	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Emissions of PFCs - (kt CO2 equivalent)	1.10	4.69	9.75	16.39	8.55	12.81	14.89	31.09	29.00	39.76	45.44
CF_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C_2F_6	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C_3F_8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C_4F_{10}	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
C_5F_{12}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_6F_{14}	NO	NO	NO	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C10F18	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C3F6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of PFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs - (kt CO2 equivalent)	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
Emissions of SF6 - (kt CO2 equivalent)	95.94	108.40	98.82	121.28	144.69	120.61	111.84	105.12	93.79	88.67	89.05
SF_6	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Emissions of NF3 - (kt CO2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Notes:

All footnotes for this table are given on sheet 3 of table 1(d).

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	2016	2017	Change from base to latest reported year
									%
Emissions of HFCs and PFCs - (kt CO2 equivalent)	2,429.11	2,647.44	2,763.84	2,910.68	3,107.79	3,319.77	3,464.02	3,642.17	100.00
Emissions of HFCs - (kt CO2 equivalent)	2,381.07	2,639.20	2,757.66	2,906.60	3,104.77	3,317.83	3,462.58	3,640.80	100.00
HFC-23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-32	0.16	0.20	0.21	0.23	0.25	0.27	0.33	0.39	100.00
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-43-10mee	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-125	0.23	0.28	0.29	0.32	0.35	0.37	0.39	0.43	100.00
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-134a	0.74	0.78	0.81	0.84	0.88	0.94	0.98	0.99	100.00
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-143a	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.09	100.00
HFC-152	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-152a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-161	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-227ea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-236cb	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-236ea	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-236fa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-245fa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-365mfc	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of HFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	0.00	0.04	100.00
Emissions of PFCs - (kt CO2 equivalent)	48.04	8.24	6.19	4.08	3.02	1.93	1.44	1.37	100.00
CF_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C_2F_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C_3F_8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C_4F_{10}	NO	NO	NO	NO	NO	NO	NO	NO	0.00
c-C_4F_8	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C_5F_{12}	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C_6F_{14}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C10F18	NO	NO	NO	NO	NO	NO	NO	NO	0.00
c-C3F6	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of PFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of HFCs and PFCs - (kt CO2 equivalent)	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NO, NE	NO, NE	0.00
Emissions of SF6 - (kt CO2 equivalent)	82.76	88.64	92.44	83.04	79.90	78.27	78.63	74.31	-11.79
SF_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-11.79
Emissions of NF3 - (kt CO2 equivalent)	0.15	0.59	0.89	1.41	2.37	2.15	2.15	2.75	100.00
NF3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] The column “Base year” should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

[c]Enter actual emissions estimates. If only potential emissions estimates are available, these should be reported in this table and an indication for this be provided in the documentation box. Only in these rows are the emissions expressed as CO2 equivalent emissions.

[d]In accordance with the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories”, HFC and PFC emissions should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. mixtures, confidential data, lack of disaggregation), this row could be used for reporting aggregate figures for HFCs and PFCs, respectively. Note that the unit used for this row is kt of CO2 equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.)

CTF Table 2a - Description of quantified economy-wide emission reduction target: base year

Description of quantified economy-wide emission reduction target: base year[a]

Party	Czech Republic	
Base year /base period	1990	
Emission reduction target	% of base year/base period	% of 1990 [b]
	20.00%	20.00%
Period for reaching target	BY-2020	

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Optional.

CTF Table 2b - Description of quantified economy-wide emission reduction target: gases and sectors covered

Gases covered		*Base year for each gas (year):*
CO_2		1990
CH_4		1990
N_2O		1990
HFCs		1990
PFCs		1990
SF_6		1990
NF_3		
Other Gases (specify)		
Sectors covered[b]	Energy	Yes
	Transport[f]	Yes
	Industrial processes[g]	Yes
	Agriculture	Yes
	LULUCF	No
	Waste	Yes
	Other Sectors (specify)	
	Aviation in the scope of the EU ETS (1)	Yes

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

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] More than one selection will be allowed. If Parties use sectors other than those indicated above, the explanation of how these sectors relate to the sectors defined by the IPCC should be provided.

[f] Transport is reported as a subsector of the energy sector.

[g] Industrial processes refer to the industrial processes and solvent and other product use sectors.

CTF Table 2c - Description of quantified economy-wide emission reduction target: global warming potential values (GWP)

Gases	*GWP values [b]*
CO_2	4th AR
CH_4	4th AR
N_2O	4th AR
HFCs	4th AR
PFCs	4th AR
SF_6	4th AR
NF_3	4th AR
Other Gases (specify)	

Abbreviations: GWP = global warming potential

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Please specify the reference for the GWP: Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) or the Fourth Assessment Report of the IPCC.

CTF Table 2d - Description of quantified economy-wide emission reduction target: approach to counting emissions and removals from the LULUCF sector

Role of LULUCF	LULUCF in base year level and target	Excluded
	Contribution of LULUCF is calculated using	

Abbreviation: LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

CTF Table 2e1 - Description of quantified economy-wide emission reduction target: market-based mechanisms under the Convention

Market-based mechanisms under the Convention	*Possible scale of contributions (estimated kt CO_2 eq)*
CERs	NA
ERUs	NA
AAUs[i]	NA
Carry-over units[j]	NA
Other mechanism units under the Convention (specify)[d]	

Abbreviations: AAU = assigned amount unit, CER = certified emission reduction, ERU = emission reduction unit.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[d] As indicated in paragraph 5(e) of the guidelines contained in annex I of decision 2/CP.17 .

[i] AAUs issued to or purchased by a Party.

[j] Units carried over from the first to the second commitment periods of the Kyoto Protocol, as described in decision 13/CMP.1 and consistent with decision 1/CMP.8.

CTF Table 2e2 - Description of quantified economy-wide emission reduction target: other market-based mechanisms

No information provided in table 2e2

CTF Table 2f - Description of quantified economy-wide emission reduction target: any other information

In December 2009, the European Council reiterated the conditional offer of the EU to move to a 30% reduction by 2020 compared to 1990 levels as part of a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] This information could include information on the domestic legal status of the target or the total assigned amount of emission units for the period for reaching a target. Some of this information is presented in the narrative part of the biennial report.

Custom Footnotes

(1) In principle, the EU ETS should cover CO2 emissions of all flights arriving at,and departing from, airports in all EU Member States, Norway, Iceland and Liechtenstein and closely related territories. However, since 2012, flights to and from aerodromes from other countries have not been included in the EU ETS. This exclusion was taken in order to facilitate negotiation of a global agreement to address aviation emissions in the forum of the International Civil Aviation Organisation (ICAO). The EU has decided on a reduced scope in the 2013–2016 period (Regulation (EU) No 421/2014 of theEuropean Parliament and of the Council of 16 April 2014)

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

Name of mitigation action[a]	*Sector(s) affected[b]*	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument[c]*	*Status of implementation[d]*	*Brief description[e]*	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*	
									2020	*2030[f]*
The Climate Protection Policy of the Czech Republic*	Cross-cutting	CO2, N2O, CH4, HFCs, PFCs, SF6, NF3	Framework policy	Planning	Implemented	This is a strategic document of the Czech Government defining main targets and paths in the field of climate protection. The programme aims at reduction of greenhouse gas emissions and at ensuring of meeting the obligations resulting from Kyoto Protocol. The programme adopts new reduction targets in the period until 2020 (e.g. reduction of GHG emissions per inhabitant by 30%). The document also coordinates the sectorial and cross-cutting policies at a national level and also takes into consideration the requirements of the European Climate Change Program (ECCP), which became binding for the Czech Republic after the accession to the EU. The individual sectorial ministries were entrusted with implementation of these National Programme. The Programme was prepared according to the requirements of Council Decision 1999/296/EC. It introduces both specific reduction (mitigation) measures to reduce greenhouse gas emissions and also adaptation measures permitting society and ecosystems to adapt to climate change.	2004	Ministry of Environment (Government)	NE	NE

Air protection act (201/2012 Coll) - framework legislation*	Cross-cutting	CO2, CH4, N2O	Framework policy	Planning	Implemented	The law introduces National programme for abatement of climate change of Earth. The law sets among other things emission limits and reduction targets and deadlines for substances influencing the climate system. There is also an obligation of operators of large plants above 5 MW to keep emission limits and to submit data on substances influencing climate system. The act is accompanied by a row of further legal documents setting emission and imissions limits, periodical inspections of boilers, fees for pollutions and various other aspects of air protection in all sectors. Since this act leads among others to fuel switches and energy efficiency improvements, it significantly influences emissions of GHGs.	2002	Government: Ministry of Environment	NE	NE
Energy act*	Energy	CO2	Increase in renewable energy (Energy supply)	Regulatory	Implemented	This act establishes the rules for operating energy enterprises and energy markets. It is accompanied by a row of decreases dealing with specific issues. The law establishes the obligation of electricity distributors to buy electricity from combined heat and power plants and from renewable energy sources. It also opens the market with electricity.	2000	Government:Ministry of Industry and Trade	NE	NE

Energy management act*	Energy	CO2	Efficiency improvements of buildings (Energy consumption), Efficiency improvement of appliances (Energy consumption)	Regulatory	Implemented	This act sets the basic rules for efficient use of energy. It is accompanied by a row of decreases dealing with specific issues. Framework measure, effects and costs in other PAMs. This law covers more topics: 1. Sets the obligation for regional authorities to elaborate Regional energy concept which should define rules for efficient use of energY and for introduction of RES. 2. Establishes the National programme for effective use of energy and utilisation of renewable and secondary energy sources. 3. Defines minimal efficiencies for electricity and heat production, maximum losses for energy transmission and distribution and sets minimal technical requirements for buildings and appliances. 4. Defines measures for support of RES. 5. Sets obligation to perform energy audits of defined categories of buildings.	2000	Government: Ministry of Industry and Trade	NE	NE

State programme on the promotion of energy savings and the use of renewable energy sources (EFEKT 1+EFEKT 2)*	Energy	CO2	Efficiency improvements of buildings (Energy consumption), Efficiency improvement in services/ tertiary sector (Energy consumption), Efficiency improvement of appliances (Energy consumption), Efficiency improvement in industrial end-use sectors (Energy consumption), Increase in renewable energy (Energy supply)	Economic, Information, Education, Research	Implemented	The programme financially supports the increase of energy effeciency through awareness raising and educational activities, energy consultancy centres and expert training. It is a cross-cutting programme and the target sectors are the state administration and local governments, private sector, households and NGO's. This programme also supports the following activities: measures to reduce the energy intensity of public street lighting; reconstruction of a heating system and the heat generation in a building; publications, guides and informative materials about the energy sector; introduction of an energy management system; preparation of energy-saving projects financed using the EPC method.	2004	Government: Ministry of Industry and Trade	95.00	84.00
Program PANEL/NEW PANEL/PANEL 2013 +*	Energy	CO2	Efficiency improvements of buildings (Energy consumption)	Economic	Implemented	The programme offers credit guarantees and subsidy to credit interest for credits for retrofits of panel houses.	2001	Government: State housing fund	17.00	16.00
Emission limits in Air protection act (201/2012 Coll.)*	Industry/industrial processes	CO2	Installation of abatement technologies (Industrial processes)	Regulatory	Implemented	The Law sets among others emission limits of pollutants and requires use of the best avaliable technologies (BAT).	2003	Government: Minitry of industry and Trade	2,600.00	2,746.00

Preferential feed-in tariffs for electricity produced from renewable energy sources*	Energy	CO2	Increase in renewable energy (Energy supply), Switch to less carbon-intensive fuels (Energy supply)	Economic, Regulatory	Implemented	This is the principal measure for support of RES use in power generation. The law defines minimal feed-in tariffs for electricity produced from RES and garantees its long-term validity and obligation of distributors to connect sources using RES and purchase the electricity from RES.	2004	Government: Energy Regulatory Authority	2,541.00	2,402.50
Operational Programme Enterprise and Innovation*	Energy	CO2	Efficiency improvement in industrial end-use sectors (Energy consumption)	Economic	Implemented	The programme which is offering subsidies for enterprises and industries. It comprises projects for the promotion of energy efficiency and use of RES in small and medium enterprises. Most projects concern manufacturing industry (1.A.2). It replaces the Operational programme Industry and enterprise.	2007	Government: Ministry of industry and trade	204.00	181.00
Operational Programme Environment 2007-2013*	Cross-cutting	CO2	Multi-sectoral policy (Cross-cutting), Efficiency improvements of buildings (Energy consumption)	Economic	Implemented	Promotion of energy savings and use of RES. The main programme offers subsidies for environment protection. It comprises promotion of energy efficiency and use of RES mainly in the Commercial/Institutional sector (1A4a).	2007	Government: State environmental fund	232.00	185.00
National Strategy of Cycling Transport Development*	Transport	CO2	Modal shift to public transport or non-motorized transport (Transport)	Planning, Economic	Implemented	The measure supports the construction of cycling infrastructure. It is financed mainly from the State Transport Infrastructure Fund. Cycling can partly replace vehicular traffic in urban and suburban areas and thus lead to energy and emission savings.	2014	Government: Ministry of Transport	100.00	89.00
Operational Programme Transport*	Transport	CO2	Improved transport infrastructure (Transport)	Economic	Implemented	The objective of this measure is to reduce energy consumption of transport by improved transport infrastructure. The Operation Program Transport supports mainly investments into transport infrastructure. Side effect of better transport infrastructure is decreased energy consumption and thus lower GHG emissions.	2014	Government: Ministry of transport, State fund of transport infrastructure	150.00	390.00

Support of biofuels*	Transport	CO2	Low carbon fuels/electric cars (Transport)	Regulatory, Fiscal	Implemented	The objective is to decrease GHG emissions from transport and to use the renewable sources of energy due to the blending of the biodiesel to diesel oil and bioethanol to gasoline.The measure is in compliance with Directive 2009/28/EC. The directive requires that the emission intensity of transport fuels fell to 10% by 31 December 2020, at least 6% compared to the average emission levels. Directive 2009/28/EC was transposed by the Act on Air Protection 201/2012 Coll., which sets the minimal shares of biofuels in gasoline and diesel in accordance with EU directive. By the end of 2015 biofuels were not subject to excise duty in the Czech Republic. From 2016 to 31 June 2017 the excise tax was so high that biofuels were more expensive than fossil fuels. Since 1.7.2017 biofuels have been subject to a lower excise duty, so they are again interesting.	2000	Government: Ministry of industry, Ministry of transport	176.00	152.00
Economic and tax tools in transport sector	Transport	CO2	Efficiency improvements of vehicles (Transport)	Economic, Fiscal	Planned	The cars with lower GHG emissions will be released from road tax. The excise tax for vehicles with CNG propulsions will be decreased.	2020	Government: Ministry of finance	NE	39.00

Regulation on CO2 from passenger cars*	Transport	CO2	Efficiency improvements of vehicles (Transport)	Regulatory	Implemented	The European Commission adopted the Directive No. 443 / 2009 about the emission limits of CO2 for new passenger cars. Car manufacturers are obliged to ensure that new vehicles their average production does not contaminate more than 130 grams of CO2 / km by 2015 and 95 grams in 2021. Regarding fuel consumption, these targets for 2015 roughly correspond to 5.6 liters of gasoline per 100 kilometers, or 4.9 liters of diesel per 100 km. Aim for the year 2021, then 4.1 l / 100 km (for petrol) and 3.6 l / 100 km (for diesel).	2000	Government: Ministry of transport, State Fund of Transport Infrastructure	237.00	803.00
EU regulation on CO2 from light-commercial vehicles (vans)*	Transport	CO2	Efficiency improvements of vehicles (Transport), Low carbon fuels/electric cars (Transport)	Regulatory	Implemented	Regulation No 253/2014/EU defines the modalities for reaching the 2020 target to reduce CO2 emissions from new light commercial vehicles. The Regulation builds on a well-established process of measuring and monitoring the CO2 emissions of vehicles in accordance with Decision No 1753/2000/EC. The main objective of the vans Regulation is to cut CO2 emissions from vans to 175 g CO2/km by 2017 and to reach 147g CO2/km by 2020. These cuts represent reductions of 14% and 28% respectively compared with the 2007 average of 203 g/km.	2000	Government: Ministry of transport	486.00	787.00

Support of public transport and modal shift from road transport*	Transport	CO2	Improved behaviour (Transport), Modal shift to public transport or non-motorized transport (Transport)	Economic, Planning	Implemented	Modal shift can be realized through increasing the attractiveness of public transport (Introduction of the integrated transport system, Increasing of passengers' comfort, Preference of public transport vehicles and Introduction of "Park and Ride" system) and through systems of combined freight transport. The support of railway transport shall be realized through investment programs for improvement of infrastructure, increasing of speed, promotion of intermodal (container) transport, construction of transship points and of logistic centers. The aim of the measure is to shift 30% of long distanced freight transport from roads to railways (in trips over 300 km).	2000	Government: Ministry of Environment, Ministry of Education, Municipalities, Transport companies	134.00	109.00
ICAO agreement*	Transport	CO2	Efficiency improvements of vehicles (Transport)	Regulatory	Implemented	The measure 'ICAO agreement' is related to the resolution A37-19 from 2010 about consolidation and continuation of policies regarding climate change. MS agreed not to increase GHG emissions in aviation in 2020 in comparison to 2005. MS also approved to increase fuel use efficiency by 2% in 2020 comparing to 2010.	2000	Government: Ministry of transport	6.00	17.00
Road toll	Transport	CO2	Demand management/reduction (Transport)	Fiscal	Planned	This measure imposes currently a toll also for trucks with the weight more than 3.5 t. The range and price of road charging for freight vehicles will change. Only motorways are charged now in the Czech Republic. The road charging will involve selected first and second class roads as well.	2020	Government: Ministry of transport	126.00	103.00

Waste management plan 2003 and 2011*	Waste management/waste, Energy	CH4	Increase in renewable energy (Energy supply), Demand management / reduction (Waste), Enhanced CH4 collection and use (Waste), Enhanced recycling (Waste), Improved landfill management (Waste), Waste incineration with energy use (Waste), Reduced landfilling (Waste)	Economic, Fiscal, Regulatory, Planning	Implemented	Integrated framework document for waste management in the country. This is the main programme document of the Czech Republic regarding the waste sector. Since it is already outdated, a new version of the programme is under preparation now. The main targets are increasing the recovery of wastes with preference given to recycling, with a statutory target of 55% of all waste produced by year 2012, increasing the recovery of municipal waste to 50 % by 2010, decreasing of the maximum amount of biologically degradable municipal wastes (BDMW) deposited on landfills according to the Landfill Directive 99/31/EC, the preference for composting and anaerobic decomposition of biodegradable wastes with the use of the final product particularly in agriculture, in land reclamation and landscaping. Only wastes that cannot be used in this manner should be processed to produce substitute fuel or used anyway for energy production.	2003	Government: Ministry of environment	524.00	974.00
Waste management plan 2015-2024*	Waste management/waste	CH4	Demand management / reduction (Waste), Enhanced recycling (Waste), Improved treatment technologies (Waste), Reduced landfilling (Waste), Enhanced CH4 collection and use	Economic, Fiscal, Regulatory, Planning	Implemented	This is a document governs whole waste management in the country. Sets preferences for management practice. Offers prognosis for waste development. This plan focuses on waste prevention, aims at a higher share of recycling (50% for paper, plastic, glass and metal wastes), compulsory separation of biologically degradable communal waste to reach the limit of maximal 35% going to landfill from the total biologically degradable communal waste.	2015	Government: Ministry of environment	330.00	330.00

			(Waste), Improved wastewater management systems (Waste)					

National Energy Efficiency Action Plan*	Energy consumption, Transport, Industry/industrial processes	CO2	Efficiency improvement in services/ tertiary sector (Energy consumption), Efficiency improvement in industrial end-use sectors (Energy consumption), Demand management/reduction (Energy consumption), Efficiency improvements of buildings (Energy consumption), Efficiency improvements of vehicles (Transport), Improved behaviour (Transport), Improved transport infrastructure (Transport), Low carbon fuels/electric cars (Transport)	Economic, Fiscal, Voluntary/negotiated agreements, Regulatory, Information, Education, Planning	Implemented	Plan of measures to be implemented in order to fulfill the required energy savings in the period 2008 - 2016. This policy includes measures from both versions of NAPEE elaborated so far. Since it is a complex measure, its impacts are reported under many other measures. Framework measure, effects and costs of NAPEE measures are presented individually.	2008	Government: Ministry of industry and trade	NE	NE

EU ETS*	Energy supply, Industry/industrial processes	CO2	Increase in renewable energy (Energy supply), Efficiency improvement in the energy and transformation sector (Energy supply), Replacement of fluorinated gases by other substances (Industrial processes)	Economic, Regulatory	Implemented	The decisive instrument to decrease emissions of greenhouse gases from big sources.	2005	Government: Ministry of environment	2,740.00	6,624.00
Application of the Ecodesign Directive*	Energy	CO2	Efficiency improvement of appliances (Energy consumption)	Regulatory	Implemented	The directive imposes among others energy efficiency requirements to products from the early stage on the design phase in order to decrease energy consumption and impacts on the climate and environment. The whole product life cycle should be regarded in an integrated perspective. Among others, energy consumption of the whole product's life cycle should be taken into consideration.	2007	Government: Ministry of industry and trade	438.00	466.00
Implementation of the Directive on the energy performance of buildings (2010/31/EU)*	Energy	CO2	Efficiency improvements of buildings (Energy consumption)	Regulatory	Implemented	The measure stipulates minimum requirements as regards the energy performance of new and existing buildings, requires the certification of their energy performance and the regular inspection of boilers and air conditioning systems in buildings.	2012	Government: Ministry of industry and trade	532.00	446.00
National Renewable Energy Action Plan*	Energy	CO2	Increase in renewable energy (Energy supply)	Economic, Fiscal, Regulatory	Implemented	Ensure the share of RES in accordance with the RES directive 2009/28/EC. Framework measure, individual actions are included in other measures.	2010	Government: Ministry of industry and trade	NE	NE

Operational Programme Environment 2014 - 2020*	Cross-cutting, Energy	CO2	Multi-sectoral policy (Cross-cutting)	Economic	Implemented	Promotion of energy savings and use of RES. The main programme offers subsidies for environment protection. It comprises promotion of energy efficiency and use of RES mainly in the Commercial/Institutional sector (1A4a).The measure supports energy efficiency improvement and use of RES in public sector. In priority axis 2 Improvement of air quality in human settlements, the following activities are supported: • The replacement of boilers running on solid fuel with new boilers running on solid fuel • The replacement of boilers running on solid fuel with new stationary combustion sources running on gaseous or liquid fuel • The replacement of boilers running on solid fuel with heat pumps • The above replacements combined with supplementary non-combustion sources of thermal energy In priority axis 5 Energy savings, the following activities are supported: • Insulation of the envelope of a building; • Replacement and renovation of windows and doors; • Implementation of structural measures having a demonstrated influence on the energy performance of buildings or improvements in the quality of the indoor climate; • Implementation of mechanical ventilation systems with waste heat recuperation; • Implementation of systems reusing waste heat; • Replacement of heat sources for spatial heating or for the production of hot water using solid or liquid fossil fuels with efficient sources using biomass, heat pumps, gas condensing boilers, or facilities for cogeneration (micro-cogeneration) using	2014	Government: Ministry of environment	368.00	423.00

						renewable sources or natural gas; • Installation of solar thermic collectors for auxiliary heating or only for the production of hot water. • Implementation of structural measures having a demonstrated influence on the energy performance of buildings or improvements in the quality of the indoor climate; • Implementation of mechanical ventilation systems with waste heat recuperation; • Implementation of systems reusing waste heat; • Replacement of heat sources for spatial heating or for the production of hot water using solid or liquid fossil fuels with efficient sources using biomass, heat pumps, gas condensing boilers, or facilities for cogeneration (micro-cogeneration) using renewable sources or natural gas; • Installation of solar thermic collectors for auxiliary heating or only for the production of hot water.		

Operational Programme Enterprise and Innovation for Competitiveness*	Energy	CO2	Efficiency improvement in the energy and transformation sector (Energy supply), Efficiency improvement in services/ tertiary sector (Energy consumption), Efficiency improvement in industrial end-use sectors (Energy consumption)	Economic	Implemented	The measure supports energy efficiency improvement, use of RES and low carbon mobility in the private sector and the reconstruction of electricity transmission and distribution systems. Funding is paid out in the form of non-returnable subsidies and preferential loans. The program covers the following measures: • the modernisation or replacement of existing energy production facilities for internal purposes, which will increase their efficiency; • the introduction and upgrading of measurement and control systems; • modernisation, reconstruction and loss reduction in electricity and heat distribution systems in buildings and production plants; • the implementation of measures to improve the energy performance of buildings in the business sector (building envelope insulation, the replacement and renovation of windows and doors, other structural measures having a demonstrable influence on the energy performance of buildings, the installation of ventilation technology with waste heat recuperation); • re-use of waste energy in production processes; • improvements in energy performance and energy efficiency in production and technological processes; • the installation of renewable energy sources for an undertaking's own consumption; • purchase of electric cars; • the installation of a cogeneration unit with maximum use of electricity and thermal energy for the undertaking's internal consumption, the support of extra costs in achieving the standard of a nearly zero-energy building and	2014	Government: Ministry of industry and trade	576.00	828.00

						a passive energy standard in the reconstruction or construction of new business buildings; • construction and reconstruction of transmission and distribution systems including the implementation of smart grids. The target group includes business entities (small, medium-sized and, where appropriate, large enterprises).		

New Green savings programme 2013*	Energy	CO2	Efficiency improvements of buildings (Energy consumption), Increase in renewable energy (Energy supply)	Economic	Implemented	The programme supports, through investment subsidies, construction of low-energy family houses in passive standard, full or partial insulation of existing houses and introduction of RES for water heating.	2013	Government: State environmental fund	15.00	13.00
New Green savings programme 2014 - 2020*	Energy	CO2	Efficiency improvements of buildings (Energy consumption), Increase in renewable energy (Energy supply)	Economic	Implemented	The programme is financed from sold emission allowances. It supports, through investment subsidies, construction of low-energy family houses in passive standard, full or partial insulation of existing houses and introduction of RES for water heating.	2014	Government: Ministry of environment	515.00	422.00
Integrated Regional Operating Programme*	Energy	CO2	Efficiency improvements of buildings (Energy consumption)	Economic	Implemented	The program supports modernizations and refurbishments of multiapartment buildings. Owners of multiapartment buildings (any physical or legal body) can receive subsidy. In terms of energy savings is significant priority axis 2 of the program and its investment priority 4c “Promoting energy efficiency, intelligent systems energy management and use of energy from renewable sources for public infrastructures, including in public buildings and in housing”. Supported measures affecting the energy performance include e.g.: insulation of residential building, replacement and refurbishment of windows and doors, passive heating and cooling, shielding, installation of systems controlled ventilation with heat recovery, installation of small scare renewable energy sources for own consumption.	2014	Government:Ministry of regional development	158.00	236.00

Extension of Public Sector Role in Demonstration of New Technologies*	Energy	CO2	Efficiency improvement in services/ tertiary sector (Energy consumption)	Regulatory	Implemented	The public sector is obliged to follow certains rules leading to purchases of energy efficient appliances.	2010	Government: Ministry of environment	285.00	232.00
Implementation of Regulation (EU) No 517/2014 of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006*	Industry/industrial processes	HFC, PFC, SF6, NF3	Replacement of fluorinated gases by other substances (Industrial processes)	Regulatory	Implemented	Ban on introduction of fluorinated gases with high GWP for given purposes of use.	2015	Government: Ministry of environment	552.00	2,029.00
Rural Development Program (2007-2013)*	Agriculture, Land use, land-use change and forestry	N20, CH4	Reduction of fertilizer/manure use on cropland (Agriculture), Improved management of organic soils (Agriculture), Afforestation and reforestation (LULUCF)	Economic	Implemented	Improving the competitiveness of the agricultural, food and forestry sectors falls within the first group of measures;Increasing biodiversity, water and soil protection and mitigating climate change is a joint objective of the second group of measures; Improving the quality of life in rural areas and to encourage the diversification of economic activities there; Helping the residents of rural micro-regions (applying the “from bottom to top” principle) to work out their local development strategy and to support the projects concerning development of the region they live in, the so called LEADER (Liaison entre actions de développement de l'économie rurale) method.	2007	Government: Ministry of agriculture	NE	NE

Cross Compliance - fulfilment of Good Agricultural and Environmental Conditions*	Agriculture	CH4, N2O, CO2	Reduction of fertilizer/manure use on cropland (Agriculture), Improved livestock management (Agriculture)	Information, Education, Economic	Implemented	The subsidies can be granted only on the condition that a beneficiary meets the statutory management requirements addressing environment, public health, the health of animals and plants, and animal welfare, the standards of good agricultural and environmental conditions (GAEC); and minimum requirements for fertilizer and plant protection product use as part of agro-environmental measures.	2009	Government: Ministry of agriculture	NE	NE
Nitrate Directive (1991/676/EEC) - 4th Action Plan*	Agriculture	N2O	Reduction of fertilizer/manure use on cropland (Agriculture)	Regulatory	Implemented	Water protection against pollution caused by nitrates from agricultural sources. Remarcation of vulnerable areas and setting of rules for management	2016	Government: Ministry of agriculture	NE	NE
Strategy for Growth in Agriculture*	Agriculture	CH4, N2O, CO2	Reduction of fertilizer/manure use on cropland (Agriculture), Improved animal waste management systems (Agriculture)	Economic	Implemented	Conceptual material of Agriculture - plan of measures to be implemented in order to fulfill the required emission savings in the period 2013 - 2020.The long-term objective of the economically justified strategic level of production in the main agricultural commodities of the moderate belt / dairy products, meat, etc.) is taken into account, also ensuring adequate market share in the production of processed agricultural and food products, especially those for which, there is a potential for competitive production.	2013	Government: Ministry of agriculture	250.00	300.00
Biomass Action Plan in the Czech Republic for 2012-2020*	Agriculture, Energy, Land use, land-use change and forestry	CO2	Increase in renewable energy (Energy supply), Afforestation and reforestation (LULUCF), Support of an efficient use of the energy potential of biomass ()	Economic, Planning	Implemented	To define appropriate measures and principles to help the effective and efficient use of the energy potential of biomass	2012	Government: Ministry of agriculture	125.00	255.00

Rural Development Programme 2014-2020*	Agriculture, Land use, land-use change and forestry	CO2, N2O, CH4	Afforestation and reforestation (LULUCF)	Economic, Planning	Implemented	A basic strategic and program documents specifying in detail the measures for meeting the objectives of the development of rural areas of the Czech Republic To support agricultural primary production and the processing of agricultural products, to support forest and water management and to ensure the continually sustainable development of the countryside	2014	Government: Ministry of agriculture	200.00	357.00
The National Forestry Programme II*	Land use, land-use change and forestry	CO2	Afforestation and reforestation (LULUCF), Enhanced forest management (LULUCF), Conservation of carbon in existing forests (LULUCF), Prevention of deforestation (LULUCF)	Economic, Regulatory	Implemented	Basic national strategic material for the development of the forestry sector in the medium term, reflecting the current international agreements, conventions and EU Directives. The main objective is to form concrete practical steps in all areas of state forest policy in the near term. The National Forest Program II (NLP II) is the basic national strategic document for forestry and forestry-related sectors. Implemented within the environmental pillar, specifically Key Action 6 lists the measures being or to be implemented to alleviate the impact of expected global climate change and extreme meteorological conditions. These measures generally focus on creating more resilient forest ecosystems by promoting diversified forest stand utilizing to the greatest possible extent natural processes, varied species composition and variability of silvicultural approaches, reflecting the current international treaties, agreements, conventions and EU directives.	2008	Government: Ministry of agriculture	NE	NE
Updated recommendations for implementing the	Land use, land-use change and forestry	CO2	Conservation of carbon in existing forests (LULUCF), Strengthening	Economic, Regulatory	Implemented	To cultivate diversified forest stands with the greatest possible use of natural processes, varied species composition, natural regeneration and variability of silvicultural	2018	Government: Ministry of agriculture	458.00	395.00

proposed measures of NLP (National Forest Plan) II*			protection against natural disturbances (LULUCF), Enhanced forest management (LULUCF)			practices. Summary of recommendations on the implementation of the proposed measures NLP (National Forest Plan) II after discussing forestry experts. Emission inventory of LULUCF sector are particularly important recommendations in Key Action 6 of NLP II, which are aimed to reduce of global climate change and extreme weather events.				
Action Plan for Development of Organic Farming 2016-2020*	Agriculture	N2O, CH4	Reduction of fertilizer/manure use on cropland (Agriculture), Improved management of organic soils (Agriculture)	Economic	Implemented	The main goal is to promote the growth of organic farming in the Czech Republic until 2020, particularly to harness the potential of organic farming in the nature protection, for research and innovation in organic farming, counseling or education. AP is closely linked to RDP 2014-2020.	2016	Government: Ministry of Agriculture	NE	NE
Ministry of Agriculture Strategy with view until 2030 (since 2016)*	Agriculture	CH4, N2O	Reduction of fertilizer/manure use on cropland (Agriculture), Improved livestock management (Agriculture), Improved management of organic soils (Agriculture)	Economic	Implemented	Conceptual material including stategic PAM and predicted activity data (animal population) trends until 2030. Priorities, objectives and actions of the Strategy will be implemented in the relevant programs. The material was approved by the Government of the Czech Republic on 3rd May 2016.	2016	Government: Ministry of Agriculture	NE	NE

ENERG Programme*	Energy	CO2	Efficiency improvements of buildings (Energy consumption), Efficiency improvement in services/ tertiary sector (Energy consumption), Efficiency improvement in industrial end-use sectors (Energy consumption)	Economic	Implemented	This programme of the Ministry of Industry and Trade is focused on the provision of soft loans for the implementation of projects improving energy performance. The administrator of the financial instrument is the Czech-Moravian Guarantee and Development Bank.	2017	Government: Ministry of Industry	4.00	4.00
Operational Programme Prague Growth Pole*	Energy	CO2	Efficiency improvements of buildings (Energy consumption)	Economic	Implemented	The operational programme under the auspices of the City of Prague focuses on support for improving the energy performance of buildings and the technical equipment used to ensure the operation of municipal public and road transport, implementation of pilot projects to convert energy intensive municipal buildings into nearly-zero energy buildings.	2014	Regional: City of Prague	1.00	1.00
Implementation of Directive 2012/27/EU on energy efficiency (Article 5)*	Energy	CO2	Efficiency improvements of buildings (Energy consumption)	Economic, Regulatory	Implemented	Each Member State shall ensure that 3 % of the total floor area of heated and/or cooled buildings owned and occupied by its central government is renovated each year to meet at least the minimum energy performance requirements.	2018	Government: Ministry of Industry	NE	NE
JESSICA Programme*	Energy	CO2	Efficiency improvements of buildings (Energy consumption)	Economic	Implemented	The programme offers long-term low-interest loans for reconstruction or modernization of residential buildings. The programme is designed for all owners of residential houses:	2014	Government: Ministry of regional development	2.00	2.00

Implementation of Kigali Amendment to Montreal Protocol	Industry/industrial processes	HFC	Replacement of fluorinated gases by other substances (Industrial processes)	Regulatory	Planned	The Kigali Amendment adds to the Montreal Protocol the phase-down of the use of HFCs.	2019	Government: Ministry of Environment	NE	NE

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

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

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

CTF Table 4 - Reporting on progress

	Total emissions excluding LULUCF	*Contribution from LULUCF[d]*	*Quantity of units from market based mechanisms under the Convention*		*Quantity of units from other market based mechanisms*	
Year[c]	*(kt CO_2 eq)*	*(kt CO_2 eq)*	*(number of units)*	*(kt CO_2 eq)*	*(number of units)*	*(kt CO_2 eq)*
Base year/period (1990)	194,016.12*	NA*	NA*	NA*	NA*	NA*
2010	140,702.10*	NA*	NA*	NA*	NA*	NA*
2011	138,701.26*	NA*	NA*	NA*	NA*	NA*
2012	134,603.55*	NA*	NA*	NA*	NA*	NA*
2013	129,496.54*	NA*	NO*	NO*	NA*	NA*
2014	127,560.13*	NA*	NO*	NO*	NA*	NA*
2015	128,564.93*	NA*	NO*	NO*	NA*	NA*
2016	130,508.90*	NA	NO*	NO*	NA*	NA*
2017	129,383.52*	NA	NO*	NO*	NA*	NA*

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

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] For the base year, information reported on the emission reduction target shall include the following: (a) total GHG emissions, excluding emissions and removals from the LULUCF sector; (b) emissions and/or removals from the LULUCF sector based on the accounting approach applied taking into consideration any relevant decisions of the Conference of the Parties and the activities and/or land that will be accounted for; (c) total GHG emissions, including emissions and removals from the LULUCF sector. For each reported year, information reported on progress made towards the emission reduction targets shall include, in addition to the information noted in paragraphs 9(a–c) of the UNFCCC biennial reporting guidelines for developed country Parties, information on the use of units from market-based mechanisms.

[c] Parties may add additional rows for years other than those specified below.

[d] Information in this column should be consistent with the information reported in table 4(a)I or 4(a)II, as appropriate. The Parties for which all relevant information on the LULUCF contribution is reported in table 1 of this common tabular format can refer to table 1.

CTF Table 4a1 Progress in achieving the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the contribution of the land use, land-use change and forestry sector

Progress in achieving the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the contribution of the land use, land-use change and forestry sector in 2017 [a,b]

	Net GHG emissions/removals from LULUCF categories [c]	*Base year/period or reference level value* [d]	*Contribution from LULUCF for reported year*	*Cumulative contribution from LULUCF* [e]	*Accounting approach* [f]
	(kt CO_2 eq)				
Total LULUCF	NA	NA	NA	NA	
A. Forest land	NA	NA	NA	NA	
1. Forest land remaining forest land	NA	NA	NA	NA	
2. Land converted to forest land	NA	NA	NA	NA	
3. Other [g]					
B. Cropland	NA	NA	NA	NA	
1. Cropland remaining cropland	NA	NA	NA	NA	
2. Land converted to cropland	NA	NA	NA	NA	
3. Other [g]					
C. Grassland	NA	NA	NA	NA	
1. Grassland remaining grassland	NA	NA	NA	NA	
2. Land converted to grassland	NA	NA	NA	NA	
3. Other [g]					
D. Wetlands	NA	NA	NA	NA	
1. Wetland remaining wetland	NA	NA	NA	NA	
2. Land converted to wetland	NA	NA	NA	NA	
3. Other [g]					
E. Settlements	NA	NA	NA	NA	

1. Settlements remaining settlements	NA	NA	NA	NA	
2. Land converted to settlements	NA	NA	NA	NA	
3. Other [g]					
F. Other land	NA	NA	NA	NA	
1. Other land remaining other land	NA	NA	NA	NA	
2. Land converted to other land	NA	NA	NA	NA	
3. Other [g]					
G. Other	NA	NA	NA	NA	
Harvested wood products	NA	NA	NA	NA	

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

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Parties that use the LULUCF approach that is based on table 1 do not need to complete this table, but should indicate the approach in table 2. Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[c] For each category, enter the net emissions or removals reported in the most recent inventory submission for the corresponding inventory year. If a category differs from that used for the reporting under the Convention or its Kyoto Protocol, explain in the biennial report how the value was derived.

[d] Enter one reference level or base year/period value for each category. Explain in the biennial report how these values have been calculated.

[e] If applicable to the accounting approach chosen. Explain in this biennial report to which years or period the cumulative contribution refers to.

[f] Label each accounting approach and indicate where additional information is provided within this biennial report explaining how it was implemented, including all relevant accounting parameters (i.e. natural disturbances, caps).

[g] Specify what was used for the category “other”. Explain in this biennial report how each was defined and how it relates to the categories used for reporting under the Convention or its Kyoto Protocol.

Progress in achieving the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the contribution of the land use, land-use change and forestry sector in 2018 [a,b]

	Net GHG emissions/removals from LULUCF categories [c]	*Base year/period or reference level value* [d]	*Contribution from LULUCF for reported year*	*Cumulative contribution from LULUCF* [e]	*Accounting approach* [f]
	(kt CO_2 eq)				
Total LULUCF	NA	NA	NA	NA	
A. Forest land	NA	NA	NA	NA	
1. Forest land remaining forest land	NA	NA	NA	NA	
2. Land converted to forest land	NA	NA	NA	NA	
3. Other [g]					
B. Cropland	NA	NA	NA	NA	
1. Cropland remaining cropland	NA	NA	NA	NA	
2. Land converted to cropland	NA	NA	NA	NA	
3. Other [g]					
C. Grassland	NA	NA	NA	NA	
1. Grassland remaining grassland	NA	NA	NA	NA	
2. Land converted to grassland	NA	NA	NA	NA	
3. Other [g]					
D. Wetlands	NA	NA	NA	NA	
1. Wetland remaining wetland	NA	NA	NA	NA	
2. Land converted to wetland	NA	NA	NA	NA	
3. Other [g]					
E. Settlements	NA	NA	NA	NA	
1. Settlements remaining settlements	NA	NA	NA	NA	
2. Land converted to settlements	NA	NA	NA	NA	
3. Other [g]					
F. Other land	NA	NA	NA	NA	

1. Other land remaining other land	NA	NA	NA	NA	
2. Land converted to other land	NA	NA	NA	NA	
3. Other [g]					
G. Other	NA	NA	NA	NA	
Harvested wood products	NA	NA	NA	NA	

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

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Parties that use the LULUCF approach that is based on table 1 do not need to complete this table, but should indicate the approach in table 2. Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[c] For each category, enter the net emissions or removals reported in the most recent inventory submission for the corresponding inventory year. If a category differs from that used for the reporting under the Convention or its Kyoto Protocol, explain in the biennial report how the value was derived.

[d] Enter one reference level or base year/period value for each category. Explain in the biennial report how these values have been calculated.

[e] If applicable to the accounting approach chosen. Explain in this biennial report to which years or period the cumulative contribution refers to.

[f] Label each accounting approach and indicate where additional information is provided within this biennial report explaining how it was implemented, including all relevant accounting parameters (i.e. natural disturbances, caps).

[g] Specify what was used for the category “other”. Explain in this biennial report how each was defined and how it relates to the categories used for reporting under the Convention or its Kyoto Protocol.

CTF Table 4a2 Progress in achievement of the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the counting of emissions and removals from the land use, land-use change and forestry sector in relation to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

GREENHOUSE GAS SOURCE AND SINK ACTIVITIES	*Base year*[d]	*Net emissions/removals*[e]									*Accounting parameters*[h]	*Accounting quantity*[i]
		2013	2014	*2015*	*2016*	2017	2018	2019	2020	Total[g]		
	(kt CO_2 eq)											
A. Article 3.3 activities												
A.1. Afforestation/reforestation		-634.49	-699.95	-746.09	-793.13	-851.82				-3,725.49		-3725.49
Excluded emissions from natural disturbances(5)		NA	NA	NA	NA	NA				NA		NA
Excluded subsequent removals from land subject to natural disturbances(6)		NO	NO	NO	NO	NO				NO		NO
A.2. Deforestation		290.49	287.41	233.76	274.25	300.77				1,386.68		1386.68
B. Article 3.4 activities												
B.1. Forest management										-21,832.68		1597.32
Net emissions/removalse		-5,619.53	-5,514.35	-4,586.33	-4,387.43	-1,725.05				-21,832.68		
Excluded emissions from natural disturbances(5)		NA	NA	NA	NA	NA				NA		NA
Excluded subsequent removals from land subject to natural disturbances(6)		NO	NO	NO	NO	NO				NO		NO
Any debits from newly established forest (CEF-ne)(7),(8)		NA	NA	NA	NA	NA				NA		NA
Forest management reference level (FMRL)(9)											-4686.00	
Technical corrections to FMRL(10)											NA	
Forest management capl											55528.59	1597.32
B.2. Cropland management (if elected)	NA	NA	NA	NA	NA	NA				NA		NA
B.3. Grazing land management (if elected)	NA	NA	NA	NA	NA	NA				NA		NA
B.4. Revegetation (if elected)	NA	NA	NA	NA	NA	NA				NA		NA
B.5. Wetland drainage and rewetting (if elected)	NA	NA	NA	NA	NA	NA				NA		NA

Note: 1 kt CO_2 eq equals 1 Gg CO_2 eq.

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Developed country Parties with a quantified economy-wide emission reduction target as communicated to the secretariat and contained in document FCCC/SB/2011/INF.1/Rev.1 or any update to that document, that are Parties to the Kyoto Protocol, may use table 4(a)II for reporting of accounting quantities if LULUCF is contributing to the attainment of that target.

[c] Parties can include references to the relevant parts of the national inventory report, where accounting methodologies regarding LULUCF are further described in the documentation box or in the biennial reports.

[d] Net emissions and removals in the Party's base year, as established by decision 9/CP.2.

[e] All values are reported in the information table on accounting for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, of the CRF for the relevant inventory year as reported in the current submission and are automatically entered in this table.

[f] Additional columns for relevant years should be added, if applicable.

[g] Cumulative net emissions and removals for all years of the commitment period reported in the current submission.

[h] The values in the cells "3.3 offset" and "Forest management cap" are absolute values.

[i] The accounting quantity is the total quantity of units to be added to or subtracted from a Party's assigned amount for a particular activity in accordance with the provisions of Article 7, paragraph 4, of the Kyoto Protocol.

[j] In accordance with paragraph 4 of the annex to decision 16/CMP.1, debits resulting from harvesting during the first commitment period following afforestation and reforestation since 1990 shall not be greater than the credits accounted for on that unit of land.

[k] In accordance with paragraph 10 of the annex to decision 16/CMP.1, for the first commitment period a Party included in Annex I that incurs a net source of emissions under the provisions of Article 3 paragraph 3, may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[l] In accordance with paragraph 11 of the annex to decision 16/CMP.1, for the first commitment period of the Kyoto Protocol only, additions to and subtractions from the assigned amount of a Party resulting from Forest management under Article 3, paragraph 4, after the application of paragraph 10 of the annex to decision 16/CMP.1 and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

CTF Table 4b Reporting on progress

Units of market based mechanisms			*Year*	
			2017	*2018*
Kyoto Protocol units[d]	*Kyoto Protocol units*	*(number of units)*	NA, NO	NO, NA
		(kt CO_2 eq)	NA, NO	NO, NA
	AAUs	*(number of units)*	NA	NA
		(kt CO2 eq)	NA	NA
	ERUs	*(number of units)*	NA	NA
		(kt CO2 eq)	NA	NA
	CERs	*(number of units)*	NA	NA
		(kt CO2 eq)	NA	NA
	tCERs	*(number of units)*	NO	NO
		(kt CO2 eq)	NO	NO
	lCERs	*(number of units)*	NO	NO
		(kt CO2 eq)	NO	NO
Other units [d,e]	*Units from market-based mechanisms under the Convention*	*(number of units)*		
		(kt CO_2 eq)		
	Units from other market-based mechanisms	*(number of units)*		
		(kt CO_2 eq)		
Total		*(number of units)*	NA, NO	NO, NA
		(kt CO_2 eq)	NA, NO	NO, NA

Abbreviations: AAUs = assigned amount units, CERs = certified emission reductions, ERUs = emission reduction units, lCERs = long-term certified emission reductions, tCERs = temporary certified emission reductions.

Note: 2011 is the latest reporting year.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] For each reported year, information reported on progress made towards the emission reduction target shall include, in addition to the information noted in paragraphs 9(a-c) of the reporting guidelines, on the use of units from market-based mechanisms.

[c] Parties may include this information, as appropriate and if relevant to their target.

[d] Units surrendered by that Party for that year that have not been previously surrendered by that or any other Party.

CTF Table 5 Summary of key variables and assumptions used in the projections analysis

Key underlying assumptions		*Historical*[b]								Projected					
Assumption	*Unit*	*1990*	*1995*	2000	2005	2010	2015	2016	2017	2018	2020	2025	2030	2035	2040
Population	*thousands*							10,565.30			10,662.10	10,712.40	10,691.90	10,607.80	10,545.50
Number of households	thousands							4,442.70			4,552.10	4,662.90	4,744.10	4,805.20	4,877.40
GDP growth rate	%							2.50			2.70	2.50	2.10	1.90	1.10
International oil price	EUR / GJ							6.80			13.68	15.73	17.33	18.08	19.14
International coal price	EUR / GJ							2.16			2.64	3.16	3.79	4.01	4.18
International gas price	EUR / GJ							4.66			8.91	9.64	10.49	11.20	11.58
Population growth	*%*														

[a] Parties should include key underlying assumptions as appropriate.

[b] Parties should include historical data used to develop the greenhouse gas projections reported.

CTF Table 6a Information on updated greenhouse gas projections under a 'with measures' scenario

	GHG emissions and removals[b]								GHG emission projections	
	(kt CO_2 eq)								(kt CO_2 eq)	
	Base year (1990)	1990	1995	2000	2005	2010	2015	2017	2020	2030
Sector[d,e]										
Energy	149,831.45	149,831.45	118,915.22	110,041.01	103,239.48	95,659.49	81,282.04	80,277.82	78,541.29	66,049.47
Transport	11,484.14	11,484.14	10,472.53	12,129.34	17,368.53	16,803.37	17,489.10	18,658.56	17,944.65	16,100.62
Industry/industrial processes	17,113.01	17,113.01	14,202.28	14,916.43	14,790.38	15,022.88	15,402.41	15,656.35	16,046.36	14,425.39
Agriculture	15,839.59	15,839.59	9,616.63	8,393.28	7,801.18	7,386.47	8,092.55	8,432.99	8,360.47	9,052.61
Forestry/LULUCF	-5,225.91	-5,225.91	-6,995.65	-7,887.46	-7,036.87	-5,538.87	-5,082.32	-2,134.94	553.74	-1,626.32
Waste management/waste	3,124.51	3,124.51	3,510.88	3,853.46	4,294.58	4,861.48	5,511.73	5,649.33	5,380.53	4,218.08
Other (specify)										
Gas										
CO_2 emissions including net CO_2 from LULUCF	158,893.50	158,893.50	124,537.11	119,097.12	118,545.66	111,821.11	99,645.47	103,403.77	103,809.62	87,930.97
CO_2 emissions excluding net CO_2 from LULUCF	164,203.58	164,203.58	131,605.98	127,059.68	125,671.32	117,459.82	104,786.44	105,607.27	103,313.48	89,614.97
CH_4 emissions including CH_4 from LULUCF	23,536.29	23,536.29	18,184.77	15,392.53	14,706.39	14,489.36	13,958.29	13,548.91	13,613.00	12,073.25
CH_4 emissions excluding CH_4 from LULUCF	23,492.14	23,492.14	18,145.42	15,351.20	14,656.44	14,432.86	13,926.62	13,510.83	13,581.25	12,041.25
N_2O emissions including N_2O from LULUCF	9,652.77	9,652.77	6,884.19	6,398.81	6,041.45	5,372.34	5,691.57	5,868.20	5,894.44	6,213.30
N_2O emissions excluding N_2O from LULUCF	9,612.74	9,612.74	6,850.31	6,365.04	6,002.61	5,328.99	5,664.58	5,837.72	5,867.62	6,186.48
HFCs	NO	NO	27.14	444.51	1,037.04	2,381.07	3,317.83	3,640.80	3,435.17	1,934.60
PFCs	NO	NO	0.01	4.69	14.89	48.04	1.93	1.37	1.07	0.98
SF_6	84.24	84.24	88.68	108.40	111.84	82.76	78.27	74.31	71.07	62.71
NF_3	NO	NO	NO	NO	NO	0.15	2.15	2.75	2.65	4.28
Other (specify)										
Total with LULUCF[f]	192,166.80	192,166.80	149,721.90	141,446.06	140,457.27	134,194.83	122,695.51	126,540.11	126,827.02	108,220.09
Total without LULUCF	197,392.70	197,392.70	156,717.54	149,333.52	147,494.14	139,733.69	127,777.82	128,675.05	126,272.31	109,845.27

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

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

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

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

[d] In accordance with paragraph 34 of the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", projections shall be presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section. This table should follow, to the extent possible, the same sectoral categories as those listed in paragraph 17 of those guidelines, namely, to the extent appropriate, the following sectors should be considered: energy, transport, industry, agriculture, forestry and waste management.

[e] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors (i.e. cross-cutting), as appropriate.

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

CTF Table 6c Information on updated greenhouse gas projections under a 'with additional measures' scenario

	GHG emissions and removals[b]								GHG emission projections	
	(kt CO_2 eq)								(kt CO_2 eq)	
	Base year (1990)	1990	1995	2000	2005	2010	2015	2017	2020	2030
Sector[d,e]										
Energy	149,831.45	149,831.45	118,915.22	110,041.01	103,239.48	95,659.49	81,282.04	80,277.82	78,541.29	66,048.87
Transport	11,484.14	11,484.14	10,472.53	12,129.34	17,368.53	16,803.37	17,489.10	18,658.56	17,604.57	15,730.72
Industry/industrial processes	17,113.01	17,113.01	14,202.28	14,916.43	14,790.38	15,022.88	15,402.41	15,656.35	16,046.33	14,425.39
Agriculture	15,839.59	15,839.59	9,616.63	8,393.28	7,801.18	7,386.47	8,092.55	8,432.99	8,360.47	9,052.61
Forestry/LULUCF	-5,225.91	-5,225.91	-6,995.65	-7,887.46	-7,036.87	-5,538.87	-5,082.32	-2,134.94	1,245.07	-491.53
Waste management/waste	3,124.51	3,124.51	3,510.88	3,853.46	4,294.58	4,861.48	5,511.73	5,649.33	5,380.53	3,948.83
Other (specify)										
Gas										
CO_2 emissions including net CO_2 from LULUCF	158,893.50	158,893.50	124,537.11	119,097.12	118,545.66	111,821.11	99,645.47	103,403.77	104,166.08	88,702.18
CO_2 emissions excluding net CO_2 from LULUCF	164,203.58	164,203.58	131,605.98	127,059.68	125,671.32	117,459.82	104,786.44	105,607.27	102,978.61	89,251.40
CH_4 emissions including CH_4 from LULUCF	23,536.29	23,536.29	18,184.77	15,392.53	14,706.39	14,489.36	13,958.29	13,548.91	13,612.75	11,803.00
CH_4 emissions excluding CH_4 from LULUCF	23,492.14	23,492.14	18,145.42	15,351.20	14,656.44	14,432.86	13,926.62	13,510.83	13,581.00	11,771.25
N_2O emissions including N_2O from LULUCF	9,652.77	9,652.77	6,884.19	6,398.81	6,041.45	5,372.34	5,691.57	5,868.20	5,888.48	6,207.34
N_2O emissions excluding N_2O from LULUCF	9,612.74	9,612.74	6,850.31	6,365.04	6,002.61	5,328.99	5,664.58	5,837.72	5,864.64	6,180.52
HFCs	NO	NO	27.14	444.51	1,037.04	2,381.07	3,317.83	3,640.80	3,435.17	1,934.60
PFCs	NO	NO	0.01	4.69	14.89	48.04	1.93	1.37	1.07	0.98
SF_6	84.24	84.24	88.68	108.40	111.84	82.76	78.27	74.31	71.07	62.71
NF_3	NO	NO	NO	NO	NO	0.15	2.15	2.75	2.65	4.28
Other (specify)										
Total with LULUCF[f]	192,166.80	192,166.80	149,721.90	141,446.06	140,457.27	134,194.83	122,695.51	126,540.11	127,177.27	108,715.09
Total without LULUCF	197,392.70	197,392.70	156,717.54	149,333.52	147,494.14	139,733.69	127,777.82	128,675.05	125,934.21	109,205.74

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

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

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

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

[d] In accordance with paragraph 34 of the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", projections shall be presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section. This table should follow, to the extent possible, the same sectoral categories as those listed in paragraph 17 of those guidelines, namely, to the extent appropriate, the following sectors should be considered: energy, transport, industry, agriculture, forestry and waste management.

[e] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors (i.e. cross-cutting), as appropriate.

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

CTF Table 7 Provision of public financial support: summary information

Provision of public financial support: summary information in 2017[a]

Allocation channels	*Year*									
	Czech koruna - CZK					*USD[b]*				
	Core/ general[c, 1]	*Climate-specific[d, 2]*				*Core/ general[c, 1]*	*Climate-specific[d, 2]*			
		Mitigation	*Adaptation*	*Cross-cutting[e]*	*Other[f]*		*Mitigation*	*Adaptation*	*Cross-cutting[e]*	*Other[f]*
Total contributions through multilateral channels:	32,719,593.00			48,409,474.00		1,399,350.00			2,070,374.00	
Multilateral climate change funds[g]	20,140,621.00			28,409,474.00		861,373.00			1,215,015.00	
Other multilateral climate change funds[h]				18,887,595.00					807,784.00	
Multilateral financial institutions, including regional development banks										
Specialized United Nations bodies	12,578,972.00			20,000,000.00		537,977.00			855,359.00	
Total contributions through bilateral, regional and other channels		36,024,086.00	88,469,326.00	13,122,572.00			1,540,678.00	3,783,652.00	561,226.00	
Total	32,719,593.00	36,024,086.00	88,469,326.00	61,532,046.00		1,399,350.00	1,540,678.00	3,783,652.00	2,631,600.00	

Note: Explanation of numerical footnotes is provided in the documentation box after tables 7, 7(a) and 7(b).

Abbreviation: USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

[b] Parties should provide an explanation of the methodology used for currency exchange for the information provided in tables 7, 7(a) and 7(b) in the documentation box.

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

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

[e] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

[f] Please specify.

[g] Multilateral climate change funds listed in paragraph 17(a) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

[h] Other multilateral climate change funds as referred in paragraph 17(b) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

Provision of public financial support: summary information in 2018[a]

Allocation channels	*Year*									
	Czech koruna - CZK					*USD[b]*				
	Core/ general[c, 1]	*Climate-specific[d, 2]*				*Core/ general[c, 1]*	*Climate-specific[d, 2]*			
		Mitigation	*Adaptation*	*Cross-cutting[e]*	*Other[f]*		*Mitigation*	*Adaptation*	*Cross-cutting[e]*	*Other[f]*
Total contributions through multilateral channels:	157,173,874.00			25,863,159.00		7,231,371.00			1,189,931.00	
Multilateral climate change funds[g]	24,468,852.00			25,863,159.00		1,125,781.00			1,189,931.00	
Other multilateral climate change funds[h]				19,822,221.00					911,995.00	
Multilateral financial institutions, including regional development banks	116,462,400.00					5,358,288.00				
Specialized United Nations bodies	16,242,622.00					747,302.00				
Total contributions through bilateral, regional and other channels		36,021,536.00	104,170,356.00	18,609,683.00			1,657,304.00	4,792,746.00	856,209.00	
Total	157,173,874.00	36,021,536.00	104,170,356.00	44,472,842.00		7,231,371.00	1,657,304.00	4,792,746.00	2,046,140.00	

Note: Explanation of numerical footnotes is provided in the documentation box after tables 7, 7(a) and 7(b).

Abbreviation: USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

[b] Parties should provide an explanation of the methodology used for currency exchange for the information provided in tables 7, 7(a) and 7(b) in the documentation box.

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

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

[e] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

[f] Please specify.

[g] Multilateral climate change funds listed in paragraph 17(a) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

[h] Other multilateral climate change funds as referred in paragraph 17(b) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

CTF Table 7a Provision of public financial support: contribution through multilateral channels

Provision of public financial support: contribution through multilateral channels in 2017[a]

Donor funding	*Total amount*				*Status[b, 3]*	*Funding source[f, 4]*	*Financial instrument[f, 5]*	*Type of support[f, g, 6]*	*Sector[c, f, 7]*
	Core/general[d, 1]		*Climate-specific[e, 2]*						
	Czech koruna - CZK	*USD*	*Czech koruna - CZK*	*USD*					
Total contributions through multilateral channels	32,719,593.00	1,399,350.00	48,409,474.00	2,070,374.00					
Multilateral climate change funds	20,140,621.00	861,373.00	28,409,474.00	1,215,015.00					
1. Global Environment Facility	20,140,621.00	861,373.00	9,521,879.00	407,231.00	Disbursed	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									
7. Other multilateral climate change funds			18,887,595.00	807,784.00					
Multilateral Fund for the Implementation of the Montreal Protocol			18,887,595.00	807,784.00	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
Multilateral financial institutions, including regional development banks									
1. World Bank									
2. International Finance Corporation									
3. African Development Bank									
4. Asian Development Bank									
5. European Bank for Reconstruction and Development									
6. Inter-American Development Bank									
7. Other									
Specialized United Nations bodies	12,578,972.00	537,977.00	20,000,000.00	855,359.00					
1. United Nations Development Programme	12,578,972.00	537,977.00	20,000,000.00	855,359.00					
UNEP	12,578,972.00	537,977.00			Disbursed	ODA	Grant	Cross-cutting	Cross-cutting

Programme for facilitating the engagement with and access to the Green Climate Fund for Serbia and/or other countries of the Western Balkans			20,000,000.00	855,359.00	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
2. United Nations Environment Programme									
3. Other									

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

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

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

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

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

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

[f] Please specify.

[g] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

Provision of public financial support: contribution through multilateral channels in 2018[a]

Donor funding	*Total amount*				*Status[b, 3]*	*Funding source[f, 4]*	*Financial instrument[f, 5]*	*Type of support[f, g, 6]*	*Sector[c, f, 7]*
	Core/general[d, 1]		*Climate-specific[e, 2]*						
	Czech koruna - CZK	*USD*	*Czech koruna - CZK*	*USD*					
Total contributions through multilateral channels	157,173,874.00	7,231,371.00	25,863,159.00	1,189,931.00					
Multilateral climate change funds	24,468,852.00	1,125,781.00	25,863,159.00	1,189,931.00					
1. Global Environment Facility	24,468,852.00	1,125,781.00	6,040,938.00	277,936.00	Disbursed	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									
7. Other multilateral climate change funds			19,822,221.00	911,995.00					
Multilateral Fund for the Implementation of the Montreal Protocol			19,822,221.00	911,995.00	Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
Multilateral financial institutions, including regional development banks	116,462,400.00	5,358,288.00							
1. World Bank									
2. International Finance Corporation									
3. African Development Bank									
4. Asian Development Bank									
5. European Bank for Reconstruction and Development									
6. Inter-American Development Bank									
7. Other	116,462,400.00	5,358,288.00							
International Development Association	116,462,400.00	5,358,288.00			Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
Specialized United Nations bodies	16,242,622.00	747,302.00							
1. United Nations Development Programme	3,000,000.00	138,026.00							
UNDP	3,000,000.00	138,026.00			Disbursed	ODA	Grant	Cross-cutting	Cross-cutting

2. United Nations Environment Programme	13,242,622.00	609,276.00							
UNEP	13,242,622.00	609,276.00			Disbursed	ODA	Grant	Cross-cutting	Cross-cutting
3. Other									

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

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

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

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

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

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

[f] Please specify.

[g] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

CTF Table 7b Provision of public financial support: contribution through bilateral, regional and other channels

Provision of public financial support: contribution through bilateral, regional and other channels in 2017[a]

Recipient country/ region/project/programme[b]	*Total amount*		*Status[c, 3]*	*Funding source[g, 4]*	*Financial instrument[g, 5]*	*Type of support[g, h, 6]*	*Sector[d, g, 7]*	*Additional information[e]*
	Climate-specific[f, 2]							
	Czech koruna - CZK	*USD*						
Total contributions through bilateral, regional and other channels	137,615,984.00	5,885,556.00						
Afghanistan / Participatory agricultural development of the Samangan province	4,998,287.00	213,766.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Enhancing capacity of junior geoscience professionals working in governmental offices (FDRE)	572,475.00	24,484.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Establishment of Sustainable Drinking Water Supply Systems in Small Towns in the Districts Zone of Sidama II, SNNPR	3,315,523.00	141,798.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Effective Irrigation for sustainable agricultural production in Kembata Tembara Zone in Ethiopia	2,042,350.00	87,347.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Study of natural phenomena threatening agricultural production in selected areas in SNNPR	2,169,213.00	92,773.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	
Ethiopia / Improving the quality of University education in the applied Earth Sciences and Development	389,140.00	16,643.00	Committed	ODA	Grant	Adaptation	Other (Post-secondary education)	

Ethiopia / Hydrogeological and Hydrochemical Mapping / (Completion of hydrogeological mapping in Ethiopia)	5,999,900.00	256,603.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Establishment of sustainable system of drinking water supply of Sidama Zone, SNNPR, Ethiopia, III (Inventarisation of water resources)	1,600,000.00	68,429.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Increased Ecological Stability of Dijo and Bilate Watersheds	8,000,000.00	342,144.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Implementation of holistic management and Climate Smart Agriculture in the Baso River catchment, Arba Minch Zuria Woreda, SNNPR, Ethiopia	8,135,000.00	347,917.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Improving the quality level of of the applied geology and creation of research center and the University of Arba Minch, SNNPR, Ethiopia	1,636,223.00	69,978.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Improving quality of life by ensuring available and sustainable management of water resources in Sidama Zone, (Geophysical survey in Dale, Bona Zuriya and Bensa woreda in Sidama zone, SNNPR, Ethiopia)	996,631.00	42,624.00	Committed	ODA	Grant	Adaptation	Water and sanitation	

Ethiopia / Support of agricultural consultancy development in Ethiopia / (Strengthening livelihoods and nutrition through improved community services in Sidama and Gedeo Zones, SNNPR)	2,500,000.00	106,920.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Rehabilitation of water resources in drough affected areas of Somali region, Ethiopia	3,964,165.00	169,539.00	Committed	ODA	Grant	Adaptation	Other (Reconstruction relief and rehabilitation)	
Ethiopia / Establishment of Sustainable System of Drinking Water Supply of Sidama Zone, SNNPR, Ethiopia III / (Ensuring access to drinking water for the residents of Loka Abaya in Sidama zone)	10,261,443.00	438,861.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Establishment of Sustainable System of Drinking Water Supply of Sidama Zone, SNNPR, Ethiopia II, (Improvement of Health, Hygiene and Sanitation in selected towns and villages of Sidama Zone, Ethiopia)	2,500,000.00	106,920.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Georgia / Study trip to the Czech Republic for the further development of capacities in the field of road meteorology	250,350.00	10,707.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	

Georgia / Evaluation of Landslide Susceptibility in the Mountainous Parts of Georgia	1,202,253.00	51,418.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	
Georgia / Strengthening capacities in the field of road meteorology III	193,961.00	8,295.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	
Georgia / Increasing Safety of Transport Corridors in Georgia through Development of Road Meteorology/Instalation of Meteorological Stations at Selected Transport Corridors in Georgia	427,000.00	18,262.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	
Ghana / Wells for life	216,000.00	9,238.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Lebanon / WASH for Syrian refugees in Beeka-valley	3,700,497.00	158,263.00	Committed	ODA	Grant	Adaptation	Other (Emergency Response)	
Republic of Moldova / Technical specification - flood prevention	45,000.00	1,925.00	Committed	ODA	Grant	Adaptation	Other (Public sector policy and administrative management)	
Mongolia / Urgent needs and livehold protection for families affected by dzud	2,000,000.00	85,536.00	Committed	ODA	Grant	Adaptation	Other (Emergency Response)	

Mozambique / Inhaca Island small-scale farming and drip irrigation project	400,000.00	17,107.00	Committed	ODA	Grant	Adaptation	Agriculture	
Myanmar / Shelter and school recovery in flood-affected villages	2,000,000.00	85,536.00	Committed	ODA	Grant	Adaptation	Other (Reconstruction relief and rehabilitation)	
Nepal / Improvement of waters, sanitation and hygiene (WASH) facilities in Nepal	220,000.00	9,409.00	Committed	ODA	Grant	Adaptation	Other (Basic health)	
Nigeria / Comprehensive assistance to IDPs and returnees in north-east Nigeria	2,787,900.00	119,233.00	Committed	ODA	Grant	Adaptation	Other (Reconstruction relief and rehabilitation)	
Peru / Use of Applied Geomorphology in the Evaluation of Landscape Vulnerability by Natural Hazards Associated with the Climate Phenomenon El Niño in the Regions of Northern Peru	429,444.00	18,366.00	Committed	ODA	Grant	Adaptation	Other (Business and other services), Other (General environment protection)	
Peru / Landslide research for risk reduction and climate change adaptation in Peru	200,000.00	8,554.00	Committed	ODA	Grant	Adaptation	Agriculture	
Philippines / Shelter reconstruction after typhoon Nina	1,000,000.00	42,768.00	Committed	ODA	Grant	Adaptation	Other (Reconstruction relief and rehabilitation)	

Serbia / Local water supply and sanitary protection of spring and wells	321,871.00	13,766.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
South Sudan / Strengthening food security and nutrition status and improving livelihoods of the most vulnerable population in Eastern Equatioria State	1,950,000.00	83,397.00	Committed	ODA	Grant	Adaptation	Other (Developmental food aid/food security assistance)	
Sri Lanka / Renovation of flood-affected Nilwala National College of Education	2,500,000.00	106,920.00	Committed	ODA	Grant	Adaptation	Other (Reconstruction relief and rehabilitation)	
West Bank and Gaza Strip / Contribution to energy programmes	8,500,000.00	363,527.00	Committed	ODA	Grant	Adaptation	Energy	
Zambia / Feasibility Study of application Czech pumping and water treatment technology in Zambia	494,700.00	21,157.00	Committed	ODA	Grant	Adaptation	Other (Business and other services), Water and sanitation	
Zambia / Analysis of the situation, needs and value chains in the agricultural sector in the Western Province of Zambia	550,000.00	23,522.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Participatory Development of Productive Landscapes in Sidama Zone, SNPR, Ethiopia	2,500,000.00	106,920.00	Committed	ODA	Grant	Cross-cutting	Agriculture	

Chile / Recovery of wildfire-affected forests	3,000,000.00	128,304.00	Committed	ODA	Grant	Cross-cutting	Other (Reconstruction relief and rehabilitation)	
Mongolia / Development of forests and genofond of local forest ecotypes in Mongolia	7,124,030.00	304,680.00	Committed	ODA	Grant	Cross-cutting	Forestry	
Mongolia / Improvement of the reliable electric supply in Mongolia	498,542.00	21,322.00	Committed	ODA	Grant	Cross-cutting	Energy	
Bosnia and Herzegovina / Using biomass to develop rural areas of Bosnia and Herzegovina - implementation of UNDP	4,833,285.00	206,710.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Solar Energy for the hospital of Dr. Safet Mujic in Mostar	2,387,905.00	102,126.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / EXPLOITATION OF RENEWABLE GEOTHERMAL ENERGY IN THE MUNICIPALITY OF DOBOJ /Ensuring pumping test in Sevarlije	981,668.00	41,984.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Mostar Hospital - additional supplies for the solar energy for the Safet Mujic Hospital	1,399,995.00	59,875.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Analysis of groundwater samples - Sevarlije	4,659.00	199.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Project documentation for installation of geothermal heating at Sevarlije school	689,703.00	29,497.00	Committed	ODA	Grant	Mitigation	Energy	

Bosnia and Herzegovina / Supporting the Energy Sufficiency of Minority Returnees in Western Bosnia - Expert Services and Consultations	230,000.00	9,837.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Support of energy self sufficiency of minority returnees in Western Bosnia - project coordination	678,470.00	29,017.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Biomass use for development of rural areas of Bosnia and Herzegovina - expert services and consultations	600,000.00	25,661.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Proposal for a technical solution for the use of geothermal energy for the development of Cazin	281,700.00	12,048.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Expansion of local production of pellets and agropellets in Bosnia and Hercegovina	447,390.00	19,134.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Forestry	
Bosnia and Herzegovina / Installation of geothermal heating in a school St. Sava - Sevarlije	4,713,892.00	201,603.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Construction Supervisor in Sevarlije	335,907.00	14,366.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Training in production and use of PV and wind turbine systems for electricity production	270,095.00	11,551.00	Committed	ODA	Grant	Mitigation	Energy	
Cambodia / Developing sustainable, market-driven biogas and solar energy	8,000,000.00	342,144.00	Committed	ODA	Grant	Mitigation	Energy	

solutions for rural communities in Cambodia								
Ethiopia / Degraded lands sanitation and reclamation as a base of sustainable management of natural resources in Awassa Zuriya Woreda	3,500,000.00	149,688.00	Committed	ODA	Grant	Mitigation	Forestry	
Georgia / Heating to Schools	499,860.00	21,378.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Energy	
Georgia / Heating to Schools	678,025.00	28,998.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Energy	
Ghana / Rural Electrification through Solar Batteries	498,750.00	21,331.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Energy	
Mongolia / Reconstruction of the coal handling workshop at the Ulaanbaatar third power plant	1,300,000.00	55,598.00	Committed	ODA	Grant	Mitigation	Energy	
Mongolia / Improving the quality and relevance of education at the Mongolian University of Science and Technology	1,000,000.00	42,768.00	Committed	ODA	Grant	Mitigation	Other (Post-secondary education)	
Mongolia / Analysis of the potential for energy audits of coal power plants in Mongolia in Ulaanbaatar	351,177.00	15,019.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Energy	

Serbia / Analysis of the potential for utilization of Energy Performance Contracting in city of Cacak	446,471.00	19,095.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Energy	
Serbia / Establishment of a joint venture for producing wood biomass as a renewable source and alternative and ecological fuel	495,000.00	21,170.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Energy	
Serbia / Serbian watermill - Local power source	458,500.00	19,609.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Energy	
Serbia / Expansion of the use of local biomass in medium-sized boilers on chips and pellets in Serbia	447,300.00	19,130.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Energy	
Viet Nam / Feasibility Study: Adjustment of simulation modelling tools according to local specifics of the example Ring Road no.3 solution in Hanoi – toward sustainable urban mobility	494,334.00	21,142.00	Committed	ODA	Grant	Mitigation	Other (Business and other services), Other (Communications), Transport	

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

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[g] Please specify.

[h] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

Provision of public financial support: contribution through bilateral, regional and other channels in 2018[a]

Recipient country/ region/project/programme[b]	*Total amount*		*Status*[c, 3]	*Funding source*[g, 4]	*Financial instrument*[g, 5]	*Type of support*[g, h, 6]	*Sector*[d, g, 7]	*Additional information*[e]
	Climate-specific[f, 2]							
	Czech koruna - CZK	*USD*						
Total contributions through bilateral, regional and other channels	158,801,575.00	7,306,259.00						
Argentina / Market Research for Vineyard Irrigation Optimization System in Argentina (SIMONA)	250,000.00	11,502.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	
Bosnia and Herzegovina / The use of root wastewater treatment plants in Bosnia and Herzegovina	1,768,496.00	81,366.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	
Bosnia and Herzegovina / DRR and resilience for flood-affected communities	2,615,000.00	120,313.00	Committed	ODA	Grant	Adaptation	Other (Disaster Risk Reduction)	
Cambodia / Business Plan for Provision of Climate Risk Assessment Services in Cambodian Agriculture	105,126.00	4,837.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	

Cambodia / Promoting the competitiveness and marketing of Cambodian root sewage treatment technology	557,600.00	25,654.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	
Cambodia / DRR and early warning	2,000,000.00	92,017.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	
Cambodia / Adaptation of agriculture to climate change	1,884,897.00	86,722.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	
Cambodia / Community based resilience building towards emergencies	2,000,000.00	92,017.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	
Ethiopia / Introduction of sustainable water resources management through increased accessability and quality of vocational education in selected zones, SNNPR	6,000,000.00	276,052.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Preparation of project documentation for drinking water supply in Hawassa Zuriya	307,484.00	14,147.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Hydrogeological and Hydrochemical Mapping / (Completion of hydrogeological mapping in Ethiopia)	4,997,150.00	229,913.00	Committed	ODA	Grant	Adaptation	Water and sanitation	

Ethiopia / Establishment of Sustainable System of Drinking Water Supply of Sidama Zone, SNNPR, Ethiopia III	5,349,486.00	246,123.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Improving Health, Hygiene and Sanitation in Selected Cities and Villages of Sidama Zone, Ethiopia (SNNPR)	5,500,000.00	253,048.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Inventarisation of water resources	1,155,000.00	53,140.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Providing access to safe drinking water to the inhabitants of town Bona, Ethiopia	83,000.00	3,819.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Establishment of sustainable system of drinking water for residents of Guguma, Teso, Bargo and Huluka in Sidama	509,092.00	23,423.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Hydrogeological survey in the woredas of Dale, Bono Zuriya and Bensa	9,645,000.00	443,754.00	Committed	ODA	Grant	Adaptation	Water and sanitation	
Ethiopia / Increased Ecological Stability of Dijo and Bilate Watersheds	4,000,000.00	184,035.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Implementation of holistic management and Climate Smart Agriculture in the Baso River catchment, Arba Minch Zuria Woreda, SNNPR, Ethiopia	5,000,000.00	230,044.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Study of natural phenomena threatening agricultural production in selected areas in SNNPR	1,204,700.00	55,427.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	

Ethiopia / Strengthening livelihoods and nutrition through improved community services in Sidama and Gedeo Zones, SNNPR	4,800,000.00	220,842.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Effective Irrigation for sustainable agricultural production in Kembata Tembara Zone in Ethiopia	2,300,000.00	105,820.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Enhancement of the education and scientific research in the field of biotechnologies, agricultural production and extension at Hawassa University	1,040,000.00	47,849.00	Committed	ODA	Grant	Adaptation	Other (Post-secondary education)	
Ethiopia / Enhance Resilience against climate change-induced food insecurity and improving livelihood opportunities of pastoralist and agro pastoralist	3,000,000.00	138,026.00	Committed	ODA	Grant	Adaptation	Agriculture	
Ethiopia / Resilience building towards emergencies in Borana zone	2,000,000.00	92,017.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	
Ethiopia / DRR and resilience towards emergencies	2,000,000.00	92,017.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	
Ethiopia / WASH assistance for drought affected population and refugees	5,795,000.00	266,621.00	Committed	ODA	Grant	Adaptation	Other (Emergency Response)	

Indonesia / Ensuring efficient and sustainable water treatment and distribution on Sumba Island	248,722.00	11,443.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	
Indonesia / Reducing water pollution through innovative wastewater treatment technology in Indonesia	205,250.00	9,443.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	
Kyrgyzstan / Improving sanitation in the Issyk-kul lake area in Kyrgyzstan	368,828.00	16,969.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	
Malawi / Enhancing Adaptation of Smallholder Farmers to Climate Change, Malawi	497,082.00	22,870.00	Committed	ODA	Grant	Adaptation	Agriculture	
Myanmar / Recovery of shelter, schools and roads after floods	4,540,000.00	208,880.00	Committed	ODA	Grant	Adaptation	Other (Reconstruction relief and rehabilitation)	
Republic of Moldova / Support of inclusive education, access to safe water in sanitations in kindergartens in the South of Moldova	1,640,205.00	75,464.00	Committed	ODA	Grant	Adaptation	Other (Education)	
Republic of Moldova / Delivery of mobile flood barriers to Moldova	11,203,561.00	515,462.00	Committed	ODA	Grant	Adaptation	Other (Government and civil society)	
Mongolia / Leveraging Technology and Tradition for Resilience in Rural Mongolia	660,000.00	30,366.00	Committed	ODA	Grant	Adaptation	Other (Disaster prevention and preparedness)	

Peru / Flood vulnerability analysis of the Piura River and its elimination possibilities	1,384,012.00	63,677.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	
Peru / Drinking water treatment plants for small and medium-sized municipalities in Peru	2,331,500.00	107,269.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	
Serbia / Utilizing the hydropotentiality of existing raw / drinking water feeders of regional water supply systems in the region of Western Serbia	247,999.00	11,410.00	Committed	ODA	Grant	Adaptation	Energy	
South Sudan / Strengthening food security and nutrition status and improving livelihoods of the most vulnerable population in Eastern Equatioria State	1,550,000.00	71,314.00	Committed	ODA	Grant	Adaptation	Other (Developmental food aid/food security assistance)	
Syrian Arab Republic / Restoration of war-torn irrigation systems in Latakia and Tartus	488,658.00	22,483.00	Committed	ODA	Grant	Adaptation	Other (Business and other services)	
Developing countries / UNISDR / Sendai Framework implementation in fragile countries	2,937,508.00	135,151.00	Committed	ODA	Grant	Adaptation	Other (Disaster Risk Reduction)	
Afghanistan / Natural Resource Management and Promotion of Sustainable Agrarian Livelihoods in four Districts of Samangan (Northern Afghanistan)	1,800,000.00	82,816.00	Committed	ODA	Grant	Cross-cutting	Agriculture	

Cambodia / Livelihood Enhancement Action Programme (LEAP)	3,981,083.00	183,165.00	Committed	ODA	Grant	Cross-cutting	Other (Multisector education/training)	
Ethiopia / Participatory Development of Productive Landscapes in Sidama, SNNPR, Ethiopia	9,000,000.00	414,079.00	Committed	ODA	Grant	Cross-cutting	Agriculture	
Mongolia / Development of forests and genofond of local forest ecotypes in Mongolia	3,630,000.00	167,012.00	Committed	ODA	Grant	Cross-cutting	Forestry	
Mongolia / Mongolian Forestry in development: elevated skills in forest planning and management	198,600.00	9,137.00	Committed	ODA	Grant	Cross-cutting	Forestry	
Bosnia and Herzegovina / Renewable energy resources for the central heating system in the city of Mrkonjić Grad	1,083,172.00	49,835.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Proposal for a technical solution for the use of geothermal energy for the development of Cazin	300,000.00	13,803.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Use of Geothermal energy for the development of Cazin municipality	323,000.00	14,861.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Support of energy self sufficiency of minority returnees in Western Bosnia - project coordination	150,000.00	6,901.00	Committed	ODA	Grant	Mitigation	Energy	

Bosnia and Herzegovina / Support of energy self sufficiency of minority returnees in Western Bosnia - technical supervision and training	1,159,025.00	53,325.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Delivery and installation of solar systems for minority returnees in Western Bosnia	6,012,740.00	276,639.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Biomass use for development of rural areas of Bosnia and Herzegovina - expert services and consultations	800,000.00	36,807.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Modernization of the heating system in St. Lukas Hospital in Doboj	8,652,385.00	398,085.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / odernization of public building heating systems in Ljubuski and in Novi Travnik - kindergarten in Ljubuski	2,996,465.00	137,864.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Modernization of public building heating systems in Ljubuski and in Novi Travnik - kindergarten in Novi Travnik	4,045,870.00	186,145.00	Committed	ODA	Grant	Mitigation	Energy	
Bosnia and Herzegovina / Biomass use for development of rural areas of Bosnia and Herzegovina - United Nations Development Programme Bosnia and Herzegovina	4,453,000.00	204,877.00	Committed	ODA	Grant	Mitigation	Energy	

Cambodia / Improvement of vocational secondary education in the field of agricultural products processing - "ACTIVE for Youth"	4,000,000.00	184,035.00	Committed	ODA	Grant	Mitigation	Other (Secondary education)	
Georgia / Use of renewable sources of energy in buildings owned by Tbilisi	248,914.00	11,452.00	Committed	ODA	Grant	Mitigation	Other (Business and other services)	
Ghana / Solar powered water pumps for the development of rural areas	247,500.00	11,387.00	Committed	ODA	Grant	Mitigation	Other (Business and other services)	
Indonesia / Small hydroelectric power plant (MVE) Tincep, North Sulawesi Province	250,000.00	11,502.00	Committed	ODA	Grant	Mitigation	Other (Business and other services)	
Indonesia / Innovations in energy self-sufficiency and clean mobility	200,000.00	9,202.00	Committed	ODA	Grant	Mitigation	Other (Business and other services)	
Mongolia / Transfer of know-how to energy savings in Mongolia	225,115.00	10,357.00	Committed	ODA	Grant	Mitigation	Other (Business and other services)	
Serbia / Analysis of the potential for utilization of Energy Performance Contracting in autonomous province Vojvodina	249,350.00	11,472.00	Committed	ODA	Grant	Mitigation	Energy	
Sri Lanka / Business plan to enter the Sri Lankan market with the technology of water heating through solar thermal collectors	225,000.00	10,352.00	Committed	ODA	Grant	Mitigation	Other (Business and other services)	
Zambia / Access to energy in Western Province, Zambia	400,000.00	18,403.00	Committed	ODA	Grant	Mitigation	Energy	

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

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CTF Table 8 Provision of technology development and transfer support

No information provided in table 8

CTF Table 9 Provision of capacity-building support

No information provided in table 9